

Numeracy across the Curriculum

What is Numeracy?

Mathematical literacy (numeracy) is an individual's capacity to identify and understand the role that mathematics plays in the world, to make well-founded judgements and to use and engage with mathematics in ways that meet the needs of that individual's life as a constructive, concerned and reflective citizen

(National Numeracy, 2012)

The acquisition of at least basic mathematical skills – commonly referred to as “numeracy” – is vital to the life opportunities and achievements of individual citizens. Research shows that problems with basic skills have a continuing adverse effect on people's lives and that problems with numeracy lead to the greatest disadvantages for the individual in the labour market and in terms of general social exclusion. Individuals with limited basic mathematical skills are less likely to be employed, and if they are employed are less likely to have been promoted or to have received further training.

(Making Mathematics Count, 2004)

Numeracy is a proficiency which involves confidence and competence with numbers and measures. It requires an understanding of the number system, a repertoire of computational skills and an inclination and ability to solve number problems in a variety of contexts. Numeracy also demands practical understanding of the ways in which information is gathered by counting and measuring, and is presented in graphs, diagrams, charts and tables

(National Framework for teaching Mathematics, 1999)

Aims

- To raise the numeracy levels of all pupils within Carmel College.
- To establish a coordinated and consistent approach to numeracy across all areas of the school curriculum.
- To enable all pupils to access the curriculum by having sufficient numerical skills to be able to do so.
- To enable pupils to appreciate the relevance and importance of numeracy in helping to explain and understand their world.

Main objectives

Teaching of numeracy should capitalise on pupils' enthusiasm for calculation and problem-solving and make number work challenging and enjoyable.

For anyone... "anxious to ensure the next generation enjoy opportunities to flourish in an economy that is growing, in a nation that is confident and in a society that believes in progress, there is no escaping the centrality of mathematics."

(Michael Gove, Secretary of State for Education, June 2011)

Given this statement, it is the responsibility of all college stakeholders to ensure that the pupils of Carmel College are taught the necessary skills to become confidently numerate members of the community.

The necessary skills are as follows:

- Have a sense of the size of number and how it fits into the number system.
- Recall mathematical facts.
- Solve mental calculations accurately.
- Solve calculations using pencil and paper methods.
- Use calculators and ICT confidently.
- Estimate with confidence and use approximate values to check the validity of their calculations.
- Understand and use measures of time and speed and rates such as miles per hour, etc.
- Confidently use an understanding of ratio, proportion and scale in a variety of different contexts
- Collect different types of data and display this data in various different diagrams and charts.
- Interpret, analyse and predict from data displayed in many forms.
- Explain and justify their mathematical reasoning when calculating either routine or non-routine problems.
- Promote a confidence and competence in using and applying mathematics, recognising that skills are transferable across different subject areas and in a variety of contexts

Implementation

To support children to develop fluency with number, as a staff we should

- Have regard for the whole school numeracy policy in the planning of our lessons;
- Use and explain mathematical vocabulary whenever it will enhance pupils' knowledge, skills and understanding of the topic;
- Give emphasis and encourage mental calculations when it is sensible to do so;
- Encourage pupils to estimate when appropriate;
- Be aware that pupils may not have met skills earlier in their mathematics programme of study and if possible consult with the mathematics department before teaching a new technique; and
- Accept valid methods presented by pupils if they can offer a reasoned argument.

Staff should within their own subjects, be able to

- Provide a range of appropriate contexts and situations which give meaning to numerical tasks
- Create an environment which encourages children to develop and use their own methods of working at numerical tasks
- Help children refine and improve their own methods of working at numerical tasks
- Create opportunities for children to compare and discuss a range of different methods of numerical calculation.
- Recognise that this process takes time and will vary from child to child
- Demonstrate how to measure to a suitable degree of accuracy;
- Use units of measure correctly;
- Demonstrate how to use the four rules of number, with and without a calculator;
- Demonstrate how to select a type of graph, diagram or chart appropriate to the data provided;
- Correctly label a graph, diagram or chart;
- Correctly interpret a graph and make appropriate comparisons where more than one graph illustrates the data;
- Use and explain the meaning of appropriate mathematical terminology and language.
- Make pupils aware of how numeracy skills may be used or can be important in other subject areas.
- Encourage pupils to fully explain any calculations, estimations or approximations they have found mentally.
- Highlight numerical errors or misconceptions as soon as they occur, either during lessons/discussions or when marked work is returned.
- Have a sense of the size of number and how it fits into the number system.
- Recall mathematical facts.
- Solve mental calculations accurately.
- Solve calculations using pencil and paper methods.
- Use calculators and ICT confidently.
- Estimate with confidence and use approximate values to check the validity of their calculations.
- Understand and use measures of time and speed and rates such as miles per hour, etc.
- Confidently use an understanding of ratio, proportion and scale in a variety of different contexts

- Collect discrete and continuous data and display this data in various different diagrams and charts.
- Interpret, analyse and predict from data displayed in many forms.
- Explain and justify their mathematical reasoning when calculating either routine or non-routine problems.
- Promote a confidence and competence in using and applying mathematics, recognising that skills are transferable across different subject areas and in a variety of contexts

Ways of improving pupils' numeracy in the mathematics classroom

- 10 minute activities at the start of each lesson to develop and secure pupils' calculation strategies and rapid recall skills.
- Using display work to jog the memory, both published material and pupils' own work.
- Questioning pupils effectively, including as many of them as possible, giving them time to think before answering, targeting individuals to take account of their attainment and needs.
- Ask pupils to demonstrate and explain their methods and reasoning and exploring reasons for any wrong answers.
- Encourage discussion of mental strategies within 'ordinary' classwork.
- Puzzles and games which require development of strategies and logical thinking.
- Identifying 'difficult' sums and targeting learning of these.
- Rehearsal and development time built in for the 'basics'.
- Investigations that require pupils to think for themselves.
- Setting short-term targets, such as timed or number of correct answers.
- Opportunities to include contributions from all pupils such as 'show me' number fans.
- Involving parents whenever possible.
- Giving pupils strategies to learn things off by heart.
- Using a plenary to draw the whole class together to sort out misconceptions, identify progress and make links to other subjects, as well as to set homework.

Numeracy within other subjects

Geography

- Collect, display and interpret data
- Lines of best fit
- Rates (eg. per 1000, per 100 000)
- Scale
- Grid references
- Area/distance
- Application of the four rules of number
- Population growth / Exponential Growth
- Correlation

Science

- Percentages, decimals, fractions
- Mass/weight
- Collect, display and interpret data
- Gradients and area under graphs
- Manipulate formulae

- Speed/distance/time
- Standard form, large numbers, small numbers
- Measures
- Area, volume
- Application of the four rules of number
- Square and square roots
- Proportional and inverse proportion
- Line of best fit
- Ratio
- Approximations

Business Studies

- Use of spreadsheets
- Formulae
- Use of money
- Profit and loss, break even
- Percentages, decimals and fractions
- Display and interpretation of data
- Application of the four rules of number

Technology

- Percentages, fractions and decimals
- Measurement
- Length, area and volume
- Mass/weight
- Collect, display and interpret data
- Percentages, decimals and fractions
- Costings
- Application of the four rules of number
- Surface area of 2D and 3D shapes
- Nets of cubes and cuboids

I.C.T

- Spreadsheets
- Databases
- Flowcharts
- Algebra
- Boolean logic

History

- Graphs, charts and pictograms of various kinds
- Percentages
- Time lines

English

- Frequency of words
- Bar charts, Pie charts
- Surveys
- Line graphs – charting emotional response

Art

- Tessellations – Escher

- Enlargements and scale factors – Perspective
- Simple ratios
- Use of geometrical shapes
- Shapes in 2D and 3D

Modern Foreign Languages

- Measurement of length, distance, time and weight
- Counting
- Tables
- Exchange rates and conversion
- Money, cost, speeds, distance

Religious Education

- Using Fractions and percentages to compare population and wealth between 1st and 3rd world countries.
- Analysing Statistics
- Properties of shapes – Triangle answers, Star of David, etc.
- Calculating percentages of an amount for charitable contributions (Tithing)
- The idea of Mathematics being the universal form of communication
- The relationship between Mathematics and Philosophy and proof
- Using symbols to design or decode coded writing

Physical Education

- Speed, distance, time, weights
- Graphs and charts
- Calculations of expended energy
- Keeping score
- Collecting and recording continuous data
- Pressure of gases in transportation of Oxygen

Departmental Handbooks and Schemes of Work

Successful teaching makes initial and continuing progress in numeracy for all pupils a central objective and reflects this in curriculum planning and organisation. It is strongly associated with leadership with the expertise and opportunity to influence practice, with a comprehensive school policy and scheme of work, and with co-operative planning between teachers to ensure consistency and progression.

Departmental handbooks should

- Contain a copy of the whole school numeracy policy.
- Identify topics requiring numeracy skills