Bishop Milner Catholic College

Numeracy Policy

Teach us to number our days….that we may gain a heart of wisdom.

Psalm 90:12

REVISED: June 2018

PRESENTED TO REPRESENTATIVES: June 2018

TO BE REVIEWED: June 2020

Definition of Numeracy

Numeracy can mean many different things. There is numeracy as the foundation of mathematics, the concepts learnt in school and necessary for understanding more advanced mathematics, such as quadratic equations, statistical analysis and calculus. Or in contrast, numeracy is seen purely as the ability to perform simple number calculations i.e. a subset of wider mathematics.

Then there is numeracy in terms of its purpose or its function: numeracy skills are those required to do a job (for example, using spreadsheets, calculating invoices) or to be an engaged citizen (for example, making sense of statistics reported in the media).

 'Mathematical literacy 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'. (PISA-Programme of International Student Assessment)

This definition allows us to focus on the development of numeracy skills and on improving life outcomes for our students. It implies the essential skills needed for solving problems, processing information, making decisions and interpreting data. Being numerate is about appreciating number relationships and interpreting answers, and not just about doing calculations.

Everyday uses of numeracy include:

- •being able to manage family budgets – credit cards, offers at supermarkets and so on

- •being able to estimate – in all kinds of situations, e.g. journey speed, time and distance, roughly how much a bill will be or your expected bank balance at the end of the month

- •being able to critically assess statistics used by advertisers or politicians

As a consequence, at Bishop Milner Catholic College our aim is develop the numeracy skills of all our students by consistent and accurate application across the curriculum. As numeracy is a key skill in life and learning all students are entitled to quality experiences in this area. The teaching of numeracy is the responsibility of all staff and the college's approaches should be as consistent as possible across the curriculum linked to the raising of achievement for all students.

We therefore need to:

1. Continue to raise the profile of numeracy within the school

2. Raise standards of numeracy

3. Make numeracy teaching an overt part of every curriculum area

4. Increase the frequency in which Numeracy skills are made explicit in other subject areas

5. Provide opportunities to increase the Numeracy skills of those pupils who are not meeting required standards.

Underpinned by:

• Creating a positive and attractive environment which celebrates numeracy

• Providing role models through celebrating the successes of older students

• Ensuring that there are activities in the curriculum to allow pupils to learn and practise their range of numeracy skills

• Displaying high quality examples of numeracy being applied across the curriculum

• Providing CPD on teaching numeracy as appropriate.

Numeracy-Departmental/Teacher Action

All departments should assist our learners to acquire proficiency in numeracy. The outcome should be numerate students who are confident enough to tackle mathematical problems in a variety of real life scenarios without going immediately to teachers or friends for help.

Each Department will as a consequence:

Contribute to the raising of numeracy standards within their curriculum area by:

• Recognising that not all students will have the same numerical skills and when unsure of the capabilities of particular students the Mathematics department should be consulted.

•The provision of high quality exemplar materials

•The use of ICT

•Displaying examples of numeracy within curriculum based contexts

• Highlighting opportunities for the use of numeracy within their subject area

• Endeavouring to ensure that materials presented to students will match their capability both in subject content and in numerical demands

• Ensuring that all staff are familiar with this policy and the associated guidelines

• Analyse pupils performance on public examinations and liaise with the mathematics department if any issues with numerical calculation have arisen.

All teachers should:

•Have the highest expectations of the students and ensure that the numerical content is of a high standard.

•Discourage students from writing down answers only and encourage them to show their numerical working out within the main body of their work.

•Encourage the use of estimation particularly for checking work.

•Encourage students to write mathematically correct statements.

•Recognise that there is never only one correct method and students are competent in explaining their own methods if it differs from those being chosen as preferred methods by the college.

•Allow and encourage students to 'vocalise' their numerical skills - a necessary step towards full understanding for many learners.

•Not make assumptions that all pupils in their class will have the same mathematical ability.

• Help students to understand the methods they are using or being taught - students gain more and are likely to remember much more easily if they understand rather than are merely repeating by rote.

• Encourage students to use non-calculator methods whenever possible.

•Encourage students to use the correct language e.g. use the word **mean** rather than **average.**

If problems with numeracy are identified then the Mathematics department need to be informed and will if possible adjust the teaching programme to address the weakness.

Numeracy across the Curriculum

Mathematical skills can be consolidated and enhanced when students have opportunities to apply and develop them across the curriculum. Poor numeracy skills, in particular, hold back a learner's progress and can lower their self esteem. To improve these skills is a whole school matter. Each department will be reminded on a regular basis to identify the contribution it makes towards numeracy and other mathematical skills so that students become confident at tackling mathematics in any context.

As a result, there should be opportunities for students to use and apply numeracy skills in a wide variety of contexts and students will be using a range of strategies and methods. The development of the college set methods booklet will give departments a starting point to aid them in the delivery of key skills.

In essence, numeracy contributes to all curriculum areas and often provides practical applications of skills acquired in mathematics lessons. It is therefore a good opportunity to apply and use mathematics in real contexts.

Departments are encouraged to liaise with the Maths department to improve their own skills in light of the most recent changes to GCSE and A-level specifications.

Art and Design: Students use numeracy in many areas in Art and Design. Many patterns and constructions are based on special ideas and properties of shapes, including symmetry. Designs may need to be enlarged or reduced introducing ideas of ratio and scale factor. In areas of sculpture proportion and measurement are used. When mixing paints, students use ratio and proportion to produce different shades and colours from the three primary colours.

Business Studies/Economics: Numeracy is an essential element of Business and Economics. Students use numeracy in both the creation and interpretation of graphs, charts and tables. Percentages are widely used in data comparisons. Students need to be able to estimate using mental calculations but they also need to be confident in the use of a calculator. Skills of analysis are involved when looking at primary and secondary data and in the scrutiny of questionnaire results. Students also use Excel spreadsheets. By applying numeracy skills to problems set in financial and other real life contexts, students also develop their financial capability and awareness of the applications of real life numeracy.

Health and Social Care/Child Care: Students use graphs, charts and measurement skills when learning about nutrition and read data when comparing actual and expected growth rates etc.

Design Technology: Measuring is used extensively in all areas of technology, involving the use of both metric and imperial units. When making models or constructions students work in millimetres and are required to measure accurately using this unit. The need for plans requires students to be able to produce scale drawings and be able to draw 2D representations of 3D shapes. Identifying and drawing plans and elevations of 3D shapes are also used when planning project work. In Food students require an understanding of proportion when working with and adapting recipes. Students also use percentages when identifying the nutritional content of different foods.

English/Drama: Mathematics lessons help to develop literacy skills by teaching mathematical vocabulary and technical terms and by requiring students to read and interpret problems and identify the mathematics necessary to solve the problem. It also requires students to explain their methods and strategies to others and present their findings and conclusions. Timelines are used to set a piece of work within its historical background and graphs can be used to show changes in the emotions of characters. English lessons may also provide non-fiction texts in which mathematical information in the form of graphs, tables or charts may need to be interpreted and explained. In the Learning Resource Centre the Dewey classification of books is an excellent application of decimal ordering.

Geography: Numeracy is used in many aspects of learning in Geography. Scale, direction, ratio and distance are used in map reading. Graphs and charts are used in the interpretation of patterns and trends. Students also generate, analyse and present data through fieldwork investigations.

History: Numeracy is used in the interpretation and construction of timelines and chronology and when analysing numerical sources, for example, the military strength of countries at the start of World War One. Students use statistics when looking at economic changes. Graphs and tables are used in the presentation of evidence.

Information and Communication Technology (ICT): Students will apply numeracy in a variety of ways in ICT lessons. These include collecting and classifying data and entering it into software, producing graphs and tables, interpreting and explaining their results. When students use computer models they will use their ability to interpret numbers and identify patterns and relationships. When designing power point presentations or websites, students will use proportion and their knowledge of shape and space as well as an understanding of enlargement when changing the size of an object. Other numerical skills are used when using formula and formatting within Excel spreadsheets.

Modern Foreign Languages (MFL): Students use numeracy in MFL when learning to tell the time, calculating café bills, handling money, working on days and dates and doing simple arithmetic calculations

involving addition, subtraction and multiplication. Work in MFL offers some students the additional opportunity they need to grasp the fundamentals of number work.

Music: The counting of time, beats and half beats are used extensively in Music, as are rhythms and rhythm patterns.

Physical Education/Dance: Athletic activities require measurement of height, distance, time, speed and symmetry. Movement and direction are used in areas of dance, gymnastics and ball games. Students also use their numeracy skills when evaluating their own performance over a period of time.

Science: Scientific investigations and experiments require students to use their numeracy skills to classify objects, accurately measure distances and quantities, estimate outcomes and quantities when required, recording results in tables and graphs. In Science, students will order positive and negative numbers, including decimals, calculate means of a set of data and calculate percentages of a quantity. At a higher level students will apply their algebra skills to substitute into formulae and rearrange scientific equations. Choosing an appropriate graph and being able to interpret data and make predictions will also take place in Science lessons.

Religious Education and Social Sciences: Timelines are utilised in both RE and the Social Sciences. The discussion of moral and social issues can lead to the use of primary and secondary data and the interpretation of graphs, charts and tables which enable students to make informed decisions and judgements and to recognise biased data and misleading representations. Primary and secondary quantitative data are used both in Sociology and Psychology. Graphs and tables are interpreted and analysed to enable students to draw valid conclusions and assess the reliability and validity of data. Psychology also involves the selection and application of appropriate non-parametric statistical tests to secondary data. An essential topic is probability and significance and its interpretation, in order to avoid both Type 1 and Type 2 errors.

Numeracy and Literacy

Linked to the ongoing enhancement of literacy across the curriculum at Bishop Milner, students should be made aware of the use of the words in a numerical context. Importantly they also need to be reminded that the same words might be used differently outside that context.
A list of vocabulary with ambiguous meanings is detailed below:

Word	Possible interpretation	Mathematical interpretation
Average	Estimate a general standard	Used synonymously with arithmetic mean; for a set of discreet data this is the sum of quantities divided by the number of quantities
Difference	Being dissimilar, non-identical	The result of subtraction
Even	Level or smooth	A positive integer that is divisible by two
Expression	Intonation of voice or aspect of face indicating emotion	A mathematical form expressed symbolically

Face	Front of head from forehead to chin	One of the flat surfaces of a solid shape
Mean	Small minded, malicious, ill-tempered	The arithmetic mean of a set of discrete data is the sum of quantities divided by the number of quantities
Negative	Image on developed film	A number less than zero
Odd	Extraordinary, strange, remarkable	A positive integer that has a remainder of 1 when divided by 2
Power	Mechanical or electrical energy as opposed to manual labour	This is a way of indicating how a number (symbol) must be operated on by using another number written as a subscript to the first
Prime	Chief or most important	A whole number greater than one has exactly two factors, itself and 1
Product	A thing or substance produced by a natural process or manufacture	The result of multiplying one number by another
Root	Part of a plant below the earth's surface, which attaches it to the earth and carries nourishment from the soil to the plant	A value, which satisfies the equation which has been formed by putting an expression, containing one variable, equal to zero
Sign	Write one's name, a signature, important information displayed on a board	A quantity added or subtracted from others in an arithmetic or algebraic expression