



Chailey School Numeracy Policy

September 2014

"Without Mathematics there is nothing you can do. Everything around you is Mathematics. Everything around you is numbers" - Shakuntala Devi

"Pure Mathematics is, in its way, the poetry of logical ideas" – Albert Einstein

"Mathematics knows no races or geographic boundaries; for Mathematics, the cultural world is one country" – David Hilbert

This policy sets out Chailey School's commitment to raising the numeracy standards of all our students. We want all our students to feel confident in using transferable numeracy skills effectively across the curriculum and to cope confidently with the demands of further education, employment and adult life. Numeracy at Chailey School will go beyond mathematical knowledge and computational skills; it will ensure students receive positive messages about numeracy and it will develop the student's ability to be systematic through problems and make reasonable judgements.

The Numeracy Policy is important for the following reasons:

- Numeracy skills enable students to understand and interpret numerical and graphical information. This facilitates improvement in students' abilities to make their own judgements and to draw sensible conclusions from information.
- Almost all subjects depend on students having competence in basic numeracy skills.
- If students' numeracy skills are not developed and used they may well be denied the opportunity to develop the level of understanding of some topics or subjects at the level expected for their age.
- Without basic numeracy skills, students can lack both personal and social adequacy which is a recipe for failure and low esteem. This highlights the importance of the link between Numeracy and SMSC (Social, Moral, Spiritual and Culture) development of the individual student.
- Industry and commerce continually bemoan the lack of numeracy skills of school leavers and graduates alike.
- If it is unacceptable to be illiterate, it is reasonable to suggest that it is unacceptable to be innumerate

A Definition of Numeracy

"A numerate student is one who has the ability to cope confidently with the mathematical needs of adult life. There should be an emphasis on the wider aspects of numeracy and not purely the skills of computation." - **1982 Cockcroft Report**

"Numeracy is a proficiency which is developed mainly in mathematics but also in other subjects. It is more than an ability to do basic arithmetic. It involves developing confidence and competence with numbers and measures. It requires understanding of the number system, a repertoire of mathematical techniques, and an inclination and ability to solve quantitative or spatial problems in a range of contexts. Numeracy also demands understanding of the ways in which data are gathered by counting and measuring, and presented in graphs, diagrams, charts and tables."

- Framework for Teaching Mathematics – yrs 7 to 9 – DfES

A numerate student at Chailey School should be able to:

- Have a sense of the size of a number and where it fits into the number system.
- Use and apply appropriate strategies successfully to solve number related problems e.g. mental, oral and written.
- Make sense of number problems and identify and use the required operations to solve them.
- Restrict their reliance on using a calculator and use them only when it is appropriate to do so.
- Develop their skills in estimation and approximation and have strategies for checking the reasonableness of their answers.
- Communicate their methods and reasoning clearly and concisely using consistent language and mathematical terminology.
- Make and use sensible estimates of a range of measures in everyday situations.
- Interpret, explain and make predictions from information given in graphs, charts and tables.
- Have a positive attitude towards numeracy.

Roles of Individuals

Numeracy Co-ordinator

Role of the Numeracy Co-ordinator is to:

- To oversee the implementation and development of the numeracy policy.
- To evaluate the impact of the numeracy policy on departments and the students.
- To liaise with the Numeracy Champions and help the development of numeracy in schemes of work.
- To identify students who are not making expected progress with numeracy and provide and monitor intervention of these students.
- To provide numeracy support or training to other staff members where appropriate.

Numeracy Champions

Role of the Numeracy Champion is to:

- Participate in "The Numerate School" working group.
- Be the link between the Faculty and the Numeracy Co-ordinator.
- Complete the Faculty audit, identifying the Mathematical elements in their schemes of work.
- With the support of the Numeracy Co-ordinator develop the numeracy strand in their schemes of work.
- Liaise with the Numeracy Co-ordinator to identify key areas of Mathematical skills with which staff require further support.
- Keep the Numeracy Co-ordinator up to date with where Mathematical skills are used in their Faculties with examples of student work where appropriate.
- Promote whole school initiatives such as the Tutor Numeracy Challenge and Chailey Cipher Challenge Club.
- Feedback to Numeracy Co-ordinator on the Numeracy Policy and Numeracy support information where necessary.

Teaching Staff

Roles of teachers other than Mathematics should:

- Always promote positive messages and attitudes towards numeracy in and out of the classroom.
- Ensure they are comfortable using the appropriate mathematical knowledge relating to their own subject. If they are not confident with this knowledge they should seek the assistance and advice of the Numeracy Co-ordinator or other Mathematics teachers in the school.
- Support the Faculty in the completion of numeracy strands in schemes of work.
- If they are tutors to ensure participation in the Tutor Numeracy Challenge or other tutor time numeracy activities.
- To provide feedback to the Numeracy Co-ordinator as to where Mathematical skills have been utilised in lessons or examples of numeracy in real life, and provide examples of work where possible.
- Provide feedback to the Numeracy Co-ordinator on any initiatives or strategies where appropriate.

Teaching and learning

The following notes set out the skills and policies that should be consistently used in teaching and learning across the curriculum. All teachers should aim to use them to inform their teaching.

1). Calculator Policy

- The school expects all students to have their own scientific calculator, which they bring to every lesson. This allows pupils to become familiar with the functions of their own calculator in order to use it effectively and efficiently.
- Students should be encouraged to use the calculator appropriately, i.e. only for difficult calculations or when working with real data involving very large, small or decimal numbers, which might otherwise restrict their progress in a lesson. Encourage pupils to use as mental or written method to work out simple calculations.
- It is good practice to always estimate answers before using a calculator.
- Sensible rounding is expected (interpreting the calculator display).
- If students are using basic calculators, care must be taken as the order of operations is often not always built-in (BIDMAS).
- Students should be encouraged to set down method working, whether using a calculator or not. Answers without working are not acceptable.
- In all areas of the curriculum the use of calculators should be encouraged where they enhance the learning taking place, however it is important that students do not develop a reliance on the use of a calculator to solve problems where mental and/or written methods can be used.
- Students need to be able to interpret the calculator display in context e.g. 5.3 is £5.30 in money.
- Staff to be aware of the removal of teaching calculator skills at KS2 and support students with these skills where appropriate.

2). Teaching and Learning Of

Number

- Estimation and sensible judgement should be encouraged at all times.
- Mental arithmetic should be recommended as a first resort.
- Students should always check their solution for mistakes and check their answers make sense in the context of the question, e.g. you can't have 2.6 people in a car, but you could have a mean of 2.6 people per car.

- In all arithmetic, the importance of place value should be stressed.
- It is better to present sums initially in a horizontal format, to encourage some form of mental calculation, estimation or written method.
- When referring to decimals, say "three point one four" rather than "three point fourteen".
- In a line of working, an "equals" sign should appear only once. Working should develop down the page, with equals signs in line (The following is poor practice:
 $6 \times (3 + 4) = 7 = 6 \times 7 = 42$, as students are equating unequal things.)
- Percentage means out of 100. It can be expressed as a decimal or a fraction out of 100. Be careful how you use percentages in your language.
 Examples:
 - You cannot "give" more than 100%.
 - A decrease of 25%, followed by a further 25% decrease, does not equal a 50% decrease.
 Accuracy is important in multi-step calculations so pupils are encouraged to round to the appropriate degree of accuracy at the **final stage of the calculation**.

Algebra

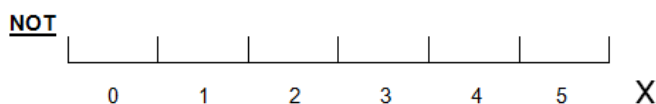
- Trial and improvement is an acceptable mathematical method.
- Students are taught how to rearrange formulae in order to change its subject. Students should be encouraged to use the balancing method to do this, rather than the use of formulae triangles. This is especially the case in Science when using the speed-distance-time formula or the density-mass-volume formula.

Shape, Space and Measure

- Work is done in mathematics on common Imperial units and their metric equivalents. Appropriate units must always be stated; e.g. in answers, graph axes etc.
- Accuracy in measurement is always emphasised in Mathematics. We allow a 2cm/mm/degree margin of accuracy.
- Students must be encouraged in the correct methods to use a compass, protractor and ruler accurately.

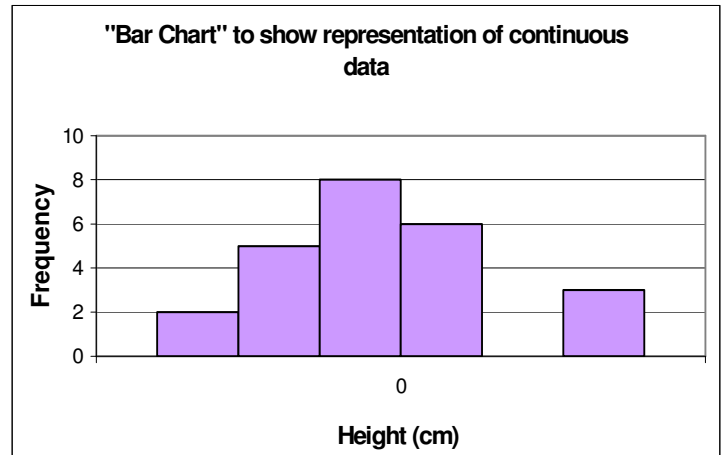
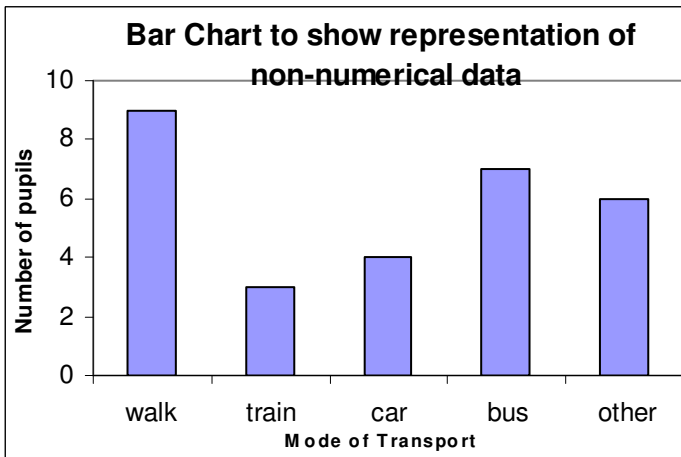
Handling Data

- Always use degrees when constructing pie charts; label sectors with the data or a key.
- All graphs should have a title and labelled axes, with units marked.
- When drawing graphs, the numbers written on the axes must be on the lines, not in the spaces.

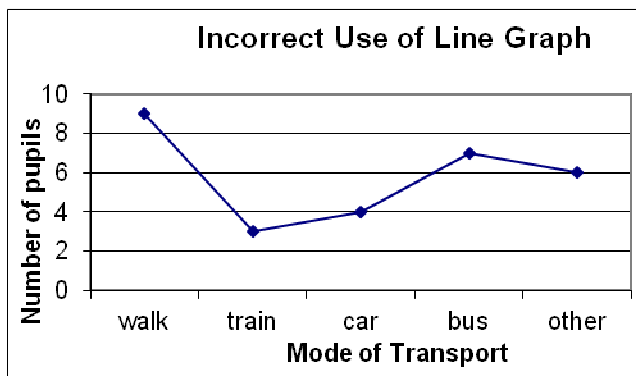


- When interpreting graphs, make sure students know what each "small square" represents on each axis. Students need to be aware that the scale on the x-axis may differ from that on the y-axis.
- Encourage students to always consider whether an information graph axis should or should not start from zero in a particular case and the implication of this.

- Bar charts should be drawn with **gaps between the bars** and are used to display discrete data (data which is counted) and where the data categories are not numerical (colours, makes of car etc). Histograms have no gaps and are used to display continuous data (data which is measured).



- Line graphs should only be used to show a trend, or when the data values between the plotted points make sense to be included.



- Scatter graphs are used to compare two sets of numerical data, to show the degree of correlation between the sets of data; be aware that correlation is not the same as causation. Any estimates made from a scatter graph will be determined by using a line of best fit. In Mathematics this is a straight line, when in Science this is a curve. Students must be made aware of this difference.
- All graphs should be drawn in pencil, using a ruler for straight lines.
- Be aware that there are 3 different averages that are commonly used; the mean, mode and median. So when using the term "average" say "mean average" (or mode or median).
- Probabilities should be written as fractions, decimals or percentages and definitely not as "1 in 7" or "1 out of 7" or "1:7".

Key Vocabulary and Literacy

Vocabulary	Definition
Average	Most commonly used as the mean average which is the sum of quantities divided by the number of quantities. Can also be represented by the median (middle number of a set of ordered data) or mode (most common number).
Congruent	Two shapes which are mathematically identical (same shape and size). Congruent shapes can be reflected, rotated or translated but not enlarged.
Consecutive	Numbers which follow on in order e.g. 1, 2, 3, 4, 5
Denominator	The bottom number of a fraction
Diameter	A line which passes through the centre of a circle from one part of the circumference to another.
Difference	The result of subtraction
Estimate	Calculating a sum by rounding each number to 1 significant figure e.g. $33.5 \times 9.8 = 30 \times 10 = 300$
Expression	A collection of mathematical terms e.g. $3a + 2b$
Face	A collection of 2D shapes which make up a 3D object
Factor	A whole number which can be multiplied by another whole number to make a target number. E.g. 4 and 5 are factors of 20.
Frequency	How often something appears.
Gradient	The steepness of a line, calculated by $\text{Change in } y \div \text{Change in } x$
Identity	Two expressions written differently which mean the same thing e.g. $xy = yx$
Improper fraction (top heavy fraction)	A fraction with a larger numerator than denominator. The decimal equivalent will be larger than 1.
Integer	A whole positive or negative number.
Inverse	An operation which is the reverse of another operation e.g. addition is the inverse of subtraction.
Multiple	A number in the times table e.g. multiples of 3 are 3, 6, 9, 12, 15 etc.
Net	A 2D representation of a 3D object which can be turned into the solid by folding it.
Numerator	The number on the top of a fraction.

Origin	The point at which the x-axis and y-axis meet (0, 0)
Parallel	Two straight lines which never meet.
Perpendicular	Two straight lines which meet at an angle of 90°
Polygon	A many sided shape. The family name for a shape with straight edges e.g. triangles, quadrilaterals.
Prime	A number which only has two factors (is only divisible by itself and 1) e.g. 13 = 13 x 1. 2 is the first prime number and the only even prime
Product	Another word for multiplying
Radius	A straight line from the centre of a circle to the circumference.
Reciprocal	$1 \div$ a number e.g. the reciprocal of 2 is $\frac{1}{2}$
Sum	Another word for adding
Tessellation	The arrangement of 2D shapes which fit together without any gaps or overlaps.

Monitoring and Evaluation

In order to monitor and evaluate the impact of this policy and the initiatives on Chailey School students and staff, the following activities will take place at different times during the year:

- Lesson observations focused on the numeracy element of the lesson. This could be a starter, plenary or activity in the lesson, rather than a whole lesson observation.
- Learning walks with a focus on classroom and corridor displays.
- The number of posts on the blog regarding numeracy.
- Student interviews, aimed at finding out their perception of numeracy/maths in other subjects. Interviews conducted before and at the start of the new academic year and at the end of the year to establish any changes in attitude, perceptions and skills.
- Meeting with Numeracy Champions at key points in the year to evaluate policies/initiatives.
- Track improvements in basic numeracy skills through Chailey School Maths Challenge assessments across KS3.
- Analysis of data at data collection points throughout the year, especially with regards to students who have received/ are receiving intervention.

Supporting Low-Attaining Students

Support is provided for pupils with lower levels of numeracy through the use of Numicon. The Numicon programme is delivered by trained teaching and teaching assistant staff and is used both within and outside of lessons.

The Mathematics teaching staff and the Higher Level Teaching Assistant attached to the Mathematics Faculty lead the 1:1 intervention. Students are predominantly identified by the tracking of progress data and through numeracy assessments. This progress is then tracked by the Mathematics department and the SENCO. Further support is given to identified students once a week through the MyMaths Support Programme.

"How We Teach It" Guides - Contents

Multiplication Methods

Division Methods

BIDMAS

Converting Units

Ratio

Fractions, Decimals and Percentages

Percentages of Amounts

Rounding

Averages

Rearranging Formulae