Numeracy Strategy

Magna Academy Poole

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Contents

Introduction

Numeracy is the ability to use mathematics in everyday life. It means having the competence and skills to use mathematics to solve everyday problems (see Appendix 1). Numeracy and Literacy are the twin main threads of life skills to be mastered during education.

Numeracy means understanding how mathematics is used in the real world and being able to apply it to make the best possible decisions. It's as much about thinking and reasoning as about 'doing sums'. It means being able to:

- Interpret data, charts and diagrams
- Process information
- Solve problems
- Check answers
- Understand and explain solutions
- Make decisions based on logical thinking and reasoning

1. Vision

At Magna Academy Poole we are acutely aware of the need for students to possess effective numeracy skills, and thus have a relentless focus on improving these skills so that every student is supported to achieve the highest possible outcomes, regardless of their socio-economic background.

The ability to have logical thinking skills needed for problem solving, alongside strong arithmetic is a fundamental requirement to ensure students can access the curriculum.

At Magna, we strive to develop students' numeracy skills to the highest standard through our culture and curriculum, both as an integrated pedagogy and as a discrete entity, thereby supporting our academy vision to have a transformational impact on our students' lives.

Our vision and framework for numeracy development are also closely linked to our academy mantras:

- Work hard be kind
- Excellence is a habit
- Empowered by knowledge
- Aspire and achieve

We believe that through hard work, a growth mindset and resilience, supported by our framework and culture of high aspirations, students can achieve whatever they set their minds to, and this includes breaking down the barriers of numeracy.

2. Rationale

All staff are responsible for the promotion of numeracy through high expectations of structured work, accuracy in calculations and the use of correct mathematical terminology.
The purpose of this strategy is to ensure clarity of whole-academy systems and strategies to support the numeracy of all students.

Evidence and recommendations from the Educational Endowment Foundation (EEF) has stated particular topics and teaching strategies should emphasise the many connections between different mathematical facts, procedures, and concepts to create a rich network of mathematical knowledge.

In addition, they have stated that quick retrieval of number facts is important for success in mathematics. It is likely that pupils who have problems retrieving addition, subtraction, multiplication, and division facts, including number bonds and multiples, will have difficulty understanding and using mathematical concepts they encounter later on in their studies.

All strategies and initiatives are also embedded in our Teaching & Learning framework so that nothing is an add-on, but are an integral part of students' daily curriculum. Additional key reading that has guided this numeracy strategy includes: NCETM, National Numeracy Strategy, Teaching like a champion (TLAC 2.0 by Doug Lemov) and six mastery fundamentals (The Learning Scientists).

3. Aims of the Magna Academy Numeracy Strategy

- To ensure all students at Magna are effective problem solvers, can make critical judgments when using mathematical techniques and can apply and use this theory in real-life situations.
- To support the transfer of students' knowledge, skills and understanding of numeracy between subjects.
- To highlight areas for collaboration between subjects.
- To ensure consistency when practising methods and using vocabulary and notation throughout the academy.
- To identify how the academy aims to raise the standards of students' numeracy.
- To ensure students achieve their highest potential GCSE or A Level grade.

4a. Characteristics of good practice in Numeracy

A consistent whole-academy approach towards mathematical language, methods, structure of written work and calculator usage is reinforced by the Mathematics Department. For example:

Language
We must be consistent in using the correct mathematical language at all times.

- When referring to decimals, say "three point one four" rather than "three point fourteen".
- Read numbers out in full, so for 3400 say "three thousand, four hundred" rather than "three, four, zero, zero".
- When referring to a number rather than an operation, use the terminology negative 7, not minus 7, unless talking about temperature.
- Encourage pupils to be less dependent on simple words e.g exposing them to the word "multiplied by" as a replacement for "times".
- Highlighting word sources e.g. quad means 4, lateral means side so that pupils can use them to help remember meanings. This applies to both prefixes and suffixes.
- Discussion about words that have different meanings in Mathematics from everyday life e.g. take away, product, similar etc.

Calculators and other Mathematical equipment

- In order to improve numeracy skills, it is essential that students are encouraged to use non-calculator methods whenever possible.
- Written and mental calculation methods are taught in a significant amount of Key Stage 3 topics. However, it should be noted that the Maths GCSE allows calculator usage for two out of the three examination papers and as such students must practise using their calculators correctly to solve difficult problems.
- All students are required to have a scientific calculator, ruler, protractor and pair of compasses (or a suitable alternative), as well as the usual pens and pencils. All students at Magna are strongly encouraged to have a Casio calculator. This should preferably be the 'Classwiz' fx83 or 85GT CW calculator. Similar Casio models no older than 'fx83/85GTX' are also acceptable.This is because supermarket own brand

calculators do not have the full range of necessary functions. This ensures that students are fully prepared for all topics covered in Maths as well as other subjects that have a numeracy element.

Methods

- It is important that all departments follow the advice on the structure of written work from the Mathematics Department. This will enable the academy to work consistently in all mathematical calculations and avoid any confusion for students.

Structure of written work

- Emphasis in all work is to ensure that students ***communicate*** their thought processes clearly over simply finding the correct solution.
- It is essential that the key formula or information is stated at the start of every calculation (where appropriate).
- Workings must be clearly shown for every stage/step when solving a problem.
- In all calculations, a vertical layout is established and the importance of place value and neat column keeping should be stressed.
  e.g £3.50 x 0.85 + £3.50

  This is poor practice: £3.50 x 0.85 = 2.975 + 3.50 = 6.475 = £6.48

  This is good practice: 3.50 x 0.85 + 3.50 = 2.975
  + 3.50
  6.475
  = £6.48

4b. Raising Attainment Strategies

Magna Academy employs a number of strategies to raise attainment in numeracy as described below:

- Tutor time numeracy activities for Years 7-13 are fully embedded across the academy. Currently, the whole academy approach is to use this time to address financial numeracy. This is achieved using a combination of resources abstracted from NatWest and the Yorkshire Building Society's teaching packages reduced to 20 minute lessons suitable for Tutor Time. The resources are all available on the main drive divided into years and units.
- Homework - Magna Academy uses the Sparx online platform for all Maths homework. This utilises personalised algorithms to produce bespoke homework for every student. Approximately 60% of each homework practises topics covered recently in class and 40% covers spaced retrieval of topics previously covered and core skills. In addition, all but the top sets in year 10 and 11 are set weekly times tables revision at the end of the weekly task to ensure complete familiarity is embedded over time (this links to the EEF expectation in paragraph 2 above)
- All Sparx tasks are written, with the answers self marked and corrected as necessary when they are checked by uploading them to the platform. Each student is issued a

Sparx exercise book for this purpose. This then completely covers the need for practice of written methods, times tables practice and spaced retrieval previously achieved by the use of printed booklets. It also reduces the amount of time spent on homework management and therefore increases effective teaching time.

- Raising Attainment ('RA') sessions in Maths run from January each year and are open to all Year 11 students. These sessions are one hour long, occur every week at the end of the academy day. They are staffed and managed by the Maths Department and have a high level of student attendance. Groups of similar ability students revise topics relevant to their Higher or Foundation course.
- Timetabled RA sessions run during AM Tutor Time and DEAR periods at lunchtime are also provided for groups identified as needing extra support throughout the school year.
- Intervention sessions occur during the academy week. Students who are not meeting their expected progress receive extra support individually or in very small groups. These are scheduled sessions and all students who receive intervention have a personalised timetable of these.
- Regular progress and attainment assessments are held at the end of every six week unit using past examination questions so that students become familiar with examiner style questions and can dissect the question correctly.
- Teachers maintain class files containing information about their students (Pupil Premium, SEND issues, EAL) which helps to guide pedagogical decisions.

5a. Department of Mathematics

The Mathematics Department's systems promote numeracy through:

Teaching and Learning

- Creating a positive learning environment of high challenge but low threat.
- Embedding a growth mindset in students so that they are resilient mathematicians that strive to attempt more complex problems.
- Maintaining a positive and attractive environment that celebrates numeracy.
- Having a rigorous scheme of work aimed at stretching and challenging all students so that they achieve their best in mathematics.
- The curriculum is cyclical in design which enables topics to be revisited.
- Providing information about common misconceptions and errors which may occur during teaching of specific topics.
- Utilising e-learning as a core tool of their studies with Sparx Maths as the main program to support mathematical understanding.
- Promoting 'Maths Literacy' in years 7 to 9 with regular testing of spelling of the key 80 words used in Mathematics. Definitions of the words are reinforced by teachers during spelling tests.

Cross-curricular links

- Seeking opportunities to use topics and examination questions from other subjects in mathematics lessons.

- Being aware of the mathematical techniques used in other subjects and providing guidance and training to other departments so that a sound, coherent and consistent approach is used in all subjects.
- Providing guidance to other departments on what numeracy skills pupils are expected to have acquired by any given stage, so that teachers know whether a skill needs teaching for the first time or reinforcing.

5b. Whole-academy Numeracy

Numeracy Coordinator Role

To ensure that the correct method of teaching mathematics is consistent across all subjects that enables students to fully develop their mathematical skills. In addition, the numeracy needs within all subjects are continuously reviewed so that all schemes of work link together to ensure an effective whole-academy approach to numeracy. Another aspect of this role is to raise the profile of numeracy and link it to nation and global events throughout the year, making students aware of the importance of numeracy; discoveries and usage of mathematics throughout history and the importance of numeracy needed for their future.

Numeracy is a whole-academy responsibility and it is important that teachers in all subjects are aware of their contribution to raising students' attainment in numeracy. The following aspects of numeracy arise in:

- Art - Symmetry; other transformations; paint mixtures as a ratio
- Geography - Representing data; finding averages; use of spreadsheets
- History - Timelines; sequencing events
- MFL - Dates; counting in other languages
- PE - Collecting and analysing real data; timings of activities and percentages; measuring heart/respiratory/blood pressure volumes/rates; calculating training zones and presenting data in graph form.
- Science - Formulae; calculating means and percentages; calculating with positive, negative and decimals; substitution; rearranging formulae; collecting and representing data.
- DT - Measurement; properties of shape; scaling and ratio.
- English - Identifying important information in a text will help them to better understand problem solving questions.
- Business - Handling data regarding the economy; Profit and loss
- Psychology; the presentation and interpretation of statistical data
- Travel and Tourism - presenting and analysing data
- "Applied Transdisciplinary Learning" (ATL) - Collating, analysing and handling data.

Mathematical skills are enhanced when students have the opportunity to apply and develop their skills across the curriculum. Poor numeracy skills can hold back a student's progress and fundamentally lower self-esteem.

In order to reduce the amount of printing necessary for Tutor Time numeracy the resources are stored on Google Drive so that individual sheets can be printed by tutors themselves when required.

5c. Post 16 Study and Student Futures

- **Sixth Form**
    - Magna Academy Sixth Form offers Mathematics at A-Level and Mathematics continues to be the most popular choice for A-levels both at Magna and nationally.

    - When considering which A Levels require higher levels of numeracy, students will be advised on these and which combination will be suitable for specific careers. In addition, further support and guidance will be provided on specific university courses should they wish to continue their studies into Higher Education.

    - Mathematics is a suitable choice alongside most other A level subjects. At Magna, students tend to include Mathematics with at least one other Science. It is essential that students wishing to pursue a career or degree in Engineering opt for Mathematics and Physics as two of their three A Level subject choices.

- **Other Pathways**
    - From Year 7 onwards, students will learn about the local Labour Market to help inform their future pathways. The tutor time Financial Numeracy programme will use age appropriate materials to allow students to interpret data to identify trends in employment to understand how the economy is changing and to calculate growth areas in the economy. Students will gain an understanding of pay and through knowledge of minimum wages and average salaries and will be able to evaluate the relative financial remuneration of different employment sectors.

    - Students will understand that different pathways will lead to higher lifetime earnings and will evaluate this factor against other factors in decisions about future pathways. Students will understand the financial costs of attending university and will assess these fees against potential earnings. Students will learn what the minimum and average wages are for apprentices and assess the benefits of short and longer term earnings in comparison with other options. Students will learn about student loan repayment schemes including interest rates.

    - Students will interpret a whole range of data when making choices about higher education establishments and choice of courses. Students will compare statistical information in league tables measuring: entry standards, student satisfaction, research quality, research intensity and graduate prospects.

    - Students will learn about the costs of independent living and will practice budgeting taking into account possible outgoings and earnings of a young person.

6. Assessments, Tracking and Progress

The progress of all students in Key Stages 3 & 4 is tracked and set against achieving a FFT5 grade and for Key Stage 5, the Alps Connect minimum expected grade. This provides an ambitious goal to aim towards. In terms of Mathematics (as opposed to whole-academy numeracy) tracking consists of the end of unit interleaved Topic Assessment or Mock Examination.

Tracking and intervention

- Student progress is recorded from the start of year 7 through to year 13 - every six weeks with a percentage score and grade.
- Setting is established in year 7 and is based on prior attainment, FFT5 target grade, GL Assessments and internal assessments. Classes are regularly reviewed to ensure students are in the correct set.

Further Support

- Continuous tracking will help to identify students that require further support. This intervention is provided by Maths teachers after academy or throughout the academy and the Phoenix Centre.
- Early identification of students with possible learning difficulties (provided through GL Assessments and SEN referral) will trigger additional screening, for example dyscalculia.
- Direct Instruction is also used in Key Stage 3 for students that require support in strengthening their basic number work. Pupils are tested to ascertain whether they require this specific support.

Most Able Intervention

- Continuous tracking of students using assessment data and teacher judgement will ensure that students are initially monitored and then identified as Mathematically Most Able.
- Each student in top sets from year 7-11 and all year 11 & 12 maths students are entered for the appropriate UKMT Maths challenge. These are conducted under formal exam conditions with access arrangements for those students who are entitled to them.
- Teams are entered for the local UKMT Team Maths Challenge rounds.
- In partnership with The Exeter Maths School, high achieving students who are targeting a grade 8 or higher are enrolled into the online tutoring programme run by EMS during year 10.
- A weekly Maths Club is provided for students who are interested in tackling interesting problems by developing new maths skills.
- EMS offer at least two places on their residential Summer School programme to high achieving Year 10 students

7. Measuring Impact

It is essential that the impact of our whole-academy numeracy strategy is measured and reviewed. Here is a summary of the main activities undertaken:

- Termly GL assessments for Year 7 and 8 students with impact reports.
- Regular work scrutinies across all year groups and subjects for numeracy.
- Lesson observations with a focus on numeracy.
- Termly review and impact report on key numeracy strategies (part of Teaching & Learning reviews)
- Homework completion rates are monitored through the Sparx platform as is competency with times tables.

8. Staff CPD

All tutors receive guidance on how to use the numeracy resources in tutor time.

Mathematics teachers also receive training every two weeks as part of Magna's CPD programme.

The Numeracy Coordinator will provide support and guidance to subjects so that there is a consistent approach and that schemes of work complement each other.

9. Quality Assurance

The Vice Principal in charge of numeracy alongside the Academic Director for Mathematics and Numeracy Coordinator ensures the overall implementation of the main provisions of the strategy. Senior Leaders and those with a TLR closely monitor and evaluate the quality of numeracy development in their areas and/or across the Academy. This is monitored through the academy Quality Assurance policy.

10. Post-lockdown numeracy guidance

This advice from NCETM provides some useful guidance on numeracy issues for teachers to consider post-covid lockdown:

- Try to avoid 'rushing through' a crowded scheme of work to 'catch up'; this is ineffective and can be demotivating.
- Instead, try to focus on securing students' deep conceptual understanding in key topics which prepare the way for future learning.
- Finding out where students have made progress. Teachers will need to be aware that students' experiences during academy closures and ongoing disruption will be very varied. Some may be apprehensive about returning to the classroom; some will be concerned about content they may have missed.

- Try to avoid making general assumptions about the learning they may or may not have done during this time.
- Try to avoid setting formal tests too early. Instead, try to focus on in-class observations, questioning and checking to find out about students' understanding and attainment; this will inform planning and reinvigorate student learning in a supportive way. Look out for wider gaps, a prior attainment picture that is more mixed and look out for surprises – some students will have progressed in unexpected areas.
- Recovery pedagogy research shows that 'lockdown provided very limited opportunities for any pupils to engage in mathematical talk, metacognitive activities or receive formative feedback'.
- Teachers will need to be aware that after sustained disruptions when much of students' learning has been in isolation, it will be important to make the most of opportunities for interactive, meaningful and collaborative learning.
- Mathematical talk is a very important part of learning. Students who discuss and debate mathematical ideas grow in confidence, understanding and attainment.
- Try to make the most of the opportunities where learning is interactive and takes place in whole class or group collaborative settings and where students can talk about their maths and share their ideas.
- Students also need time to get used to the new expectations too.

Appendix 1- Numeracy situations in everyday life

When do we use numeracy?	Examples
At work	Giving correct change, weighing and measuring, using spreadsheets and understanding data.
In practical everyday activities at home and beyond	Working out how many minutes until our train, increasing a recipe to serve extra guests.
As consumers	Understanding how much we'll save with a 15% discount, checking we've received the right change, working out how much to tip in a restaurant.
In managing our finances	Setting and keeping to a budget, understanding interest rates, understanding the financial implications of borrowing money, working out how much money to put into a pension.
As parents	Helping children with homework, playing board and puzzle games with children.
As patients making sense of health information	Managing our diet and nutrition, making and keeping medical appointments, measuring medicine doses, working out a routine for taking tablets regularly.
As citizens understanding the world about us	Making sense of statistics and graphs in the news, understanding information about government spending.