BLACKWATER COMMUNITY SCHOOL

NUMERACY POLICY

Updated November 2021

Statement:

Blackwater Community School is committed to raising the standards of numeracy of all students by improving their ability to use numeracy skills effectively across the curriculum. The performance of Irish students in international studies such as the OECD survey has declined in recent years. Blackwater Community School is devoted to creating a greater awareness of and a more positive attitude towards mathematics and numeracy by developing a greater understanding of what numeracy is and making students aware that it is more than just mathematics.

Definition:

Numeracy is a proficiency which involves confidence and competence with numbers and measures. It is more than the ability to do basic arithmetic. Numeracy encompasses the ability to recognise situations where mathematical reasoning and skills are applied to solve problems and meet the day to day demands of living in this current society. Numeracy skills are required for everyday life such as employment, sport, shopping and other day to day tasks. It includes having spatial awareness and the ability to appreciate patterns and sequences. It promotes problem solving ability in a range of contexts. Numeracy also demands the students to understand data, statistics, computation and measurement.

A numerate student will be able to:

- Have a sense of the size of a number and where it fits into number systems
- Calculate accurately and efficiently basic numeracy calculations drawing on a range of strategies
- Use proportional reasoning to simplify and solve problems
- Be aware of materials, shape and space
- Be aware of patterns and difference, classifying matching and comparing
- Recognise that they can effectively explain their working through diagrams, tables, graphs, charts, formulae and symbols
- Transition from concrete, tactile, kinaesthetic abilities to auditory and analytical
- Understand and measure weight, space, area, perimeter and angles

- Understand the number system –percentages, fractions, decimals etc
- Read maps, scales, graphs and planes accurately

Whole School Approach

- Put in place and keep active a numeracy committee with a coordinator, a school link, Learning Support Coordinator, Principal and interested members of staff
- Include a numeracy section in each subject plan, identifying where each subject can avail of numeracy moments
- Put in place regular visual initiatives around the school such as numeracy related posters, adjust the front cover of the BCS test page to include a % box which will involve students working out their own % in any subject test
- Create a survey to assess the students understanding of Numeracy
    - What is it?
    - What does it involve?
    - When do I use it?
- Greater promotion of "Maths Week" and "Science Week" that incorporate the fundamental aspects of Numeracy
- Implement a screening of students ability to perform basic numeracy tasks such as area/spatial awareness, basic calculations, patterns etc
- Use results of the WRAT test to assess the mathematical and numerical ability of the students in the school
- Implement regular up skilling through in-services of all staff members to continue the development of Numeracy in the school
- Regular review and updating of the Policy in the school, and feedback to the whole staff

Study, Revision and Homework

- Reinforcement of the homework journal to be checked by the class tutor and year head, students expected to have their diary signed each night by parents/guardians
- Participation of parents encouraged
- Regular assignments given and corrected
- Provision of good study techniques/study skills as per PR book
- Homework encouraged, students made to realise that oral homework is as important as written homework
- Material revised prior to all tests and examinations
- Provision of supervised study and Homework Club – reinforcement through the mentoring scheme

The Special Needs Department

- Dual role in providing supplementary teaching and supporting and consulting with colleagues
- High quality interaction with students through teaching
- Interaction with Principal, Subject Teachers, Year Heads, Class Tutors and Parents in the development and implementation of the Numeracy Policy.
- Consultative role
- Acquisition of teaching and learning resources

Teaching and Learning

- This policy promotes teaching that:
- Is informed by clear, challenging and progressive objectives and shared goals
- Encompasses purposeful, direct and explicit learning experiences across the curriculum
- Is well pitched to students needs
- Enables students to better understand the area of numeracy and acquire new skills as well as integrating and consolidating numeracy skills already learned
- Encourages and supports clarity around standards expected and achieved
- Is highly active and engaging to all involved with specific emphasis on the importance of cross curricular links that exist in numeracy
- Promotes a collaborative interaction between teachers and students
- Monitors and evaluates the students numeracy abilities
- Creates an ethos of numeracy across the school
- Motivates students to take increasing responsibility for the development and improvement of their numeracy needs
- Is reflective, secured in use and meaningful in context

Planning and Assessment

- Planning in Blackwater Community School (BCS) is specific, rigorous, measurable, achievable, realistic and adheres to a timeframe. The successful implementation of this Numeracy policy is dependent on the extent to which the whole staff in BCS takes account of the needs of all its students.

Planning for Numeracy aims to:

- Promote and develop a consistent approach to Numeracy across the whole school

- Put in place whole school initiatives throughout the year that raises the awareness of numeracy with both staff and pupils
- Put in place visual triggers that raise awareness and understanding of numeracy in everyday life
- Explore the concept of numeracy across the school
- Create a greater awareness that numeracy is more than Mathematics and is integrated into a wide variety of curriculums
- Develop a strategy where by numeracy moments are identified and acted on across the school curriculum
- Ensure inclusion and differentiated learning
- Identify and make provisions for professional development of the whole staff as well as specific individual needs
- Facilitate the continuing development of students numeracy needs and moments
- Share best practices, forge links between the relevant subject departments as well as building supportive networks to ensure continuity of learning
- Recognise how recourses can be organised and used to develop numeracy skills within the classroom
- Lead to robust, evidence based school self evaluation
- Create awareness with Parents/Guardians of the aims of the school in the development of the pupils numeracy skills
- Raise Parent/Guardians awareness of what they can do to support the school and hence the enhancement of their students learning

Evaluation

This strategy will be monitored and reviewed through:

- The school and departmental development plans
- Lesson observation by teachers
- Sampling students works
- Student Survey and specific whole school tasks
- Discussion with staff, Parents and students
- Reviewing planning and policy
- Analysing the assessment data

Information that will be provided from the monitoring and review process will inform decision making about the improvement and enhancement of this policy.

Short term action

Create a numeracy rich environment by:

- Creating a more numerically visual school through posters, displays and newsletter
- Including specific numeracy tasks across the whole school (Students to calculate their percentage result in any subject test in the % section of the test cover sheet or in journal)
- Present everyday numeracy as often as possible in all subject areas (acting on numeracy moments)
- Ensure that all classrooms have a functional clock
- Improve the students awareness of what numeracy is

Short Term Action

- Visual measurements in classrooms and corridors
- Update numeracy bank for weekly newsletters
- WRAT assessment update
- Reinforce numeracy moments throughout all subjects
- Posters for all classrooms

LONG TERM PLAN

- Display school map and dimensions on the corridor, ensure that each classroom has a map with dimensions (Work in progress)
- Display numeracy topics/statements in each classroom relevant to that subject (Partially achieved)
- Promote student involvement in Maths week (Ongoing)

- Arrange events to acknowledge numeracy – Create a link between TY and 1st year (Similar to Paired Reading – TY students assist 1st year students during Maths week)
- Creation of booklets for project similar to D.E.A.R (Ongoing)
- Increase the numbers sitting Higher level Maths across the board (improvements in recent years)
- Introduce Modular Numeracy course in TY (Ongoing)
- Review and expand the policy (Ongoing)

Improvement Plan 2021/2022

Topic / Area:	Recommendation	Relevant Action	By Whom	When Reviewed	Completed
Year- group Assessments	Assess each year group using a standard assessment. Update data and compare results	Assessment for 1st, 2nd and 3rd years to be conducted by January 2022	Numeracy Committee members	Ongoing	
Booklets- D.E.A.R	Numeracy skills basic arithmetic. Greater focus on ability to do complete basic computations without a calculator	Students complete questions without calculator – mental arithmetic. Series of 5 minute worksheets to be carried out at the beginning of class	Numeracy Committee members	Ongoing	
TY and 1st Year Buddy System	TY student to help 1st years having difficulty with math – Buddy Programme	Meet TY Coordinators to discuss - explore students interested and those who would benefit. Plan to have lie for Sept 2018	TY teachers and 1st year teachers	Ongoing	
Maths Week Activities	Greater emphasis to be placed on problem-solving questions and incorporating numeracy based activities throughout the week	Identify suitable activities for each year group. Include questions on the school app so that parents can participate too	Numeracy Committee members and relevant year group teachers	Ongoing	

Numeracy Initiatives over the past 2 years

As numeracy coordinator over the past 2 academic years, there have been a number of initiatives completed by the numeracy committee.

- Jerry McCarthy from the SSE gave a whole school in service on numeracy (Information for subject specific numeracy attached in policy).
- We have numbered all the classroom doors and emphasised the variety of numbers – prime, odd, even etc. These can be seen throughout the school.
- Subject specific posters have been made and put in all classrooms.
- A variety of numeracy puzzles have been available with prizes for winners.
- A numeracy quiz has been held for 1st years to emphasise that numeracy is not just maths.
- Completed numeracy games – mental maths for 2nd years during maths week, numeracy quiz with 1st years, numeracy bingo with 3rd years, countdown with TY, 5th and 6th years.
- WRAT Testing was completed on students. (Appendix 1)
- Developed a numeracy assessment for 1st year students as a means of assessing the overall ability of the year group.
- Students were surveyed about their understanding of numeracy was.
- We have created a cover page for all in house exams to allow the students work out their own percentage from the fraction. (Appendix 2)
- Numeracy moments for each subject have been identified and explained to all staff during staff meetings to reemphasise numeracy moments in all classes.
- We have also ensured that all classrooms have a working clock.

This document is consistent with the school's mission statement. It aims to give all students the opportunity to achieve their full learning and social potential. The document sets out our long-term development plan for the future to provide a more comprehensive Numeracy Support Structure in the school. A whole school approach has been adopted to meet the needs of all pupils and to provide an equality of education in a changing society and there should be continuous re-appraisal of what we are doing as a school in relation to numeracy.

As a school we must adopt a pro-active approach to change by continually reviewing and evaluation the situation and adopting as necessary.

Date of discussion with whole staff _____

Date of discussion and adoption by BOM _____

Signed: _____

Chairperson of the Board of Management

PLANNING AND IMPLEMENTING A SCHOOL WIDE APPROACH

TO NUMERACY DEVELOPMENT IN
BLACKWATER COMMUNITY SCHOOL

The following planning and development can be used by teachers in BCS to latch onto and highlight numeracy moments in their class. It includes some examples of the impact of numeracy across the curriculum. This document is a list which neither exhaustive, definitive nor prescriptive.

This list was given to school during an in-service given by Mr. Jerry McCarthy, Numeracy Advisor JCSP/PDST Support Service. A similar document may be formulated by each subject department and included into their specific Subject Department planning Document. Each Department can edit and/or include this list in their specific subject plan.

Art

Hope (2004) identifying the importance of practical activity for students as they learn to *"manipulate real objects to gain spatial awareness, properties of size, shape, appropriate vocabulary in which explicit mathematical links can be made"*

Representation and Spatial and Geometric Sense

- Use of patterns and image enlargement / reduction
- Scale drawing
- Proportion and scale
- 2D and 3D properties
- 3D shapes and their nets
- Use grids for enlargement and reductions e.g. draw a grid over a small picture using pencil and ruler in 1 cm increments; then redraw the grid onto a large sheet using 1:3 to enlarge.
- Many artistic patterns and constructions in our own and other cultures are based on spatial ideas and properties of shapes, including symmetry.
- Use and application of scale and proportion
- Use and application of symmetry
- Paint mixing as an application of ratio
- Study of the use of squares and rectangles in the work of artist Piet Mondrian
- Study of the use of quadrilaterals in the work of artist Henri Matisse
- Study of the use of symmetry in the work of artist William Morris
- Study of the use of tessellation, circles and quadrilaterals in the work of artist Bridget Riley
- Patterns and symmetry within weaving and patchwork
- Use of Tangrams - an old Chinese puzzle of seven polygons that are cut from a square
- Use of a timeline to depict events in art history
- Repetition, symmetry and tessellation in art
- Use of mathematical shapes for drawing, e.g. ellipses, cubes etc. The Golden Section and Leonardo da Vinci.
- Investigation of the Bayeux Tapestry
- The numerical ideas of pattern and shapes are taught in art and design, for example through cubism or the tessellations of Escher
- Link work on perspective to the development of enlargement and scale factor innumeracy.
- Work in art and design can support the understanding and construction of shape, space and measures.
- Layouts on Graphic Arts
- Multimedia – film and graphics (2D)
- Scale diagrams in Construction Technology

- CADD
- Design briefs using PC
- Make origami and paper aeroplanes - accurate measuring, folding and understanding of 2-D shapes, together with the vocabulary for these activities
- Cake decorating
- Designs for textiles
- Designs for kites
- Designing a pop-up card ^
- Advertising – travel brochures – interpret maps – design one for a challenge adventure holiday where visitors have to 'rough

- **Measures and Measurement**
- Measuring lengths, areas and volumes, angles
- Through the planning and investigation process, estimate the amount of material needed to make a number of components for an art project.
- Measurements are regularly needed in art.
- Use of measuring instruments
- Different paper sizes
- How are they related?
- What about envelope sizes?
- Different thicknesses of paper.
- What are they called
- What are they used for?
- The quantities that paper is sold in
- The weight of paper
- Permitted levels of tolerance in measurement in art assessments, graphic design and in art constructions
- Designing and creating the maps of different countries (i.e. measuring, using approximations, halving, sub-dividing etc.)
- Measuring time to complete an activity
- Measuring length and angles

Number Sense and Computation

- Apply ratios to solve problems e.g. be able to mix paint using colour ratios.
- Understand and use equivalences between commonly used percentages e.g. add stated percentages of colour to the origin colour to create a monochromatic scheme of colours.
- Understand and use equivalences between commonly used percentages e.g. design a newspaper page with 25% of the area dedicated to advertisements.
- Use and application of time lines (of famous artists)
- Dates and calendar
- Currency conversions / trade of artefacts
- Sequencing and ordinal arrangements

- Use and application of ratio and proportion e.g. Use of paint mixing as a ratio application
- Use and application of scale
- Use and application of proportion
- Designs may need enlarging or reducing, introducing ideas of multiplication, scale and ratio
- The number of primary colours
- The number of secondary colours
- The number of colours in the spectrum
- Editing (film sequences)
- Computer Generates Graphics (image manipulation)
- Using skills of estimation and comparison

Numeracy Language and Communication

- Numeracy Keywords
    - Key phrases in numeracy
    - Key symbols of numeracy
    - Using numerical vocabulary correctly and precisely
    - Explaining and justify their methods and conclusions
    - Use of consistent and precise language and terminology for shapes and their properties
    - Art and design can contribute to the development of pupils' problem solving, communication and reasoning

- Defining similar shapes, congruent shapes etc.

Science

"Every scientific investigation or experiment is likely to require one or more of the mathematical skills of classifying, counting, measuring, calculating, estimating and recording in graphs and tables"
DfEE 1999

Representation and Spatial and Geometric Sense

- Using shapes of objects to understand friction, resistance and streamlining
- Symmetry in the natural world e.g. butterflies, leaves, camouflage
- Fibonacci spirals in the natural world e.g. fir cones, sunflowers, snails
- The repetition in life cycles of animals and plants

Measures and Measurement

- Using (and making) recording measurements with appropriate precision
- Using an appropriate range of units of measurement and considering the required degree of precision and accuracy
- Recalling the approximate magnitude of appropriate physical quantities in order to make sensible comparisons
- Organise the available timeframe to complete the required task e.g. planning and conducting an investigation over 1to 2 weeks.
- Select and use appropriate measuring instruments and units in the course of conducting experiments and investigating.
- Measure and record measurements.
- Demonstrate the correct use of vernier gauge, micrometer, pipette, graduated cylinder, thermometer, degrees Celsius, degrees Fahrenheit etc.
- Use measuring equipment with precision and accuracy to collecting data for investigations and experiments.
- Make appropriate conversions between units of measurement.
- Use information about one scientific event to determine and predict the timeframe of another.
- Estimate the position of an object after reflecting off a surface.
- Estimate distance between planets
- Making a timing device using a pendulum, sand, water, springs etc.
- Measuring instruments used in the science laboratory
- Practical results – measurement: time / weight / volume
- Analysing graphs
- Which (*x*) was fastest / most reactive
- Measuring the time it takes for a certain mass to dissolve
- Predict what might happen in an experiment
- Measuring the diameter of a single pea, from a pod
- Measuring lung capacity
- Using shadows to study the movement of the sun
- Costing vegetables and finding the variety that is best value for money
- Measuring and recording growth of plants
- Measuring compost in litres

- Using a sieve to determine if the potato was too small for sale
- Reading scales
- That timescale in the growth of a plant
- Observations, drawings and record-keeping of the growth of plants
- Recording of pulse and breathing rate before and after exercise
- Investigation of heat insulation

Data Sense, Handling and Interpretation

- Almost every scientific investigation or experiment is likely to require one or more of the mathematical skills of classifying, counting, measuring, calculating, estimating, and recording in tables and graphs. Pupils will, for example, order numbers, including decimals, calculate means and percentages, use negative numbers when taking temperatures, decide whether it is more appropriate to use a line graph or bar chart, and plot, interpret and predict from graphs. They will explore rates of change in cooling curves and distance-time graphs, apply formulae and solve equations, for example, in problems on moments.
- Representing data accurately using appropriate graphs, charts and tables, identifying patterns and trends, interpreting effectively and making predictions
- Present and display information collected in an investigated project using a pie chart, line graph, bar chart etc.
- Collect scientific data from a variety of sources to determine relationships between two variables. Use the trends apparent from the graphs and tables to determine trends e.g. the graph of time versus temperature.
- Analyse data from statistic surveys and calculate the percentage of data in a given category.
- Representing and interpreting tables, graphs and data from experiments
- Cause and effect
- Tabulating and graphing data.
- Reading scales
- Pie charts of food groups
- Bar charts of daily calorie intake
- Calorie counting
- Use first-hand and secondary data to carry out a range of scientific investigations.
- Explore growth and how to measure it. Explore the range of heights in the class, and compare to data of expected heights.
- Compare data about individuals, produce graphs of variation for particular features and investigate correlations.
- What aspects of handling data are developed during science lessons? How are ICT devices used in this work (for example, sensors, spreadsheets, computer graph packages, calculators, graphical calculators)? How does this work enhance pupils' mathematical development?
- How does science help develop pupils' understanding of numbers in context, particularly large numbers, fractions and decimals, indices, ratios and proportions, and the relationships between different metric units?
- Does the teaching and interpretation of formulae and graphs support the expectations in numeracy?

- What use is made of different forms of graphs in science?
- Have we agreed with numeracy how graphs should be labelled and presented?
- Does the progression in graphical work in science support its development in numeracy?
- How is ICT used (graph plotters, graphical calculators) to support this work?
- How does work in science link with using and applying numeracy in our school?

Number Sense and Computation

- Opportunities for counting and measuring e.g. many seeds in a pod?
- Performing mental calculations
- Counting, classifying, estimating, ordering numbers
- Calculating means and percentages
- Use strategies, estimation and contextual knowledge to confirm calculations and answers are reasonable.
- Timelines (geological)
- Using / reading stop watches
- Use number sense and knowledge of scientific facts to determine the accuracy of calculations within reasonable limits. Given that the average pulse rate is between 60 and 90 beats per minute, students can determine the accuracy of calculations of average pulse rate, and the determination of actual pulse rate, when it is measured as beats per 15 seconds and converted to beats per minute.
- Select and use simple and formulae to solve numerical problems.
- Use percentages to calculate and solve problems.
- Calculate the fat content of commonly eaten foods using a calorie counter or fat / fibre guide.
- Use numbers sense, appropriate strategies, computational skills and key information to solve numeracy problems e.g. given the formula for speed, calculate the speed when given the start and finish times and distance travelled.
- Read, write, compare and order positive and negative numbers e.g. use thermometers to measure temperatures in the environment.
- Understand and use equivalences between commonly used percentages e.g. use an understanding of percentage of fractions when discussing the reduction of biodiversity.
- Calculating with formulae
- 3-way relationships e.g. Density/Mass/Volume, Speed/Distance/Time, Voltage/Resistance/Current
- Rearranging formulae
- How does science help to develop pupils' understanding of numbers in context, particularly large numbers, fractions and decimals, indices and the relationships between different metric units?
- Do we encourage pupils to estimate answers to calculations, make sense of an answer, check the reasonableness of a number and use mental methods and jottings as appropriate?
- How do we support methods and approaches to written calculation that are used in maths lessons?

- Can we adopt a consistent approach to problem solving, investigations and enquiry-based approaches?
- Are pressure and wind speeds related?
- Compare climates from different parts of the world. Interview people who have lived outside of Ireland.
- Understand and use the substitution of numbers into simple formulae e.g.
- Distance / time to determine average velocity
- Mass / volume to determine density

Numeracy Language and Communication

- Numeracy Keywords
- Key phrases in numeracy
- Key symbols of numeracy
- Using numerical vocabulary correctly and precisely
- Explaining and justify their methods and conclusions
- Discussing word problems
- Test explanations by using them to make predictions and by seeing if evidence matches the predictions.

Geography

"Geography and numeracy are intimately linked"
Fox and Surtees (2010)
"Geography develops skills in thinking and reasoning"
Morgan (1998)

Representation and Spatial and Geometric Sense

- Draw a scale map of the school.
- Maps, coordinates, angles, direction, scale and ratios
- Using grid references on a street directory, locate a particular site.
- Use latitude and longitude to locate sites in the atlas and explain whether they are located in the southern or northern hemisphere.
- Reading latitude and longitude coordinates.
- Using scale to determine real distances.
- Use a sense of direction and scale when drawing and interpreting maps and plans.
- Draw a sketch map of the local bus route, identifying major land uses in terms of natural and man-made features. Estimate the distances and provide a suitable scale.
- Use an aerial photograph to construct a topographical map with symbols and appropriate scale. Construct a contour cross section from a topographical map or made a 3-D model.
- Use grids for enlargement and reductions e.g. draw a grid over a small picture using pencil and ruler in 1 cm increments; then redraw the grid onto a large sheet using 1:3 to enlarge
- Using atlases, travel guides and wall maps to locate the places in the journey
- Compare and contrast wind directions and pressure systems in the northern and southern hemispheres.
- How does teaching within geography support work on co-ordinates and measures?
- How are graphs and charts used in geography/ Are our labelling conventions consistent with numeracy?
- How does teaching within geography support work on coordinates and measures?
- How are graphs and charts used in geography? Does their development support the progression outlined in the yearly teaching programmes for mathematics? Do our labelling conventions for graphs match those of the mathematics department?
- Provide opportunities to pupils to make statistical enquiries, for example, in analysing population data to explore and compare lifestyles; they will also use a wide range of measurements and rates of change.
- Atlas (coordinates)
- Find the treasure
- Geological / geographical mapping
- Coordinate – world map
- Mapping earthquake sites / volcanoes
- Design a tour map of the east end of Dublin using grid references
- Use of grid references and compass points for location, direction, distance, size and scale

- Comparison of maps and globes in order to see how a rounded surface may be represented on a flat surface
- Internet map searches
- Internet photograph searches of main features of an area
- Plotting routes e.g. adventure climbs, sailing competitions, charity walks, cycle rides and expeditions

Measures and Measurement

- Using a wide range of measuring instruments to facilitate the accurate measure of data, such as distance, rainfall or temperature
- Maps, coordinates, angles, direction, scale and ratios
- Chronology using a time line
- Read a bus or train timetable and establish appropriate routes of travel to get from A to B in the shortest time. Discuss what impact the availability of this transport has on suburban development.
- Select and use appropriate measuring instruments to measure the dimensions of school grounds and the position of buildings and draw a representative map to scale.
- Measure and record measurements.
- Use measuring equipment with precision and accuracy or within permitted tolerances.
- Record temperature and rainfall over a period of time using a rain gauge and a wet / dry thermometer.
- Make appropriate conversions between units of measurement.
- Estimate the area of a landmass based on the comparison with other land masses.
- Estimate the percentage of the area on the map that is natural environment and built environment.
- Measurement and survey of the Earth's surface
- Measurement of distances
- Co-ordinate system for grid references on maps
- Bearings
- How and when do we reinforce pupils' knowledge, skills and understanding in aspects of measurement (including estimation)?
- Planning trips using railway, bus and plane timetables
- Investigating and studying time zones, day and night, seasons - because the earth is a sphere moving around the sun
- Data Sense, Handling and Interpretation
- Weather recording
- Collecting data by counting, measuring and surveys
- Sorting, ordering and classifying data collections - making choices about selection of criteria
- Use of numerical data when making geographical descriptions and comparisons e.g. comparing populations or areas
- Critically interpret statistical information, tables and graphs.

- Represent relevant and purposeful information in graphical and table form and interpret to answer questions.
- Present as part of an investigative project, appropriate tables and data e.g. to depict rainfall statistics, hours of sunshine etc.
- Present and display information collected in an investigated project using a pie chart, line graph, bar chart etc.
- Create rainfall or temperature graphs and gain insights and meaning from what they indicate.
- Compare rainfall of cities in equivalent northern and southern latitudes.
- Analyse data from statistic surveys and calculate the percentage of data in a given category e.g. the percentage of households that use gas, wood, oil or electricity for heating.
- Collect, record and present evidence, analyse and evaluate evidence and draw and justify conclusions
- Representing and plotting data (e.g. population growth/density proportion of world developed / undeveloped, land use etc.)
- Reading scales
- Use of spreadsheets
- Use of TV, newspaper, internet, e-mail to gather weather information - followed by observation and discussion
- From discussion, photographs and internet, study and investigate why specific forms of transport are used
- Tabulating and graphing data
- The trips to the local shop / supermarket - price comparisons, packaging patterns, food sources
- Collecting, recording, presentation and interpretation of data from a geographic investigation
- Can we use the handling data cycle – state problem, identify and collect data, analyse and represent data, interpret results – directly in relation to a geography topic? Are there opportunities for joint working with the maths department?
- Which parts of the handling data cycle – state problem, identify and collect data, analyse and represent data, interpret results – relate directly to work in geography? Are there opportunities for joint work with the mathematics department? Which units offer greatest potential for joint working? Would there be any ICT use in this work?
- Project: Carry out an enquiry into weather patterns and relationships using meteorological records.

Number Sense and Computation

- Use strategies, estimation and contextual knowledge to confirm calculations and answers are reasonable.
- Investigating and problem solving in field studies
- Calculations and computation involving estimation, finding totals or averages
- Understanding, analysis and interpretation of a wide range of statistical evidence including secondary source data
- Timelines (geological)
- Estimating area – measuring volcano size

- Discussing evidence in geography may involve measurement, estimation and approximation skills, and making inferences
- Reading timelines
- Comparisons of temperatures
- Use number sense and knowledge of number facts to determine the accuracy of calculations within reasonable limits.
- Select and use simple and formulae to solve numerical problems.
- Apply ratios to solve problems e.g. use a given scale to draw a 1 : 10, 000 scale map of the school
- Apply ratios to solve problems e.g. estimate the proportion of rural land use to the built environment. What proportion of land use is devoted to primary industry? Suggest reasons for the proportions.
- Using a grid map, estimate the area of land use in a selected area.
- Understand and use equivalences between commonly used percentages e.g. survey students on their country of origin. Describe this information as a percentage or faction.
- Read, write, compare and order positive and negative numbers e.g.:
- compare population movements between capital cities. Suggest reasons for these movements
- heights above and below sea level
- changes in temperature ,temperatures in sunlight and shade
- Discussing evidence in geography may involve measurement, estimation and approximation skills, and making inferences
- The study of maps includes the use of coordinates and ideas of angle, direction, position, scale and ratio.
- The use and application of scale and ratio
- Comparisons of populations, land masses, birth rates etc.
- How do we teach ideas related to scales and scale factors?
- Can we adopt a consistent approach to problem solving, investigations and enquiry-based approaches?
- Which elements of the number and calculation strands of numeracy feature in teaching geography?

Numeracy Language and Communication

- Numeracy Keywords
- Key phrases in numeracy
- Key symbols of numeracy
- Using numerical vocabulary correctly and precisely
- Explaining and justify their methods and conclusions
- Discussing word problems
- Communicating the results of a statistical enquiry
- Discussion about and practice in using the language of logic and reasoning
- Cause and effect
- Comparing by size, weight etc.
- Do we use a common vocabulary in space, shape and measure
- How can we develop consistent pupils' interpretation and analysis skills?

- In what ways could our work on thinking skills in geography contribute to the development of using and applying mathematics?
- Sort with the similarity and differences of rocks and soils - sorting and grouping using different criteria
- Hypothesis Testing
- Example Hypotheses
- Housing density decreases as distance from the town centre increases.
- Quality of housing increases as distance from the town centre increases.
- Quality of the environment improves as distance from the town centre increases.
- Area, ratio of areas
- Basic calculation
- Compound measure
- Scale
- Statistical measures
- Statistical diagrams
- Variation

Woodwork / Metalwork / Technology / Technical Graphics

Representation and Spatial and Geometric Sense

- Undertake at 2-D /3-D plan or drawing using measurements and / or grid
- Create a plan view drawing of the school showing the location of buildings and exit signs using a manual grid or a CAD type programme
- Use a sense of direction and scale when drawing and interpreting diagrams and plans.
- Use appropriate drawing standards of scale and proportion to develop orthogonal and isometric perspectives
- Convert objects to scale view e.g. 1:2, 1:10
- Understand how the characteristics and properties of 2-D and 3D- shapes influence the design of familiar objects.
- From a picture of a room, study the objects and redraw them as 2D shapes (flattened drawing) or as simple orthogonal / elevation drawings.
- Use an understanding of shapes in structures to construct items e.g. models of bridges to support weights.
- Transform a 3-D object to a 2-D orthogonal drawing and vice versa.
- Use drafting patterns in laying out material ready for cutting.
- Apply an understanding of scale and enlargement or reduction to construct design drawings for a project design.
- Do we use a common vocabulary in space, shape and measure?
- Scale diagrams in Construction Technology
- CADD
- Design briefs using PC
- Measures and Measurement
- Plan and work within time restrictions to produce a finished design or product.
- Monitor time schedules and manage tasks to enable completion.
- Select and use appropriate measuring instruments.
- Measure and record measurements.
- Demonstrate the correct use of a steel rule.
- Use measuring equipment with precision and accuracy or within permitted tolerances.
- Make appropriate conversions between units of measurement.
- Convert millimetres to metres when explaining the dimensions on a house plan.
- Through the planning and investigation process, estimate the amount of material needed to make a number of components for a project.
- Understanding and interpreting simple metric measurements
- Measuring and cutting materials
- Measuring wastage
- Measuring skills, units of area and volume
- How and when do we reinforce pupils' knowledge, skills and understanding in aspects of measurement (including estimation)?
- Investigate and measure the circumference and growth rings of various tree species**.**
- Understanding and interpreting simple metric measurements

- Measuring and cutting materials
- Measuring wastage
- Understanding and interpreting simple metric measurements
- Measuring and cutting materials
- Measuring wastage
- Measuring skills, units of area and volume
- How and when do we reinforce pupils' knowledge, skills and understanding in aspects of measurement (including estimation)?
- Compare petrol consumption for different types of car.
- Measure the spark plug gaps using a feeler gauge. What are the tolerances for different cars?
- Environmental design using plans / blue prints
- Detailed plans in building construction
- Doorways to construction uses building plans
- Environment / landscape design

Data Sense, Handling and Interpretation

- Critically interpret statistical information, tables and graphs.
- Present as part of an investigative project, appropriate tables and data of materials to be used e.g. timber type / metal type, number of items, cost per unit, names of suppliers, deadlines for deliveries etc.
- Present and display information collected in an investigated project using a pie chart, line graph, bar chart etc.
- Test design materials, collecting and interpreting information to make appropriate choices.
- How (and when) do the technology subjects reinforce pupils' knowledge, understanding and skills in all aspects of measurement, including estimation of measures?
- Is the approach to ratio, proportion and percentages compatible with work in mathematics? What methods of calculation do we encourage?
- How can our work support the construction and transformations strands of shape, space and measures when pupils are developing, planning and communicating their ideas?
- How are scales and scale factors used in the different strands of technology when pupils are developing, planning and communicating ideas?
- Are the different strands of handling data applicable to technology teaching, in particular when pupils are evaluating processes and products? If so, is there any ICT in use in this work?
- Do mathematics and technology use a common vocabulary when teaching all these elements?
- What are the links between using and applying mathematics and the problem-solving elements of technology?
- What are our expectations for accuracy of measurements, use of decimal places and significant figures, and use of units and their abbreviations?

Number Sense and Computation

- Use strategies, estimation and contextual knowledge to confirm calculations and answers are reasonable.
- Use number sense and knowledge of number facts to determine the accuracy of calculations within reasonable limits.
- Use simple formulae to calculate material used e.g. surface area of board materials.
- Select and use simple and formulae to solve numerical problems.
- Calculation / estimation of amount of material and fixings required
- How do we teach ideas related to scales and scale factors?
- Name the shapes of different wood joints
- Investigate the life spans of various tree species
- Calculation / estimation of amount of material and fixings required
- How do we teach ideas related to scales and scale factors?
- Name the shapes of different engine parts.
- Investigate car registration plates.
- Multimedia Image resizing
- Computer Generates Graphics (image manipulation)

Numeracy Language and Communication

- Numeracy Keywords
- Key phrases in numeracy
- Key symbols of numeracy
- Using numerical vocabulary correctly and precisely
- Explaining and justify their methods and conclusions
- Discussing word problems
- Can we adopt a consistent approach to problem solving, investigations and enquiry-based approaches?

Music

"I listen to a lot of music when I do mathematics... I have this fantasy that music is actually stimulating the same part of the brain that I need for mathematics".
(Du Sautoy, 2008)
"There are strong connections between music and mathematics. Like mathematics, much of the structure of music is based on patterns and relationships"
(Coles and Copeland, 2002)

Spatial, Geometrical and Representational Sense

- Rhythms and patterns in music correlated with patterns in series.
- Measure the size of a stage, draw a plan view and work out the measurements and dimensions of the set for a performance or equipment for a musical item.
- The study of pattern in musical forms such as ABA, AABA, ABAB (leading to fugue, sonata and symphonic form) can be enhanced by pupils' understanding of repeating patterns in numeracy.
- Investigation how the sequence of sounds and rhythms in music resemble those of numbers, shapes and measurements in numeracy and mathematics
- Investigations of pitch (graduations of high / low), duration (groups of beats and rhythms), dynamics (graduations of volume, louder / quieter / silence), tempo (different speeds) and structure (the way different sounds are organised).
- Make linkages and comparisons between shapes in written music (such as high/low, rising/falling, ascending/descending) and the pupils' work on graphs.
- How are the lengths of notes represented in manuscript?
- In what ways has manuscript evolved over the centuries?
- Start to write music with reference to the number of beats in each bar

Measures and Measurement

- Produce a timeline to represent the progress of an art movement, dance style or music genre along with significant social and cultural influences of the time.
- Measurement in a set / stage design. Measure the size of the stage, by pacing or by using a tape measure. Use measurement to inform the best distance of the audience from the stage and the best positioning of the stage lighting.
- Measurement of musical instruments
- What is the fret spacing on a – guitar – violin etc . . . give some reasons?
- Can pupils' knowledge of time and speed enhance their understanding of musical time, e.g. when considering beats per second and the differences between certain types of music e.g. pop, techno, garage etc? Data Sense, Handling and Interpretation
- Conduct a survey of students to evaluate the relevance / enjoyment of a performance of another school. Use this evaluation as a review for a future performance.

Number Sense and Computation

- Use numbers sense, appropriate strategies, computational skills and key information to solve numeracy problems. Calculate the ticket prices for a musical production based on making a particular profit. Calculate the cost of materials for the production.
- Music makes significant use of symbolic representation, as does numeracy.
- Work on equivalent fractions can enhance pupils' understanding of the relative values of notes
- Addition of fractions, e.g. in 4/4 time – minim = ½ of bar, crotchet = ¼ of bar, quaver = 1/8 of bar etc.
- Rhythm patterns, represented either symbolically or numerically, have parallels in numerical sequences
- Comment out and conduct in 3 / 4 and 4 / 4 time
- Investigate how the frequency of a note doubles as you go up and octave
- Number of participants in an orchestra
- Counting to a regular rhythm often forms part of a pupil's earlier numerical education; use this prior knowledge to enhance pupils' understanding of rhythm
- Pupils' knowledge of time and speed can be used to enhance their understanding of musical time e.g. when considering technical issues such as beats per second and the differences between certain types of music, for example music from around the world, pop, techno, and so on.

Numeracy Language and Communication

- Key phrases in numeracy
- Key symbols of numeracy
- Using numerical vocabulary correctly and precisely
- Explaining and justify their methods and conclusions Discussing word problems
- Music can contribute to the development of pupils' skills in organisation, logical thought, problem solving, collaborative and cooperative learning, listening to and sharing opinions.

ICT

Representation and Spatial and Geometric Sense

- Produce graphs, charts and tables
- Interpretation of graphs, charts and tables
- Use of the spreadsheet as a calculator
- Creating tables of results
- ICT applications that illustrate the appropriate use of graphs
- Discussing and criticising the features of grapgs and charts generated by software packages that can be misleading
- Use of transformations, 2D and 3D drawing in desk-top publishing

Measures and Measurement

- Measurement of distance and angle

Data Sense, Handling and Interpretation

- Collecting and classifying data
- Selecting appropriate forms of data representation
- Enter the data into data-handling software
- Representing data electronically
- Resourcing data from internet sources
- Number Sense and Computation
- Using measurement formulae
- Using appropriate general-purpose ICT packages to support pupils' mathematical development
- Spreadsheet skills, used in modelling and simulations
- Use and application of the numeric, algebraic and graphical skills involved in constructing formulae and generating sequences, functions and graphs

Numeracy Language and Communication

- Numeracy Keywords
- Key phrases in numeracy
- Key symbols of numeracy
- Using numerical vocabulary correctly and precisely
- Explaining and justify their methods and conclusions
- Discussing word problems
- Communicating the results of a statistical enquiry
- Discussion about and practice in using the language of logic and reasoning

• Cause and effect

- Comparing by size, weight etc.
- and explanation of their results

• Do we use a common vocabulary in space, shape and measure?

- How can we develop consistent pupils' interpretation and analysis skills?
- Direct access to numerous mathematical websites
- Collect, enter, analyse and evaluate information relevant to the enquiry and reach conclusions
- Which general purpose packages used in ICT support numerical development?
- How can we help develop pupils' use of maths specific software e.g. dynamic geometry software, Logo, graph plotting?
- Could numeracy be further developed in ICT and are there opportunities for discussion with the pupils?
- Do other subjects have access to appropriate ICT systems for supporting pupils' numerical development?

Physical Education

P.E. "provides opportunities for children to use and apply a range of mathematical skills including number, measurement, space and shape, graphing and data handling".
(The Rose Report (GB) (DCSF 2009)

Representation and Spatial and Geometric Sense

- Sequences and pattern of movement
- Investigating patterns in dance
- Creating fluent sequences of movement in gymnastics, using the vocabulary of position, direction, shape and movement
- Devise and perform sequence of movements
- Draw shapes on the ground for the dancers while devising dances
- Triangle dances
- Videos taken of the movements and actions to help the students to develop their ideas on dance
- Treasure hunt – food
- For orienteering identify the best route from A to B. Use contour lines to determine the easiest or most suitable route. Determine the gradient from A to B and whether the gradient is going up or down.
- Plotting readability data
- Plotting ages of the novel's character
- Explaining and justify their methods and conclusions
- Interpreting and discussing results
- Symmetry in dance and balance
- Demonstrate number patterns by movement of people
- Plot the records of one sport against time on a graph. Can you use the graph to make a prediction?
- Plot men's and women's results on the same graph
- Orienteering

Measures and Measurement

- Measurement of heights, lengths, distances, time, position, direction, fitness-related data
- Select and use appropriate measuring instruments.
- Measure and record measurements.
- Construct a daily-activities chart showing sleep, work, eating etc. and determine when to take 20 minutes of exercise per day. Graph this information.
- Select and use appropriate measuring instruments.
- Measure and record measurements.
- Demonstrate the correct use of a stopwatch and height gauge.
- Use measuring equipment with precision and accuracy.
- Make appropriate conversions between units of measurement.
- Estimate the best angle to launch a shot put or discuss.
- Estimate the area of the school basketball courts.

- Using units of measurement: 100ths of seconds etc.
- Using metric measurements and making conversions.
- Using measurement of distances and times
- Organise fitness programmes
- Use the following are measuring instruments: weighing scales (body mass) ,a stopwatch (time to undertake activity) ,tape measure (height, vertical jump, long jump, arm span)
- Data Sense, Handling and Interpretation
- Using data to make comparisons e.g. scoring averages
- Graph fitness test results across different fitness components and present these findings in percentage format.
- Survey class re sports played / watched. Present a graph.
- Collection of real data for processing in numeracy, e.g. look at Olympic records
- Project: Collect and analyse simple data about their own and others' performances, e.g. the number of shots they have on target in a game, the number of times they hit the ball into one area of the field, the number of times they play a backhand shot.
- In what ways do pupils gather and use performance data e.g.: in general fitness work?
- Are there any links (for example, in gymnastics or dance) building upon ideas of pattern, movement and symmetry developed in numeracy?
- How does the teaching of physical activities develop pupils' awareness of time, distance and speed? At what stage are rates such as km per hour discussed? Is this compatible with the expectations in mathematics?
- How are map references, compass bearings and estimates of distances travelled developed in planning and carrying out outdoor activities? Are these in line with the mathematics yearly teaching programmes?
- In what ways do pupils gather and use performance data: in general fitness work? ,in specialised work such as athletic activities?
- How does this work support the handling data strand of numeracy? How can mathematics be used to support pupils' interpretations of performance data?
- How are differences in readings from manual and electronic data-logging equipmeny discussed? Is reference made to statistical terms such as the mean, mode and median that might be appropriate for measuring performance in a range of physical activities?
- How do pupils use problem solving, communication and reasoning in physical activities?

Athletic activities use measurement of height, distance and time, and data-logging devices to quantify, explore, and improve performance. Ideas of counting, time, symmetry, movement, position and direction are used extensively in music, dance, gymnastics, athletics and competitive games.

- Calculations of speed of athletic performance
- Planning a sports day - costing, timing, organisation
- Planning a sports event - measurement, time, number work
- Record keeping of personal achievements in athletics over a term to identify improvement in performances - data handling and timing, measuring time and distance, estimation.
- Recording of results and times at a sports day
- Orienteering - space in shape
- Outdoor activity with maps, scales, symbols - space and shape, movement
- Using the bleep test to assess fitness levels and recovery levels
- Keep fit project - such as skipping, with recording of times, total skips etc - link with national Keep Fit Projects for heart health awareness
- Use strategies, estimation and contextual knowledge to confirm calculations and answers are reasonable.
- Use number sense and knowledge of number facts to determine the accuracy of calculations within reasonable limits.
- Select and use simple and formulae to solve numerical problems.
- Calculate the percentage of success shots on goal.
- Calculate the fat content of commonly eaten foods using a calorie counter or fat / fibre guide.
- Use numbers sense, appropriate strategies, computational skills and key information to solve numeracy problems e.g. use food tables to calculate the nutritive content of a recipe or food item.
- Apply ratios to solve problems i.e. use ratios or proportion to break down information available within text e.g. calculate the ratio of newspaper space devoted to a men's and women's sport. Get the students to measure the newspaper area to the nearest square centimetre. Discuss and identify a more equitable solution to the present ratios
- Fitness – work to rest ratios
- Calculate how many calories are used and expended in various activities.
- Understand and use equivalences between commonly used percentages e.g. design a sports day brochure with 25% of the area dedicated to advertisements.
- Using / reading stop watches

Numeracy Language and Communication

- Numeracy Keywords
- Key phrases in numeracy
- Key symbols of numeracy
- Using numerical vocabulary correctly and precisely
- Explaining and justify their methods and conclusions
- Discussing word problems
- How does the teaching of physical activities develop pupils' awareness of time, distance and speed? Do we discuss compound measures such as Km/hr?
- How are differences in readings from manual and electronic data-logging equipment discussed?
- Use spatial language to describe movements in dance
- Move in response to mathematical spatial language

Home Economics

Measures and Measurement

- Weighing and reading a variety of scales including decimals on electronic scales
- Adapting recipes for different numbers of people using ratio and proportion
- Produce a timeline of organisational steps necessary to produce a recipe or meal.
- Select and use appropriate measuring instruments.
- Measure and record measurements.
- Demonstrate the correct use of the thermometer and weighing scales.
- Use the following are measuring instruments: weighing scales (forward ingredients), an oven timer (to monitor cooking or baking time) ,an egg timer (to monitor the time taken to boil an egg) ,graduated container (food measures)
- Use measuring equipment with precision and accuracy.
- Make appropriate conversions between units of measurement.
- Estimate the quantities required to cook a recipe e.g. estimate 100 grams of butter by cutting up a 500 gram block into fifths.
- The preparation of food involves measurement, working out times and calculating cost, frequently extending into calculations involving ratio and proportion.
- Reading and using scales
- Metric and imperial conversions
- Cooking and baking times
- Find the different measuring systems used in different recipe books.
- How do different measuring systems relate to each other?
- Look at oven dials. What are different systems for measuring how hot the oven is? How do they relate to each other?
- Look at diet related statistics and their use in weight control.
- Planning and cooking a meal from French cuisine (e.g. use of weighing scales to weigh ingredients, cooking times, costing, number of courses etc).
- Can convert from imperial to metric in order to follow a recipe e.g. 1 cup = 250 millilitres,1 teaspoon = 5 millilitres , 1 tablespoon = 20 millilitres

Data Sense, Handling and Interpretation

- Use a graph to illustrate carbohydrate, sugar and fibre content in a range of breads.
- Designing a survey to determine adolescent breakfast eating habits. Collect information from a variety of students, collate and interpret the results and plan action to modify these habits in your school.
- Plan and design appropriate survey questions e.g. how much money do girls and boys spend in the canteen each week and on what items?

Number Sense and Computation

- Use strategies and contextual knowledge to confirm calculations and answers are reasonable.
- Food orders / Costing
- Use number sense and knowledge of number facts to determine the accuracy of calculations within reasonable limits.
- Use a relevant formula to calculate the percentage of body fat from fat -calliper measures at selected body positions.
- Calculate BMI using height and weight measures.
- Use the food pyramid to analyse daily food intake.
- Determine the content of protein, fat and carbohydrates in a range of sample foods.
- Select and use simple and formulae to solve numerical problems.
- Calculate the fat content of commonly eaten foods using a calorie counter or fat / fibre guide.
- Interpret the percentage of nutrients on food nutrition labels.
- Use numbers sense, appropriate strategies, computational skills and key information to solve numeracy problems e.g. use food tables to calculate the nutritive content of a recipe or food item.
- Apply ratios to solve problems i.e. use ratios or proportion to break down information available within text e.g. calculated the ratio of newspaper space devoted to a men's and women's health. Get the students to measure the newspaper area to the nearest square centimetre. Discuss and identify a more equitable solution to the present ratios.
- Apply ratios to solve problems e.g. be able to use recipe ratios - apple crumble topping: flour, sugar, butter in the ratio of 3 : 2 : 1
- Apply ratios to solve problems e.g. plan a class meal, recipe quantities as appropriate – meal for four to a meal for twenty.
- Understand and use equivalences between commonly used percentages e.g. reduce a recipe by half (50%) ,garment alterations
- Recipes as a ratio application and context
- Baking times
- Sizes of garments and shoes
- Estimation
- Use of calculator
- Read, write, compare and order positive and negative numbers e.g.: measure ingredients using scales ,measure the temperature of the fridge and freezer and understand why food is stored in freezers at - 18º Celsius
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Numeracy Language and Communication

- Numeracy Keywords
- Key phrases in numeracy
- Key symbols of numeracy
- Using numerical vocabulary correctly and precisely
- Explaining and justify their methods and conclusions
- Discussing word problems
- Communicating the results of a statistical enquiry
- Discussion about and practice in using the language of logic and reasoning
- Cause and effect
- Comparing by size, weight etc.
- Sequencing

English

English teachers have opportunities to "enrich all four strands of language - speaking, listening, reading and writing - and these are equally valid aspects of numeracy"
(The Rose Report (GB) 2009)
"Writing is an integral part of using and applying mathematics and numeracy"
(Fox and Surtees 2010)
"Mathematics writing (across a wide range of genres) is not natural: it needs teaching"
(Wray 2006)
"Reading and writing can never be pigeon-holed as simply English activities and children read and write in virtually all other curriculum areas. This suggests that each curriculum area offers its own opportunities for the teaching of reading and writing as well as specific content"
(Wray and Lewis 1997)
"The role of language is central to the development of mathematical competence and confidence in mathematical work"
(Ball 1990)
"Children will find that they can do mathematics as they use the areas of talk categorised by Wray as discussion, explanation, description, questioning and oral retelling"
(Fox and Surtees 2010) (Wray 2006)
Ball (1990) recognises the importance of discussion-based learning and describes the child as a "mathematical thinker" with "responsibility and opportunity to develop his / her own learning".
The Williams Report (GB) (DCST 2008) stresses the importance of "high-quality discussion develops children's logic, reasoning and deduction skills, and underpins all mathematical learning activity".

Representation and Spatial and Geometric Sense

- Using a graph to track the state of Macbeth's temper during the play (using "time" on the horizontal axis and "measure of tember" on the vertical axis)
- Drawing stage plans for short drama pieces.
- Fiction writing – draw map of imaginary island as setting for story
- Instructional / Procedural writing e.g. write directions to and from the school canteen (from students' classroom)
- Using a line graph to track the plot in a novel.
- Interpretation of graphs and charts from the media
- investigating the link between poetry and numeracy (Coles an Copeland, 2002)

Measures and Measurement

- Organise and undertake a timed debate.
- Determine the appropriate camera angles with creating visual texts.
- Represent relevant and purposeful information in graphical and table form and interpret to answer questions.
- Dimensions of pages
- Area of margins
- Average number of words per page
- Measurement of sketches and graphics

Data Sense, Handling and Interpretation

- Using data, its representation and analysis in a piece of persuasive writing
- Surveying and analysis of opinions on reading habits or preferences of books e.g. percentage of students who liked sci-fi, crime, comedy etc.
- Analyse everyday text (e.g. newspaper articles) to find examples of how data can be used to highlight an issue or to support an argument.
- From experience and from everyday examples, explain how statistics can be misleading.
- Use different types of data representation to support an argument and to create desired effect e.g. graphs, pie charts, frequency distribution tables, line graphs, pictograms, shading, minimum value, maximum value.
- Represent relevant and purposeful information in graphical and table form and interpret to answer questions.
- Conduct a survey of students to evaluate the relevance / enjoyment of a drama performance of another school. Use this evaluation as a review for a future performance.
- Graphically represent the targeted audience for advertisements on television programmes, over the time period between 4 p.m. and 10 p.m.
- Plan and design appropriate survey questions e.g. how much money do girls and boys spend in the canteen each week and on what items?
- Read a magazine survey (in which data is presented in percentage form) which illustrates young people's opinions on particular topics of interest. Discuss and compare views in class.
- Comparison of data sets on word and sentence length from different newspapers
- Comparison of 2 data sets on word and sentence length.
- Survey class re sports played / watched. Present a graph.
- Survey class re cultural background. Present a graph.
- Analysing newspaper articles with statistical information

Number Sense and Computation

- Strategies to cope with and decode word problems
- Writing in a variety of numerical and mathematical genres:
- planning and recording numerical and mathematical investigations
- predicting numerical outcomes
- recounting numerical work of various kinds
- itemising instructions for carrying out different types of numerical work
- making records of numerical activities
- writing reports, explanations and details of observations
- making labels which have to be accurate
- writing headings that provide the required information for others
- offering numerical and mathematical proof

- Calculate the newspaper advertisement costs based on the page area and cost per square centimetre of advertising space for that particular page type e.g. front page.
- Read a magazine survey (in which data is presented in percentage form) which illustrates young people's opinions on particular topics of interest. Discuss and compare views in class.
- Use numbers sense, appropriate strategies, computational skills and key information to solve numeracy problems. Calculate the ticket prices for a stage production based on making a particular profit. Calculate the cost of materials for the production.
- Use numbers sense, appropriate strategies, computational skills and key information to solve numeracy problems e.g. use supermarket brochures to select purchases up to a predetermined amount. List the purchases and compute the change they would receive.
- Apply ratios to solve problems i.e. use ratios or proportion to break down information available within text e.g. analyse a newspaper text to determine what part is devoted to advertising, main story, banner headlines etc.
- Understand and use equivalences between commonly used percentages e.g. convert the percentage of readership or a viewing patterns to factions, where appropriate.
- Understand and use equivalences between commonly used percentages e.g. design a newspaper page with 25% of the area dedicated to advertisements.
- Rhythm in poetry
- Frequency of vocabulary
- Using or making a time-line of events in the book
- Time lines of famous artists
- Readability formulae
- Number of pages in a novel
- Dates of original publication and second editions etc.
- Ages of the novel's characters
- Time lines of events in the novel
- Ordering and ranking: e.g. placing in ordinal arrangement
- Surveys

Numeracy Language and Communication

- Spelling of key numerical vocabulary
- Reading of non-fiction in which charts and tables have to be interpreted
- Comparing the language used in various texts e.g.: analysing word lengths in novels, broadsheet-newspapers, tabloid-newspapers, magazines etc.
- Numeracy Keywords
- Key phrases in numeracy
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- Using numerical vocabulary correctly and precisely
- Explaining and justify their methods and conclusions
- Discussing word problems
- Communicating the results of a statistical enquiry
- Discussion about and practice in using the language of logic and reasoning
- Cause and effect

- Comparing by size, weight etc.
- Sequencing
- The following are all important aspects of helping pupils with the technical vocabulary of numeracy: Use of Word walls, Visual Verbal Squares
- Using a variety of words that have the same meaning e.g. add, plus, sum
- Encouraging pupils to be less dependent on simple words e.g. exposing them to the word multiply as a replacement for times
- Discussion about words that have different meanings in Mathematics from everyday life e.g. take away, volume, product etc
- What knowledge, skills and techniques at word level ,at sentence level , at text level
- can be developed in English lessons that will help pupils to: use mathematical vocabulary correctly? explain and justify their methods and conclusions? interpret and discuss results? solve word problems?
- communicate orally and on paper the results of a statistical enquiry or other in-depth piece of mathematics

Modern Languages (+ Gaeilge)

Representation and Spatial and Geometric Sense

- Use a page from a street directory to map a route from the school to a chosen location. Then give directions orally in the target language to another student who must determine the destination.
- Create a floor plan of the student's "dream house", keeping rooms approximately to scale and use the target language to label the rooms
- Use of basic graphs and surveys to practice foreign language vocabulary and reinforce interpretation of data.

Measures and Measurement

- Complete a timetable for the coming week using the 24-hour clock, using the appropriate keywords in the targeted language.
- Telling the time in another language
- Investigating number systems in another language
- Counting in another language
- Measures and measurement
- Investigating distances between towns in the country where the modern language is spoken

Data Sense, Handling and Interpretation

- Data collection to make comparisons
- Surveys
- Study a text above the pastimes of people in the target culture. Display information gained from the text in graphic and table format. Interpret the information to answer specific questions.
- Read a magazine survey from the targeted culture (in which data is presented in percentage form), which illustrates young people's opinions on particular topics of interest. Discuss and compare views in class.
- Compare numerical data about prices, local temperatures, distances in the target language.
- Carry out and present the results of a survey in the target language

Number Sense and Computation

- Use conversion formulae to convert euros into the currency of the target culture.
- Planning holidays
- Use and interpretation of transport timetables
- Currency conversions
- Shopping
- Use of percentages to calculate and solve problems.
- Calculate the cost of articles of clothing during a 20% off sale. The students havethe opportunity to use the language of clothing and shopping in the target language.
- Use numbers sense, appropriate strategies, computational skills and key information to solve numeracy problems e.g. use supermarket brochures from the target culture

- to select purchases up to a predetermined amount in the local currency. List the purchases and compute the change they would receive.
- Apply ratios to solve problems i.e. use ratios or proportion to break down information available within text e.g. analyse a newspaper text from the target culture to determine what part is devoted to advertising, main story, banner headlines etc.
- Apply ratios to solve problems e.g. plan a class meal in the target language, adjusting recipe quantities as appropriate – meal for four to a meal for twenty.
- Read, write, compare and order positive and negative numbers e.g.: gather data on temperature from the target country and compare to Ireland's range of temperatures.
- Dates, sequences and counting in other languages
- Currencies and currency transactions
- Could we support the teaching of place value by exploring the language patterns in counting numbers?
- % of people who spend holidays in target country
- % type of transport they use /accommodation used
- Using conversion tables e.g. converting euros to sterling or US dollars
- Creating a classroom shop with goods priced in the currency of the country
- Investigating cafe menus with prices
- Multiplication cavers spoken in the MFL
- Currency and distance conversion tables
- Travel data - distances, time, costs
- Travel brochures

Numeracy Language and Communication

• **Numeracy Keywords**

• **Key phrases in numeracy**

- Key symbols of numeracy
- Using numerical vocabulary correctly and precisely
- Explaining and justify their methods and conclusions
- Discussing word problems
- Foreign keywords for number, counting, measurement units, time etc.
- Dates, sequences and counting in other languages; use of basic graphs and surveys to practise foreign language vocabulary and reinforce interpretation of data.
- What knowledge, skills and techniques
    - at word level
    - at sentence level
    - at text level
- can be developed in language lessons that will help pupils to:
    - use mathematical vocabulary correctly?
    - explain and justify their methods and conclusions?
    - interpret and discuss results?
    - solve word problems?

    - Communicate orally and on paper the results of a statistical enquiry or other in-depth piece of mathematics?
- To what extent do we support the development of words involved in reasoning and proof (for example, 'if … then', 'therefore', 'it follows that …', etc.)?
- How can we support the teaching of pupils, including EAL pupils, to understand and use, read, write and spell correctly the mathematics vocabulary. Are there particular words in the Vocabulary checklist that we could stress?
- To what extent does our work on interpreting information/being a critical reader contribute to the development of mathematics (for example, handling data presented in charts, graphs and diagrams)?
- How might the skills developed in language lessons enhance pupils' capacities to solve problems, to reason and justify, and to evaluate their work in mathematics?

Mathematics

Representation and Spatial and Geometric Sense

- Use a long tape measure or trundle wheel to measure relative distances
- Design a tour map of the east end of Dublin using grid references. Determine the optimum delivery route for a delivery person in terms of time and distance.
- Design drink containers given certain parameters e.g. a capacity of 1 litre, keeping materials costs as low as possible, practical for packing and use.
- Use and describe transformations (e.g. enlargement, reduction or rotation).
- Designing containers – how much do they need to contain – how do they sit on a shelf
- Houses – how much floor space – cost?
- 3D shapes – garden pavers etc
- Cost to renovate a bedroom

Measures and Measurement

- Complete a timetable for the coming week using the 24-hour clock, using the appropriate keywords.
- Calculate the length of flights between airports in Ireland. Make use of both 24 and 12 hour clocks.
- Plan a trip giving arrival and departure dates and total time taken for each leg of the journey.
- Read a bus or train timetable and establish appropriate routes of travel to get from A to B in the shortest time.
- Select and use appropriate measuring instruments and units.
- Measure and record measurements.
- Make appropriate conversions between units of measurement.
- Estimate the distance for a trip around Ireland and the amount of petrol needed.
- Estimate the cost and materials required to paint and carpet a house.

Data Sense, Handling and Interpretation

- Critically interpret statistical information, tables and graphs.
- Represent relevant and purposeful information in graphical and table form and interpret to answer questions.
- Present and display information collected in an investigated project using a pie chart, line graph, bar chart etc.
- Understand which type of data representation is applicable in a specific instance or context.
- Pie charts / histograms / bar charts / line graphs / Scattergrams
- Problems involving speed / time

Number Sense and Computation

- Use strategies, estimation and contextual knowledge to confirm calculations and answers are reasonable.
- Use number sense and knowledge of number facts to determine the accuracy of calculations within reasonable limits.
- Calculate the cost to paint a house based on the amount of paint used per square metre.
- Select and use simple and formulae to solve numerical problems.
- Use percentages to calculate and solve problems.
- Use numbers sense, appropriate strategies, computational skills and key information to solve numeracy problems e.g. solve problems involving discounts, VAT, profit and loss.
- Provide opportunities for students to explain their mental processes and talk through both correct and incorrect answers
- Find ways of helping students to make connection between conceptual aspects of Mathematics and methods of calculation
- Treat calculations as problems, which require interpretation in a meaningful way rather than encouraging students simply to spot the appropriate method to use.
- Use realistic contexts in which to apply problems
- Estimation questions
- Working out values for graphing, given *x* coordinate
- Apply ratios and proportion to solve problems e.g.
- Slope
- Sharing a lottery prize
- Mixing concrete
- Recipes
- Making chemicals
- Similar triangles
- Read, write, compare and order positive and negative numbers e.g.:
  use number lines to order numbers in a variety of forms
  comparing wins and losses for a sports team

Numeracy Language and Communication

- Numeracy Keywords
- Key phrases in numeracy
- Key symbols of numeracy
- Using numerical vocabulary correctly and precisely
- Explaining and justify their methods and conclusions
- Discussing word problems

History

"From the standpoint of young learners, making links between subjects enriches and enlivens them, especially history and geography"
Rose Report (GB) 2009

Representation and Spatial and Geometric Sense

- How are graphs and charts used in history?
- Can we adopt a consistent approach to problem solving, investigations and enquiry-based approaches?
- How are graphs and charts used in history? Does their development support the progression outlined in the yearly teaching programmes for mathematics? Do our labelling conventions for graphs match those of the mathematics department?
- Pupils will make statistical enquiries, for example, in analysing population data to explore and compare lifestyles
- Students will also use a wide range of measurements and rates of change.
- The study of maps includes the use of coordinates and ideas of angle, direction, position, scale and ratio.
- Establishing chronological order and sequence by using a time line
- Relationship between units of time
- Investigating mosaic patterns in historical buildings
- Creating the model of a WW2 aeroplane
- Data Sense, Handling and Interpretation
- Tabulating and graphing data (e.g. populations of ancient cities, casualties in battles and wars etc.)
- Compare population statistics for a particular location today with 100 years ago.
- Use the handling data cycle – state problem, identify and collect data, analyse and represent data, interpret results – directly in relation to a history topic?
- Create opportunities for joint work with the maths department e.g. using data on passengers of the Titanic (could also be linked to the English dept for creative writing), using data from census returns for a local town or village from 100 yrs ago compared with the present day?
- Which parts of the handling data cycle – state problem, identify and collect data, analyse and represent data, interpret results – relate directly to work in history? Are there opportunities for joint work with the mathematics department? Which units offer greatest potential for joint working? Would there be any ICT use in this work?
- Fatalities in war
- Interpreting frequency tables
- Interpreting pie charts of data

Number Sense and Computation

- Discussing evidence in history may involve measurement, estimation and approximation skills, and making inferences
- Timelines and sequencing of historical events and characters
- Chronology using a time line
- Estimation of the duration of an ancient war
- Analysing historical evidence numerically where appropriate e.g. by finding averages of the number of death in different regions during the Black Death
- Dates of events
- Investigate the range and type of diseases prevalent during a particular period, the rate of spread, mortality rates, impact on different ages
- Number of fatalities in various wars, battles, events etc.
- Working out the length of the reign of a monarch
- Investigating Roman currency
- Numeracy Language and Communication
- History of maths, ancient civilisations, knowledge of maths and astronomy and their use in ancient architecture
- Discussing evidence in history may involve measurement, estimation and approximation skills, and making inferences
- Cause and effect
- Analysing parallel events in history
- Investigating a Roman market
- Vocabulary associated with the passing of time
- Identify, select and use a range of appropriate sources of information, evaluate the sources used, select and record information relevant to the enquiry and reach conclusions
- Morse code, Enigma etc.

• **Numeracy Keywords**

- Key phrases in numeracy
- Key symbols of numeracy
- Using numerical vocabulary correctly and precisely
- Explaining and justify their methods and conclusions
- Census databases
- Discussing word problems
- Communicating the results of a statistical enquiry
- Discussion about and practice in using the language of logic and reasoning
- Cause and effect
- Comparing by size, weight etc.
- Do we use a common vocabulary in space, shape and measure?
- How can we develop consistent pupils' interpretation and analysis skills?
- In what ways could our work on thinking skills in history contribute to the development of using and applying numeracy?
- Studying and documenting the life and work of Florence Nightingale

- Studying and investigating the work of mathematicians such as Pascal, Fibonacci and Euler
- Studying and investigating Roman civilisation - number systems, tiling patterns, army organisation, distances on Hadrian's Wall
- Studying and investigating historical buildings - symmetry in design, plans and records of the buildings
- Studying and investigating Egypt - pyramids, number systems, measuring system
- Use of census material - data handling and recording
- Study of churchyards and parish records - dates of birth, dates of death, longevity, family trees
- Study and investigation of historical voyages of discovery
- The development of units of measure began with the Magna Carta (1215)

CSPE

Measures and Measurement

- Given a quantity of waste produced in one household in one day, calculate the total waste from a large number of households in one year (making conversions as appropriate).
- Data Sense, Handling and Interpretation
- Construct simple surveys from community members on experiences at school e.g. uniform, subjects taught etc. Create and use the information to make comparisons between schooling over the years.
- Analyse data from statistic surveys and calculate the percentage of data in a given category e.g. the percentage of households that use gas, wood, oil or electricity for heating.
- Exploring and investigating bias and exaggeration within statistical information.
- Research a topical political, spiritual, moral, social or cultural issue, problem or event by analysing information from different sources, including ICT-based sources, showing an awareness of the use and abuse of statistics
- How much work involves handling and interpreting data as a means of enabling pupils to become better informed citizens? Can we use the handling data cycle – state problem, identify and collect data, analyse and represent data, interpret results – directly in relation to any topic? Are there opportunities for joint working with the maths department?
- Research into the design, make and market process collecting data from market research.
- Analysing newspaper articles with statistical information.
- Projects: Investigate smoking patterns in different age groups within Ireland. How widely available are fair-trade goods in local shops? Explore voting patterns in general elections. Compare the turnout in elections in different countries.
- When discussing numbers (for example, in populations), time differences, fractions, percentages and proportions, does teaching build upon the expectations set out in the number strand of the yearly teaching programmes for mathematics?
- How much work involves handling and interpreting data as a means of enabling pupils to become better informed citizens? Which elements of the handling data cycle – state problem, identify and collect data, analyse and represent data, interpret results – are used most? Do you use ICT in this work?
- Does teaching employ a range of graphs and charts in line with expectations in the mathematics yearly teaching programmes.
- Are there opportunities to make links with numerical work on maps, scales and distances? Compare the timing of such work with the objectives in the yearly teaching programmes for numeracy.
- Are pupils introduced to numeracy from other cultures?
- Do we use pupils' numerical knowledge and skills when we explore the ideas of probability, risk and chance?
- Is correct numeracy vocabulary used where appropriate?
- When exploring evidence, are pupils given opportunities to develop their competence in problem solving, communicating and reasoning?

- The discussion of social issues is likely to lead to the use of primary and secondary data and the interpretation of graphs, charts and tables, helping pupils to make reasoned and informed decisions and to recognise biased data and misleading representations. By applying mathematics to problems set in financial and other real-life contexts pupils will develop their financial capability and awareness of the applications of mathematicsin the workplace.

Number Sense and Computation

- Use numbers sense, appropriate strategies, computational skills and key information to solve numeracy problems e.g. use the current ages of the students to calculate their age in a given year in the future.
- Work experience investigations / numeracy in the work place
- Wages, VAT, tax, interest payments, mortgage types, market research
- The most efficient way for students to evacuate the school building in an emergency.

Numeracy Language and Communication

- Numeracy Keywords
- Key phrases in numeracy
- Key symbols of numeracy
- Using numerical vocabulary correctly and precisely
- Explaining and justify their methods and conclusions
- Discussing word problems

Religious Education (RE)

Representation and Spatial and Geometric Sense

- Patterns, symbolism, statistics, dates, life cycles - all have relevance and applications in religious studies
- Cycles of birth and death
- Endings and beginnings
- Using the number line to order events from BC to AD (Coles and Copeland, 2002)

Data Sense, Handling and Interpretation

- Interpretation and comparison of data gathered from secondary sources (internet) e.g. developing and developed world
- Number Sense and Computation
- Historical references to number in texts. (e.g. number of loaves added to the number of disciples!)
- Calendrical reckoning - collecting, recording, presenting and interpreting data involving graphs, charts and statistical analysis
- Different systems for tabulating and counting
- historians do not use the year 0, so calculations of differences across the years BC to AD give results that are one more or one less than the same calculation with integers

Numeracy Language and Communication

- Development of an accurate vocabulary through the communication of ideas
- Using numeracy keywords
- Key phrases in numeracy
- Key symbols of numeracy
- Using numerical vocabulary correctly and precisely
- Explaining and justify their methods and conclusions
- Discussing word problems

Appendix 1:

Numeracy Committee WRAT 4 Maths Test Comparison

Note: The numbers given for each student are their standardised scores.

A standardised test is used to measure a student's achievement in **English reading** and **Maths** compared to other children throughout the country **at the same class level** or **age level**.

Standard scores usually go from 55 to 145 with 100 being an **average score** on a standardised test. The table below describes what the different **standard scores** tell you about a student's achievement in English reading and Maths.

Standard score	What the score means	Approx. % of children who get this score
130 and above	Very high	2%
120-129	High	7%
110-119	High average	16%
90-109	Average	50%
80-89	Low average	16%
70-79	Low	7%
Below 70	Very low	2%

Target Group First Years 2014 – 2015 (Present 3rd Years)

- **May 15 – Sept 14:** This compares students' results from the beginning of First Year to their result at the end of First Year. Overall difference of -1.5 Each students' difference is recorded and also an overall average difference for the group.**Note** this is only an approximate value as some student's that were absent were taken into account when this average was calculated

- **May 16 – May15:** This compares students' standardised score from the end of Second Year with their result from the end of First Year. Individual comparisons are made and again an approximate overall average difference of -4.39. **Note:** This average difference is only an approximate value as again students that were absent were taken into account when average was calculated.

Before we carried out the WRAT 4 in Third Year we looked at factors that may be producing negative overall average differences for example

- The use of calculators (as calculators are not used for the WRAT 4). Operations such as adding, multiplication, division, fractions, percentages etc can now all be done on the calculator in class
- The students not taking the test seriously as some are aware that they do not get results of the test back
- Time of the day that the WRAT4 is administered

We had a brief 3rd Year Maths meeting and discussed the above. We then tested the target group

- Tests were administered first class of the day
- Students were told the importance of the tests at school level and at a national level
- Students were also told that Mr Ring and the numeracy committee would be examining and comparing their results individually.

Feb17 – May16:

This compares students' standardised scores from 3rd Year to their results in 2nd Year. There was a noted improvement in these results with an overall average difference of 0.02

Appendix 2: Cover Page In House Exams

Blackwater Community School

TEACHER NAME
SUBJECT
EXAM TIME
EXAM DATE

Name	
Class	

KEY WORDS

Percentage/ Fraction

$$\frac{\square}{\square} \times 100 = \quad \%$$

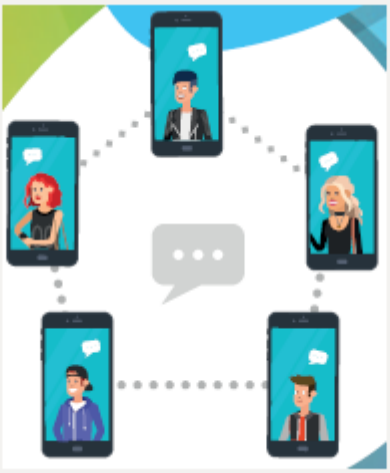
Appendix 3: Numeracy Puzzles Examples

Numeracy Puzzle: 1

Pete, Sarah, Matt, Nina and Arturas are all friends.

Each of them sends one text message to each other person.

How many text messages will be sent in total?



Numeracy Puzzle 2:

Amy, Liam, Samira and Luke meet up.

Each person shakes hands with every other person once.

How many handshakes are there in total?