

NUMERACY INITIATIVE

An introduction to Numeracy

Virginia College



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1.1 The focus of the evaluation

A school self-evaluation of teaching and learning in Virginia College was undertaken during the academic school year 2014-2015. Numeracy skills in Mathematics were evaluated and monitored over a period of time with a sample of first year students. Students' attitudes towards Mathematics were measured using surveys. Parents' understanding of Project Maths was also surveyed. This is a report on the findings of these evaluations.

1.2 School context

Virginia College is a co-educational school under the patronage of Cavan and Monaghan Education Training Board. Virginia Vocational School as it was originally known was founded in 1962. The school owes its origins to an initiative of Co. Cavan VEC and the Virginia Agricultural Show Society which resulted in the constructions of five classrooms on the agreement that the VEC would staff and equip the school and pay the Virginia Agricultural Show Society £5000. In its first year the school had an enrolment of 75 and a staff of 3 teachers. Since then the school has grown and developed with an extension completed in 1998 and a further major extension and refurbishment completed in 2006. The school was renamed Virginia College in 2006 after wide consultation with members of the education community and it also adopted a new logo.

The school, which is the only second level school in Virginia, serves the educational needs of the local community. The school has a picturesque location on the shore of Lake Ramor and is easily accessible from the town. The town of Virginia is located on the N3 and is 80 km from Dublin. Employment opportunities in the area which have been traditionally based on small farms have expanded with the development of manufacturing industry locally and with the town's location within the commuter belt for the Greater Dublin Region. This has contributed to the demographic development of the town which has seen its population increase by over thirty per cent in the intercensal period 2002-2006, a pattern repeated in much of the surrounding areas.

The school draws its students from 9 primary feeder schools, some of which also provide students to other post-primary schools in the neighbouring towns. Enrolment currently stands at 722 students.

Faithful to our motto, Virginia College is committed to providing quality teaching and learning in a safe and positive learning environment. Whilst fostering academic and personal achievement, we aim to nurture an educational community of informed, responsible and caring citizens for an ever changing world. The school aims:

To have consistently high expectations, and to help students perform well in external examinations.

To help develop students as caring, responsible and participating members of society.

To help students grow in self-worth through experiencing success in some aspects of the wider curriculum.

To provide an ordered learning environment which encourages positive discipline.

To help students develop their academic, physical, emotional, spiritual and career potential.

To involve and foster good relationships with parents and wider community in the learning of students

Introduction

It is intended that this document will provide information and guidelines for a uniform approach to numeracy across the whole curriculum. It is not intended to be a prescription for teaching but should be used for guidance and reference only. It is important that each subject department incorporates the whole school approach towards numeracy enhancement in their classroom planning.

Definition of Numeracy

Numeracy involves being able to:

- Think and Communicate quantitatively
- Make sense of data
- Have a spatial awareness
- Understand patterns and sequences
- Recognise situations where mathematical reasoning can be applied to solve problems

Numeracy is **NOT** limited to the ability to use numbers, to add, subtract, multiply and divide.

Research and Findings on Numeracy Attainment in Irish post primary schools

TIMSS

The Irish performance in mathematics in TIMSS (2011) is significantly above the international scale centre point of 500. However, results show that the percentage of Irish pupils reaching the Advanced Benchmark (9%) is lower than would be expected from overall Irish performance.

PISA

The drop to significantly below average in PISA (from 17 to 26) can in part be attributed to the “comparatively low performance of higher-achieving students” (ERC)

However, results show that the percentage of Irish pupils reaching the Advanced Benchmark (9%) is lower than would be expected from overall Irish performance. (Close 2013)

Chief Examiners reports in Accounting, German.

The role of the Numeracy Committee

The role of the Numeracy Committee is to help promote numeracy in the school. The Numeracy Committee is made up of six teachers representing different subject areas in the school.

Importance of a Whole School Approach to Numeracy



Whole school collaboration is key to consistent approaches to numeracy across subject departments

Developing positive attitudes and an awareness of numeracy is the responsibility of the whole school community



**What
You
Shouldn't
Share**

NEGATIVE ATTITUDES TO MATHS



Purposes of a whole school approach to Numeracy:

- ◆ to ensure that students receive positive messages about numeracy when used across the curriculum
- ◆ to secure high standards in numeracy across the school
- ◆ to implement the school's agreed approach to the teaching of numeracy skills
- ◆ to provide a basis against which progress can be judged
- ◆ to record methods, vocabulary and notation that have been agreed – *not necessary*
- ◆ to assist the transfer of students' knowledge, skills and understanding between subjects
- ◆ to indicate areas for collaboration between subjects and processes for facilitating such collaboration
- ◆ to fulfil the current National Strategy for Literacy and Numeracy requirement

Data gathering and analysis in Virginia College

All first year students in Virginia College took part in a survey on their return after the Easter break facilitated by the Maths teachers. The survey is available in the Numeracy folder on the staff drive in the folder SSE-SDP 2013-2014.

In September data gathering will continue in the form of: JC and LC Maths SEC subject analysis, First Year Common Competency test

Summary of results

On One Drive

Key areas of focus based on findings in Virginia College

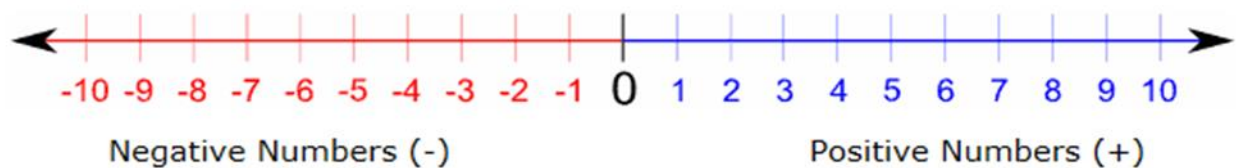
The Numeracy Committee identified 3 key areas for improvement. These are:

1. Improve students' poor attitudes towards maths from 63% to 55%
2. Improvement in scores for percentages, ratio and fractions from 42% to 55% (indicated by first Year Competency test)
3. To improve parental awareness re Project Maths from 42% to 55%.

Targeting all three areas should improve student attainment in Mathematics and improve the uptake of maths at higher level for junior cert.

Suggestions for short term strategies

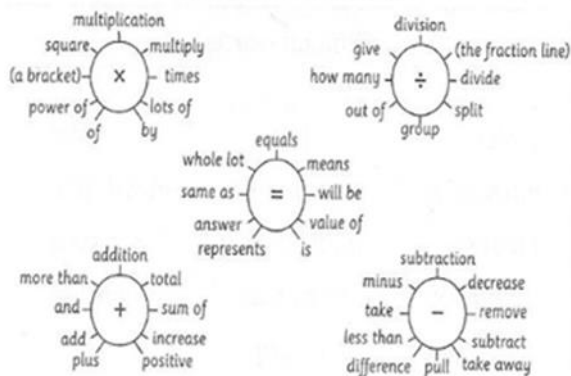
- ✓ All teachers and students use the same calculator (which is on booklist)
- ✓ Teachers all have maths calculator emulator available on the common drive
- ✓ Maths quotations on posters around the school
- ✓ Clock and academic calendar to be placed on the wall in all classrooms
- ✓ Returning tests as a fraction – work out own percentages in all subject tests
- ✓ Links on school website for parents highlighting need for maths in everyday life and highlighting numeracy strategies, numeracy apps available on ipad etc.
- ✓ Give distances from reception to various areas
- ✓ Lunch time clubs include chess, draughts etc.
- ✓ Link to on-line maths dictionary on school web site
- ✓ Maths page to be included in student journal
- ✓ Numeracy keywords graphically designed and placed in maths classrooms



×	1	2	3	4	5	6	7	8	9	10	11	12
1	1	2	3	4	5	6	7	8	9	10	11	12
2	2	4	6	8	10	12	14	16	18	20	22	24
3	3	6	9	12	15	18	21	24	27	30	33	36
4	4	8	12	16	20	24	28	32	36	40	44	48
5	5	10	15	20	25	30	35	40	45	50	55	60
6	6	12	18	24	30	36	42	48	54	60	66	72
7	7	14	21	28	35	42	49	56	63	70	77	84
8	8	16	24	32	40	48	56	64	72	80	88	96
9	9	18	27	36	45	54	63	72	81	90	99	108
10	10	20	30	40	50	60	70	80	90	100	110	120
11	11	22	33	44	55	66	77	88	99	110	121	132
12	12	24	36	48	60	72	84	96	108	120	132	144

$$\begin{aligned} \sqrt{1} &= 1 \text{ since } 1^2 = 1 \\ \sqrt{4} &= 2 \text{ since } 2^2 = 4 \\ \sqrt{9} &= 3 \text{ since } 3^2 = 9 \\ \sqrt{16} &= 4 \text{ since } 4^2 = 16 \\ \sqrt{25} &= 5 \text{ since } 5^2 = 25 \\ \sqrt{36} &= 6 \text{ since } 6^2 = 36 \\ \sqrt{49} &= 7 \text{ since } 7^2 = 49 \\ \sqrt{64} &= 8 \text{ since } 8^2 = 64 \\ \sqrt{81} &= 9 \text{ since } 9^2 = 81 \\ \sqrt{100} &= 10 \text{ since } 10^2 = 100 \end{aligned}$$

Symbols with words



How to problem solve

Read through problem, then re-read it
 Highlight important information/key words
 Underline important numbers
 Break information into manageable chunks
 Discuss problem, decide on a method
 Decide which symbol $+$ $-$ \times \div to use
 Estimate an answer (use easy numbers)
 Calculate answer (use pictures or diagrams)
 Check against the estimate
 Check against the original question

Whole School Approach

Whole School Approach

Express students' test scores as a fraction and then as a percentage

1. Make a fraction by placing the test score received over the total number of marks.
2. Estimate the percentage mark from the fraction.
3. Change the fraction to a percentage by multiplying the fraction by $\frac{100}{1}$.
4. Check your answer using a calculator.

Key Vocabulary

Percentage	→	A number as a fraction of 100
13%	→	is equivalent to $\frac{13}{100}$

Common Approach to Fractions

Diagram

Estimate

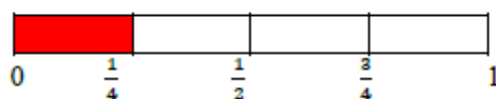
Calculate

Problem 1. If Donald ate $\frac{2}{3}$ of his own bar of chocolate and if he ate $\frac{1}{4}$ of Tim's chocolate bar. What fraction of a bar of chocolate did he eat?

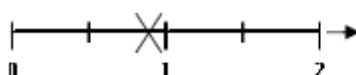
Diagram



What fraction remains?



Estimate



Since the sum of $\frac{2}{3}$ and $\frac{1}{4}$ on the fraction strip above is less than one, represent the sum of the two fractions with an X on the number line.

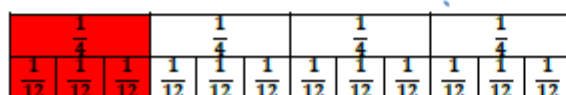
Calculate

Because $\frac{2}{3}$ and $\frac{1}{4}$ have different denominators, look for the common denominator of both fractions with the help of the fraction wall, i.e. what is the lowest common denominator that 3 and 4 divide into? When the common denominator is found, add like terms to like terms.



Now, what fraction remains?

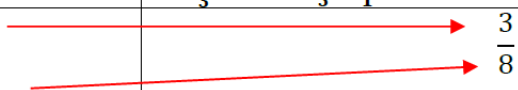
$\frac{2}{3}$ is equivalent to $\frac{8}{12}$




$\frac{1}{4}$ is equivalent to $\frac{3}{12}$

$$\frac{8}{12} + \frac{3}{12} = \frac{11}{12} \text{ of one bar of chocolate}$$

Key Vocabulary

Fraction	Compares a part to the whole. e.g. $\frac{1}{3}$ of €9 = $(\frac{1}{3} \times \frac{9}{1}) = €3$
Numerator = 3	
Denominator = 8	
Equivalent Fractions	Equivalent fractions are fractions whose numerator and denominator are in the same ratio as that of the original fraction. e.g. $\frac{1}{3}$ is equivalent to $\frac{2}{6}$

Whole School Approach to teaching Ratios

A fraction compares a part to the whole	A ratio compares a part to a part
<p>There are 15 girls and 18 boys in a particular class. What fraction of the total class are girls?</p> <p>Diagram</p>  <p>Estimate</p> <p>From the diagram it is clear that girls account for less than a $\frac{1}{2}$ of the total. Therefore the answer will be less than a $\frac{1}{2}$.</p> <p>Calculate</p> <p>The total (or the whole) in this case is the total number of students. $15 + 18 = 33$. The fraction of the class comprising of girls is $\frac{15}{33}$. $\frac{15}{33} = \frac{(3)(5)}{(3)(11)} = \frac{5}{11}$</p> <p>Check</p> <p>Answer is in line with the estimate</p> <p>To write a fraction in its simplest form, look to see if there is a highest common factor to the numerator and the denominator.</p>	<p>There are 15 girls and 18 boys in a particular class. What is the ratio of girls to boys in that class.</p> <p>Estimate</p> <p>From the figure above there are only a few more boys than girls. Therefore the ratio will be a far less than 1:2 (girls:boys) and closer to 1:1</p> <p>Calculate</p> <p>15:18 $(3)(5) : (3)(6)$ 5:6</p> <p>Ratio is written in its simplest form. Look to see if the numbers in the ratio have a highest common factor.</p> <p>Check</p> <p>5:6 is in line with the estimate.</p> <p>Avoid common misconceptions such as $5:6 \neq \frac{5}{6}$</p>

Some Numeracy strategies we employ already / can incorporate:

All Departments:

- ✓ Analysis of marking schemes – weighting of questions, percentage of overall marks etc
- ✓ Ratio of *marks : minutes* for each exam question

History Department

- ✓ Display key dates
- ✓ Population curves
- ✓ Statistical analysis – Highlight statistics in ratio format
 - Use piecharts (with fractions) to represent data
- ✓ Time lines
- ✓ Sequencing events
- ✓ History of maths, science, ancient civilisations, knowledge of maths and astronomy and their use in ancient architecture

Science Department

- ✓ SI units of measurement and conversions
- ✓ Graphing Booklet and analysis of graphs (SALT), representing and interpreting tables, graphs and data with experiments
- ✓ Using mathematical formulae
- ✓ Problem solving using formulae, rearranging formulae
- ✓ Distance between planets and standard index form
- ✓ Periodic table of elements trends and patterns
- ✓ 3 way relationships (distance, speed, time and mass, density, volume and voltage, resistance and current)

Home Economics

- ✓ Weights and conversions
- ✓ Reading scales
- ✓ Volumes
- ✓ Temperature and conversions
- ✓ Cooking times
- ✓ Ratios in recipes

ICT

- ✓ Representing data
- ✓ Considered use of graphs
- ✓ Use of spreadsheet as a calculator
- ✓ Formulae in excel
- ✓ Average function
- ✓ Creating tables of results
- ✓ Resourcing data from internet sources
- ✓ Direct access to numerous mathematical websites
- ✓ Mathematical apps
- ✓ Survey software

Languages

- ✓ Dates, ordering and counting in other languages
- ✓ Games to reinforce number learning (eg. Bingo, buzz-whizz etc.)
- ✓ Patterns in verbs
- ✓ Shopping and change
- ✓ Money conversions - *repetition*
- ✓ Use of basic graphs and surveys to practice vocabulary
- ✓ Use of graphs / analysis to introduce discussion
- ✓ Time and school timetable

Geography

- ✓ Maps, grids, references (co-ordinate system for grid references on maps, bearings, use of scale and ratio)
- ✓ Weather data charts
- ✓ Representing data (population, growth/density, portion of world developed/underdeveloped, land use)
- ✓ Use of spreadsheets
- ✓ Measurement survey of Earth's surface
- ✓ Population pyramids
- ✓ Display of field study data
- ✓ Games

Music

- ✓ Notes and values
- ✓ Rhythm, patterns
- ✓ Addition of fractions eg: 4.4 time – minim = $\frac{1}{2}$ bar, crotchet = $\frac{1}{4}$ bar, quaver = $\frac{1}{8}$ bar etc.
- ✓ Extracts of music displayed on walls with beat values shown

Physical Education

- ✓ Collection of real data for processing in maths
- ✓ Look at Olympic records
- ✓ Time calculations
- ✓ Metric measurements
- ✓ Symmetry in dance and balance
- ✓ Score boards
- ✓ diagrams of layout for games

Religious Education

- ✓ Interpretation and comparison of data gathered from secondary sources (internet) on eg developing and developed world.
- ✓ Look for historical references to number in texts (eg number of loaves added to the number of disciples!)

English

- ✓ Mathematical poetry
- ✓ location of quotes with page number
- ✓ Survey analysis – use piechart as motion for debate

SPHE

- ✓ What fraction of the class is absent?
- ✓ What percent of the class is present?
- ✓ What is the ratio of boys to girls today?

Resources

www.education.ie “The National Strategy to Improve Literacy and Numeracy among young Children and Young People 2011-2020 “

www.pdst.ie

www.jcsp.ie

www.tes.co.uk

http://www.lancsngfl.ac.uk/secondary/math/index.php?category_id=826&s=!B121cf29d70ec8a3d54a33343010cc2

www.mathscareers.org.uk

www.instantdisplay.co.uk

www.ams.org

www.NRICH.maths.org

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School Improvement Plan Numeracy

VIRGINIA COLLEGE SCHOOL IMPROVEMENT PLAN	
Summary of main strengths as identified in last SSE (13/10/14):	<ul style="list-style-type: none"> • Good uptake of higher level Maths at Junior and Senior cycle • Analysis of results was in keeping/above national average • Maths week is promoted and events are inclusive for all levels • Common testing is practiced with all year groups • Option of Maths Tutor program is offered • Base classrooms for Maths are print-rich, in keeping with the literacy initiative
Summary of main areas requiring improvement as identified in last SSE:	<ul style="list-style-type: none"> • Attitude towards Maths • Parental awareness re Project Maths • Student ability in areas of percentages, ratio and fractions
Improvement targets (related to students' achievement)	<ul style="list-style-type: none"> • Reduce poor attitude to Maths from 63% to 55% • Improve test scores for percentage, ratio and fraction section from 45% to 55% • Improve parental awareness re Project Maths from 42% to 55%
Required actions (Related to Teaching and Learning that will help to achieve the targets)	<p>Student attitude:</p> <ul style="list-style-type: none"> • Career talk to TY students, highlighting use of Maths beyond classroom • Action project by TY students re Maths beyond classroom (<i>to be displayed</i>) • Introduce Mathletes to TY (Khan Academy) • Visual display of Maths posters throughout school • Develop Maths week to involve other subjects/departments • Provide links to useful sites on school website • Staff to display positive attitude re Maths in front of students <p>Test Scores:</p> <ul style="list-style-type: none"> • All staff to present test scores in fraction form and let students find % (common approach) • Each dept. to include ratio/fractions into subject area • Student based activities with results presented in each format <p>Parental awareness:</p> <ul style="list-style-type: none"> • Presentation to incoming first year parents • Information on school website

Persons responsible	<ul style="list-style-type: none"> • All staff to promote positive attitude • All staff presenting test scores as fractions, converting to % with common approach • Maths dept. and numeracy committee to develop activities and provide numeracy booklet • A. Carolan to make presentation to incoming first year parents
Timeframe for action	3 year plan
Success criteria/measurable outcomes	Retest students in May 2016 and May 2017 Resurvey students in 2016 and 2017 Survey parents
Review date(s)	May 2016

School Self-Evaluation Report Numeracy

1. Introduction

1.1 The focus of the evaluation

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- ☐ To involve and foster good relationships with parents and wider community in the learning of students

2. The findings

- Attitude towards Maths
- Parental awareness re Project Maths
- Student ability in areas of percentages, ratio and fractions

3. Target improvement areas

- Reduce poor attitude to Maths from 63% to 55%
- Improve test scores for percentage, ratio and fraction section from 45% to 55%
- Improve parental awareness re Project Maths from 42% to 55%

4. Summary of school self-evaluation findings

4.1 Our school has **strengths** in the following areas:

- Good uptake of higher level Maths at Junior and Senior cycle
- Analysis of results was in keeping/above national average
- Maths week is promoted and events are inclusive for all levels
- Common testing is practiced with all year groups
- Option of Maths Tutor program is offered
- Base classrooms for Maths are print-rich, in keeping with the literacy initiative

4.2 The following areas **are prioritised for improvement**:

- Reduce poor attitude to Maths from 63% to 55%
- Improve test scores for percentage, ratio and fraction section from 45% to 55%
- Improve parental awareness re Project Maths from 42% to 55%

4.3 The following legislative and regulatory requirements need to be addressed.

Updating of the school Numeracy Policy with reference to Implementation of national numeracy strategy Circular 25/12