



‘Numeracy Strategies’

Scoil Na Tríonóide Naofa,
Doon, Co. Limerick.



2015/2016

Contents	Page
<u>Section 1: Context of School</u>	1
<ul style="list-style-type: none">• Introduction• Mission Statement• Aims• School Resources• Programmes on Offer• Learning School Project Team• Target Students	
<u>Section 2: Specific Project Report</u>	4
<ul style="list-style-type: none">• Rationale• Project Details	
<u>Section 3: Outline of Intervention</u>	7
<ul style="list-style-type: none">• Methodologies• Collection of Data• Findings/Outcomes	
<u>Section 4: Conclusions/Recommendations</u>	19
<u>Appendices</u>	

Section 1: Context of the School

Introduction

Scoil Na Tríonóide Naofa was part of an eight school bundle of new schools to be built announced by Ruairi Quinn, T.D., Minister for Education and Skills on the 21st of November 2012. This was carried out under the Public Private Partnership (PPP) model. Scoil Na Tríonóide Naofa is a Catholic Voluntary Secondary School under the trusteeship of C.E.I.S.T. and is an amalgamation of St. Fintan's C.B.S. (ERST), St. Michaels Community College Cappamore (VEC) and St. Joseph's Secondary School, Doon (Mercy).

Turning the sod began on the 11th December 2012 and the school was built to accommodate 850 students. The school opened its doors in February 2013 and was officially opened by Jan O'Sullivan, T.D., Minister for Education and Skills on the 7th of November 2014.

665 students are currently enrolled, and the school has a catchment area that stretches from Caherconlish Co. Limerick to Dundrum Co. Tipperary. The staff consists of 46 teachers, 2 special needs assistants and 2 secretarial staff, with BAM being in control of maintenance.

Mission Statement

Scoil NaTríonóide Naofa is a co-educational Catholic school providing an inclusive education which strives to enable students to achieve their potential. We seek to promote the well-being of all members of the school community in a respectful, safe and caring environment which values the dignity of each individual.

Aims

1. To provide an education in the Catholic tradition characterised by faith, hope and love.
2. To recognise the needs and rights of all partners in the school community, through fostering respect and promoting Christian values.
3. To encourage the intellectual, social, physical and spiritual development of each student.
4. To create an environment which enables students to develop positive self-esteem.
5. To recognise and develop our school's role as an integral part of our wider community.

Scoil NaTríonóide Naofa operates within the context of the legislation and regulations of the Department of Education and Skills, the rights of the trustees as set out in the Education Act, 1998 Along with the religious and educational philosophy of C.E.I.S.T. (See C.E.I.S.T. Charter)

School Resources

The financial and teaching resources of the school are provided by a combination of Department of Education and Skills grants, teacher allocations, voluntary contributions and occasional fund raising.

Implementation of the school plan and school policy must have due regard to resources and funding available. Scoil Na Tríonóide Naofa operates within the regulations of the Department of Education and Skills and follows the curricular programmes so prescribed which may be amended from time to time in accordance with Sections 9 and 30 of the Education Act 1998.

Programmes on Offer

The school operates a mixed ability system which promotes an inclusive educational environment. In addition to the Junior Certificate and the Leaving Certificate a Transition Year programme is offered. The Leaving Certificate Vocational Programme (L.C.V.P.) is also offered as an addition to the fifth year curriculum. STN aspires to provide a broad range of subjects enhancing each pupil's educational experience. 1.2 Specific indicators in the context of our school

Learning School Project Team

The project was led by Deirdre Ryan and Aoise Carroll and supported by Eilis Casey, Principal and a team of Maths teachers within in the Maths Department of Scoil na Trionoide Naofa

Section 2: Specific Project Report

Rationale

The Learning schools project is an action research project, the aim of which is to promote the on-going development of a community within the school and enhance the capacity of individual teachers in leading learning. This project is borne out of the energy within the staff at our school to explore and apply progressive teaching methodologies, programmes and approaches to the teaching and learning environment in our classrooms.

With reflection on last year's Learning School Project (LSP) on 'Literacy,' we concluded that numeracy would be the next logical project given the national focus on both numeracy and literacy.

"Numeracy is not limited to the ability to use numbers, to add, subtract, multiply and divide. Numeracy encompasses the ability to use mathematical understanding and skills to: solve problems and meet the demands of day-to-day living in complex social settings." (*Literacy and Numeracy for Learning and Life, DES 2011*)

By also reflecting on the term 'Numeracy,' as a school we agreed there is an automatic association with the Maths department. However, through discussion we realised that that was where we needed to look more closely. We decided that the idea of 'Numeracy' is cross curricular and so we needed to make this a school focus and consider the needs of improving numeracy skills across all subject curriculums within the school. With this in mind we decided to build the understanding of numeracy within the school and try to create a numeracy rich environment.

In LSP7 our project focus is “Numeracy in the School Environment”. Through acknowledgment of weakness in the numeracy area within the school, we realised the importance of developing numeracy within the school. By developing awareness that Numeracy is cross-curricular and developing numerical literacy, we aim to create a numeracy rich environment whereby all students will be aware that numeracy does not just apply to the Maths department. With a small focus group we will be able to monitor the progress and development of the students understanding of numeracy. This is the rationale that Scoil Na Tríonóide Naofa has used going forward with this Learning School Project. The project aims to co-ordinate numeracy initiatives across the school and to measure precisely the impact of our initiatives.

Project Details

Scoil Na Tríonóide Naofa became involved in the Learning School Project to further enhance teaching and learning in the school and also to encourage reflective practice. The opportunity to participate in the Learning School Project arose for us when Literacy and Numeracy were on the national agenda. As a new amalgamated school, it was also the beginning of the School Self Evaluation process which complements the reflective practice nature of the Learning School Project.

Numeracy is one of the key indicators that determine examination success and so Numeracy in First Year became the main focus of this project. Teaching strategies to be used were discussed. It was our intention to adopt a whole school approach to this project, to promote collegiality, co-operation between students, teachers. This project provided a clear

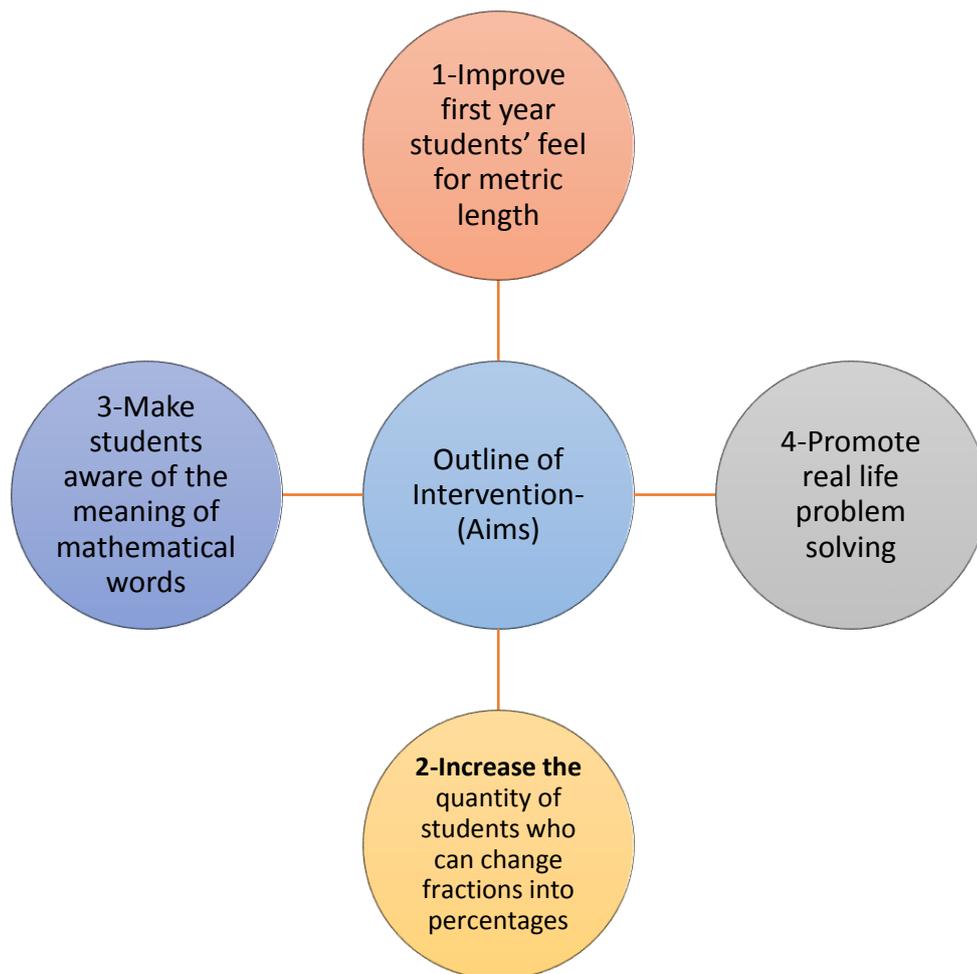
framework needed to engage in systemic change and will help the school to create a plan of where it wants to go in terms of numeracy in the next 3 years.

It was hoped that engagement with the project would:

- Raise awareness among the whole staff on the role to be played by each teacher in engaging with numeracy in the classroom
- Create an awareness in relation to data analysis which could be used in a whole school context.

However, the initial intention changed as the project developed.

Section 3: Outline of Intervention



Methodologies

Firstly after putting the LSP7 team together, we discussed different approaches to Numeracy within the school. We originally wanted to “increase knowledge, teacher awareness and responsibility of numeracy as cross curricular.” Through discussion, we decided we would speak with the Maths Department to see what their view would be. A list of suggestions to increase awareness of numeracy was put on the staff room notice board and further suggestions were welcomed. After some consultation and discussion, we decided on the following methodology.

We would carry out an intensive 6 week numeracy programme throughout the school, concentrating on first years in the following strategies:

- Metric length – it is not taught in math class to first years
(Metric length includes referring to appropriate units of length (mm, cm, m, km), estimating length and converting units of length to different units of length)
- Converting fractions to percentages,
- Problem solving,
- Literacy through numeracy in the form of word of the week.

AIM 1: Improve first year students' feel for metric length

STRATEGIES:

- I. Trial and error exercise in 'estimation or length' each day, during the first lesson of each day and/or trial and error in drawing lines of specified lengths, during the first lesson of each day
- II. A metre strip given to each teacher to stick on their wall, as a reference point for length
- III. A door height / width sticker given to each teacher to stick on their classroom door
- IV. 5 minute workshop on estimating length presented by TY to first year students
- V. Posters displayed in appropriate classrooms for converting lengths between mm, cm, m and km Appendix 1
- VI. Promotion of unit conversion methods in relevant subjects; Use the rule....

'If the unit of measure increases, the units decrease, so divide;

If the unit of measure decreases, the units increase, so multiply"

- VII. A station on each floor of the school to allow students to measure their height
- VIII. Posters displayed around the school indicating distances from and to various locations in the school Appendix 2
- IX. This strategy will be pre tested and will be post tested in one pilot group of first years.



AIM 2: Increase the quantity of students who can change fractions into percentages, using a common school approach

STRATEGIES:

- I. Every classroom has a step-by-step poster on how to change a fraction to a percentage. Appendix 4
- II. Test results to be returned as fractions only and students are to calculate their own percentage
- III. Language teachers: please feel welcome to translate this poster!
- IV. This strategy will be pre tested and will be post tested among all first years.

AIM 3: Make students aware of the meaning of mathematical words

STRATEGY:

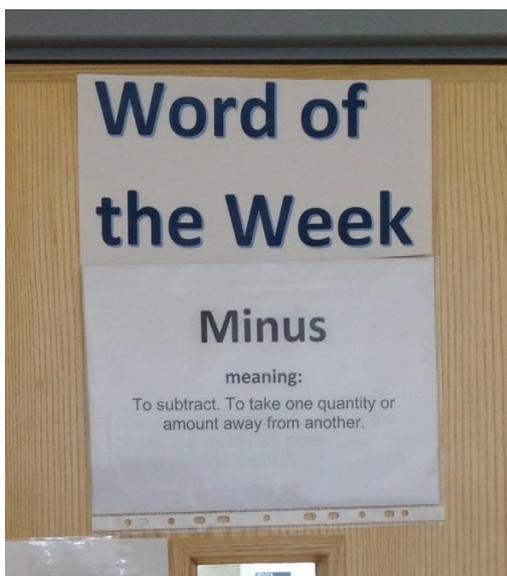
- I. 'Numeracy Word of the Week' displayed in every classroom and on a noticeboard

Methods for Word of the Week and Keywords/Key concepts

Numeracy is a whole school issue and an important part of teaching and the learning process. Students need to be able to express themselves, both orally and in writing in order to enhance their learning in all subjects. All teachers play an important role in improving student's numeracy skills. Therefore, the Keyword Strategy was chosen as a way of targeting the whole school, in order to improve standards and to create a "numeracy rich" environment.

Word of the Week

Exam keywords were chosen to be displayed, since informal meetings with staff revealed concern about students understanding of basic exam questions. The focus was on regular keywords found in exam papers. Words were identified from JCSP Keywords of Numeracy booklet. The Word of the Week was printed large enough to be seen from a distance, with its meaning. Important words were highlighted, using the Bold and Italic controls, to counteract the 'word heavy' nature of the text. Appendix 5



For instance,

Factor

Meaning: a whole number which divides exactly into a whole number (with no remainder).

Word of the Week in the classroom

However, just the display of the Word of the Week in the hall was not enough in itself and the Keyword Strategy was extended to the classrooms, by providing each teacher with a copy of the Word of the Week and a plastic display folder.

Teachers were asked to display the Word of the Week in their classrooms and to explain the meaning and usage in exams to all their classes especially first years. The theory is that if every teacher spent a few minutes with every class, teaching the Word of the Week, student knowledge would increase and numeracy awareness would be enhanced.

Numeracy Board

A Numeracy Board was created to display the Word of the Week. The placement of this board was discussed with management and different sizes and locations were considered, such as the General Purpose Room, stairs and the Entrance Hall.

The most successful area proved to be a large display, mounted on a black-board stand that was specially made for the Central Hall and Entrance. The board size and position allows it to be seen by every student and person entering the school.

A free standing board also has the flexibility of being repositioned, when the need arises for other events or displays and helps to prevent the Numeracy Board from becoming part of the furniture!

AIM 4: Promote real life problem solving

STRATEGIES

- I. Real life problems requiring mathematical solutions to be displayed on all maths teachers' doors on a weekly basis obtained from the website cemc.uwaterloo.ca Appendix 6
- II. Solutions to problem of the week to be displayed the following week
- III. Maths teachers to encourage all junior students to think about and/or discuss the problems set
- IV. This strategy is to be promoted but not tested. Students are to be encouraged to engage in conversations about puzzles or teachers may explain them if / when appropriate.

To develop a print rich environment teachers were encouraged to implement the following strategies:

- Display a metre strip
- Display the door height / width sticker on the door
- Display the 'how to change fractions to decimals' poster
- Guide students through the 'converting fraction to percentage' poster if required
- Return all test results from January to March as fractions only
- Encourage students to measure their own height at the locations on each floor
- Encourage students to engage in conversations involving length / height
- Update subject plans to include any numeracy used in your classroom / whole school approach
- Display the poster 'How to convert units of length in your classroom
- Refer to units of length and their conversion rates as often as possible
 - 'If the unit of measure increases, the units decrease, so divide;
 - If the unit of measure decreases, the units increase, so multiply

Collection of Data

Two of the four strategies were pre and post tested. Word of the week and the Problem solving strategy were promoted in the whole school but were not pre and post tested.

<u>Results of Converting Fractions to Percentages</u> <u>Competency Test</u>		
	Pre test	Post test
Question given:	If Mary scored $\frac{5}{17}$ in a test, calculate her result to the nearest percentage	Change $\frac{19}{40}$ into the nearest whole percentage
Can change fraction to %	39 students	49 students

Cannot change fraction to %	47 students	50 students
Sample size	86 students	99 students
Can change fraction to %	45%	49%

Findings and Outcomes

In summation, following the re-testing, we analysed and found that our aim of raising overall attainment in converting fractions to percentages was achieved. There was an overall percentage increase of $(\frac{4 \times 100}{45 \times 1} =) 9\%$. We had hoped that every student would have improved. While success was not achieved throughout the whole group selection, we feel that an increase of 9% is quite positive and we hope to increase this more next year. In hindsight, the results may have been affected by:

1) The post-test question being more difficult, with .5 being the digit that causes most mistakes in conversions.

$$\text{Pre-test: } \frac{5}{17} = 0.291 \times 100 = 29.1 = 29\%$$

$$\text{Post-test: } \frac{19}{40} = 0.475 \times 100 = 47.5 = 48\%$$

2) Sample size being different and potentially involving different students. Absenteeism of test days was not catered for.

Data Analysis of Imperial Length Competency Test

Results of Awareness of Imperial Length Competency Test	Pre test Correct %	Post test Correct %	% increase
USAGE OF UNITS RESULTS			
1) Number the following dimensions in order of size, from shortest to longest: Centimetres, Kilometres, Metres, Millimetres	86%	96%	11%
2) Which unit of measure would you use to measure the height of a dog?	82%	91%	11%
3) Which unit of measure would you use to measure the distance to Dublin?	100%	100%	0%
4) Which unit of measure would you use to measure the thickness of a 1 cent coin?	91%	96%	6%
5) Which unit of measure would you use to measure the length of a desk?	68%	52%	-19%
CHANGING UNITS RESULTS			

6) How many centimetres are in a metre?	86%	96%	11%
7) How many metres are in a kilometre?	59%	74%	15%
8) How many millimetres are in a centimetre?	68%	91%	23%
9) How many millimetres are in a metre?	82%	83%	1%
10) Doon is 6.2 kilometres from Cappamore. How far is this in metres?	50%	74%	24%
ESTIMATION WITHIN 10% ACCURACY RESULTS			
11) Estimate how many desks are needed to make a desk measuring one metre in length	82%	83%	1%
12) Estimate the height of the door in centimetres	73%	48%	25%
13) Estimate the width of a car, using cm, km, m or mm.	27%	52%	25%
14) Estimate the height of the sports hall in cm, km, m or mm.	32%	35%	3%
15) Draw 10cm, without using a ruler	77%	87%	11%

Findings/Outcomes

- All 15 questions demonstrate encouraging information. Fourteen of these questions show an improvement in Imperial Length Competency, some are marginal but it also includes significant improvements. Question 5, regarding the unit of measurement

used to measure the length of a desk caused some confusion. This was against the trend and is hard to explain.

- As can be seen from the above table, there has been a 29% increase in the number of students achieving in estimating heights to lengths to within 10% accuracy of unseen items.
- There was a 28% increase in converting kilometres to metres accurately.

Section 4: Conclusions and Recommendations

The six week numeracy programme had a positive impact on our first years and through the test results gathered, it showed an improvement in students learning.

- We would continue promoting strategies for awareness of length but perhaps not by testing it. This strategy can be fun and the skill of awareness may not need to be tested.
- We learned that in order for a certain cohort of students to engage in any activities of their own accord, in their free time, then it was vital that there was an incentive in place for them. E.g. while engaging in the problem solving strategy, rewarding students with a prize might be a suggestion for the future.
- We would recommend that Maths teachers specifically teach conversion of fractions to a percentage during strategy weeks, with a much greater emphasis on the .5 rule. We would request all teachers to return fraction results “ not out of 100”
- Next time, we would keep the sample groups more controlled and perhaps carry out the research strategies with a control group also.

- In hindsight, adopting 4 strategies was challenging. We would adopt only 1 whole school testable strategy next time.
- The Word of the Week strategy, proved to be successful as a whole staff effort towards improving literacy through numeracy in the school. Though the emphasis was towards first years, all students have benefited from a Word of the Week in the hall and in the classrooms. Next year, other keywords could be promoted such as commonly misspelt words or exam key words from other subjects. We suggest that all subject departments create keyword lists that are specific to their subjects and make these available in the Numeracy folder on the staff server. Analysis of these exam keywords would show the keywords that are common to all subjects and provide a comprehensive resource for Word of the Week. Improving literacy through numeracy in our school, involves all subjects, all teachers and all students.
- The SEN department would consider supporting the weaker students outside of class and incorporate the strategies used.
- The free standing Numeracy Board located in the hall, should continue to be used for keywords, since it is in a prominent position and seen by all students. However, it should be renamed as the Keyword Board and kept just for that purpose. Space should be found for a separate, wall mounted Numeracy Board. A whole board should be allocated for Numeracy and the same for Literacy. The ideal place for these boards would be in the General Purpose Area. It could be a 'working' board for literacy events in the school, such as competitions, displays of students work, book lists, promotional posters and events such as a numeracy week.

What were the effects of the actions?

From this process we have learned that creating a numeracy rich environment in the whole school is a huge challenge and one that cannot be achieved over the course of one year. It is a process that must be ongoing; it must be visible and interactive in every lesson. It must not become a chore for teachers or students or parents or any member of the school body but more so a part of daily school life that we expect and willingly accept. We look forward to facing the challenges we faced this year again in the coming school year and continuing to make our school a numeracy rich environment