

Integrating Mathematics and Physical Education

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Five reasons to integrate in general

- A lot to “cover” in the primary school curriculum
- Life requires us to “join the dots”
- Children can go deeper into topics than if a topic occurs in one subject only
- Enthuses children and consequently encourages home-school communication
- Satisfying for the teacher

Levels of integration

(Fogarty 1991)

Diagram taken from a paper by Kathy Lake, "Integrated Curriculum: A research study"
(See "Further Reading" slide)

| Name | Description |
|------------|--|
| Fragmented | Separate and distinct disciplines |
| Connected | Topics within a discipline are connected |
| Nested | Social, thinking, and content skills are targeted within a subject area |
| Sequenced | Similar ideas are taught in concert, although subjects are separate |
| Shared | Team planning and/or teaching that involves two disciplines focuses on shared concepts, skills or attitudes |
| Webbed | Thematic teaching, using a theme as a base for instruction in many disciplines |
| Threaded | Thinking skills, social skills, multiple intelligences, and study skills are "threaded" throughout the disciplines |
| Integrated | Priorities that overlap multiple disciplines are examined for common skills, concepts, and attitudes. |
| Immersed | Learner integrates by viewing all learning through the perspective of one area of interest |
| Networked | Learner directs the integration process through selection of a network of experts and resources |

Mathematics and Physical Education

“Mathematics education provides the child with a wide range of knowledge, skills and related activities that help him/her to develop an understanding of the physical world and social interactions. It gives the child a language and a system through which he/she may analyse, describe and explain a wide range of experiences, make predictions, and solve problems”

“Physical education meets the physical needs of the child and the need for movement experiences, challenges and play. It develops a desire for daily physical activity and encourages constructive use of free time and participation in physical activities in adult life.”

(Primary School Curriculum, 1999)

Physical Education

Broad Objectives

Knowledge and understanding

- Gather, record and interpret information on achievement
- Be inventive, make decisions, solve problems and develop autonomy
- Develop an understanding of the use of space, speed, direction and level

Social and personal development

- Interact and co-operate sensitively with others, regardless of cultural or social background

Curriculum Strands

Physical Education Strands

Athletics

Dance

Gymnastics

Games

Outdoor and adventure activities

Aquatics

Mathematics Strands

Number

Algebra

Shape and Space

Measures

Data

Olympic records maths activity

Problem from NRICH: <http://nrich.maths.org/public/>

- Look at the ten graphs showing how Olympic records have changed over time in ten athletic events.
- Can you deduce which event each graph represents?
- Can you determine what the units might be on the vertical axis for each graph?
- Are there any unusual features on any of the graphs?
- Can you think of a plausible explanation for them?

Aquatics



Swimming Calculations

- What is the length of our local swimming pool?
- If I swam the following number of lengths, how far would I have swum?

1 length
2 lengths
3 lengths
10 lengths
50 lengths
 $\frac{1}{2}$ length

Multiplying

Say how you figured out each one.

The numbers you choose here allow you to differentiate among learners in the class. Some children will do them all and more complicated ones. Others will just do some of these. Try to help each child do better than they think they can do.

- If the pool is 25 metres long, how many lengths would I have to swim in order to swim

50 metres
100 metres?
250 metres?
500 metres?
a kilometre?
5 metres?

Dividing

Say how you figured out each one.

Athletics

Athletics

Estimate how long it would take you to run 100 metres.

Ask a friend to time how long it takes you to run 100 metres.

What is the difference between your estimate and the actual time.



If you ran a kilometre at that speed, how long would it take you?

Could you run a kilometre in that time? Justify your answer.



Games

Sort this PE Equipment



Could be sorted by

Criteria

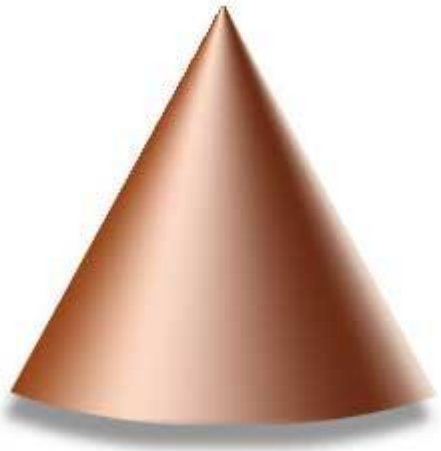
(Categories)

- Colour (yellow, blue, two-colour etc.)
- Type (cone, bat, ball etc.)
- Material (wood, plastic, leather etc.)
- Shape (sphere, non-sphere; round, not round etc.)
- Use (throwing and catching, hitting, marking etc.)
- Property (can roll, can stack, can slide etc.)

Principles when setting a sorting task

- Sorting one set of objects in multiple ways is better than sorting multiple sets of objects in one way each
- Children must choose the criteria and categories for sorting
- It's good if there are some ambiguous categories that require discussion

Name these Objects



Compare the cones

Other shapes



What shape is a football in Gaelic football?

Why is this a suitable shape?

Can you suggest a shape that would be unsuitable as a football? Justify your answer.

Figure out the score in points in each of the following GAA matches



Who won each match?
By how much did they win?



This activity introduces children to calculations of the form $(a \times 3) + (b \times 1) = c$ in a concrete way. This is important for understanding place value and multiplication of 2-digit numbers.

Clarifying link to place value and multiplying

| Goals | Points | Score in Points |
|-------|--------|------------------------------------|
| 2 | 7 | $(2 \times 3) + (7 \times 1) = 13$ |
| | | |

| Tens | Units | Value of Number |
|------|-------|-------------------------------------|
| 3 | 6 | $(3 \times 10) + (6 \times 1) = 36$ |
| | | |

$$\begin{array}{r} 23 \\ \times 4 \\ \hline 92 \end{array}$$

$$(4 \times 3) + (4 \times 20) = 92$$

GAA score problem

If your team's score in a camogie match was 23 points, what could the score have been in goals and points? ← Allows for differentiation

Have you found all the possible solutions?

Some possible solutions to GAA score problem

0 – 23

1 – 20

2 – 17

3 – 14

4 – 11

5 – 8

6 – 5

7 – 2

Could there be other possible scores? Justify your answer.

Could the team have scored exactly 18 points and some goals?
Why? Why not?

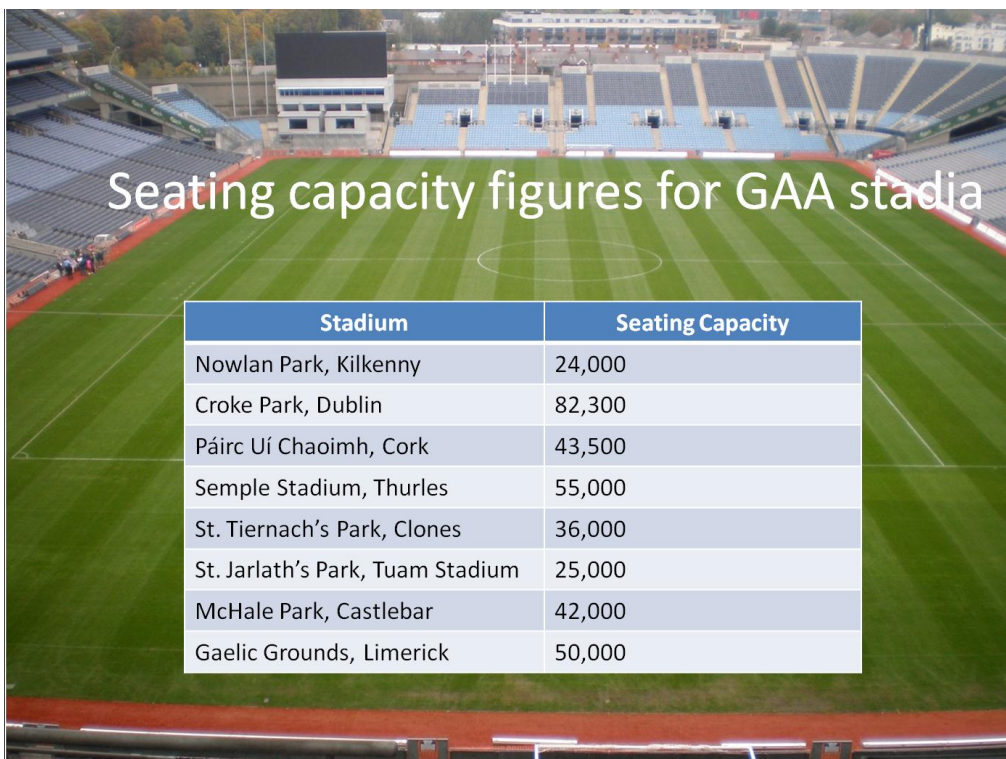
Do you notice any pattern in the solutions?

Could be applied to rugby (try, conversion, penalty)



Seating capacity figures for GAA stadia

| Stadium | Seating Capacity |
|----------------------------------|------------------|
| Nowlan Park, Kilkenny | 24,000 |
| Croke Park, Dublin | 82,300 |
| Páirc Uí Chaoimh, Cork | 43,500 |
| Semple Stadium, Thurles | 55,000 |
| St. Tiernach's Park, Clones | 36,000 |
| St. Jarlath's Park, Tuam Stadium | 25,000 |
| McHale Park, Castlebar | 42,000 |
| Gaelic Grounds, Limerick | 50,000 |



(a) Write out these venues in order of seating capacity starting with the stadium with the highest capacity. Read out your list for the boy or girl sitting beside you and see if they are the same.

(b) If a match in Nowlan Park, Kilkenny took place when the stadium was filled to $\frac{2}{3}$ of its capacity, how many spectators were present?

(c) If Páirc Uí Chaoimh were filled to 50% of its seating capacity, how many spectators would there be?

(d) Write a number that is between the seating capacities of Nowlan Park and Tuam Stadium?

(e) If Semple Stadium were filled with adults and children in the ratio of 4 to 1, how many children were present?

(f) For the same game, if tickets cost €19 for adults and children were admitted free, how much money was collected on the gate?

Marking your opponent



In most Gaelic games each player tries to “mark” the corresponding player during a game. E.g. a full back marks a full forward. If every player marks their corresponding player, and if each player is wearing the correct jersey, what will be the sum of the numbers on each pair’s jerseys?

Shapes, lines and angles on the pitch

What shape is a Gaelic games pitch?

What word describes the line that is formed by the cross bar on the goal?

What words describes the line that is formed by one goal post?

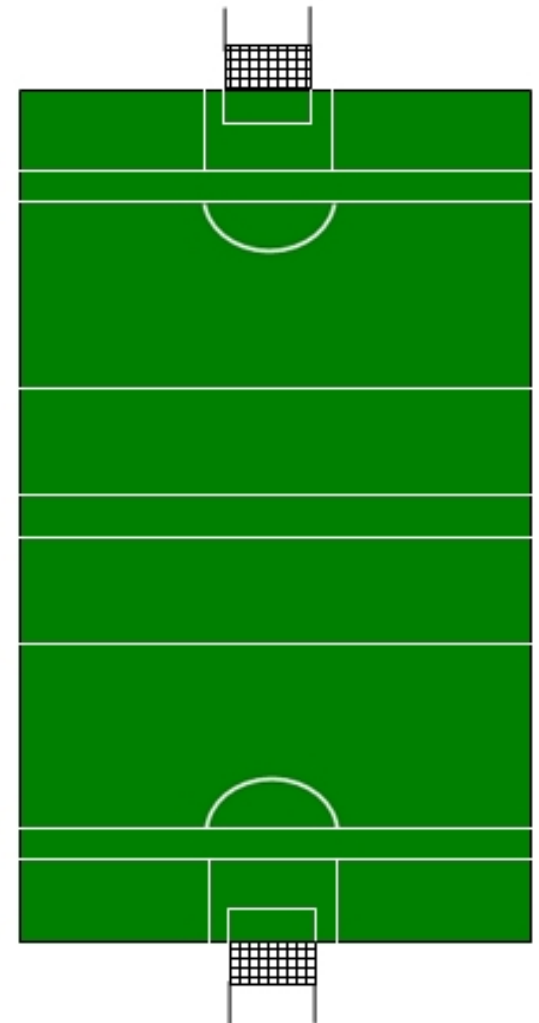
How would you describe the relationship between the two goal posts?

How would you describe the relationship between the one goal post and the cross bar?

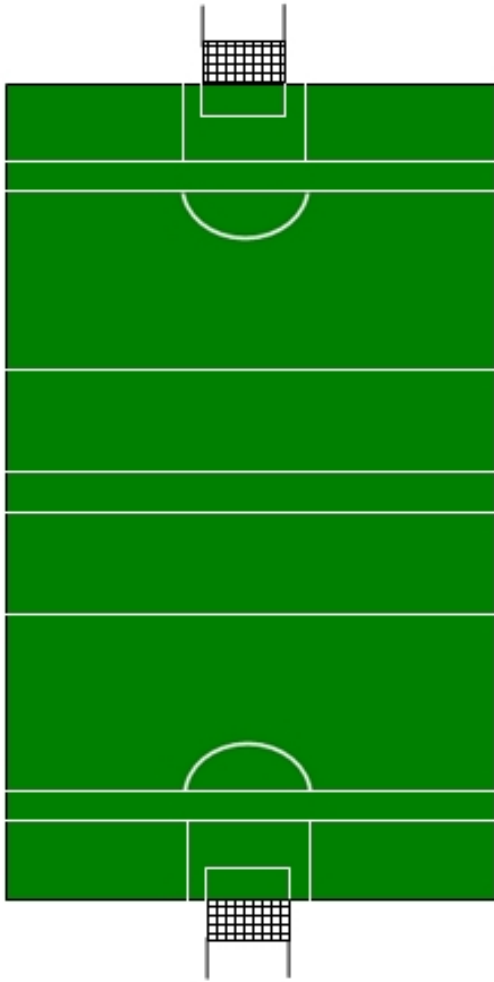
What angles can you recognise in the goal post?

Do the goal posts have line symmetry?

Does any other shape at a sports stadium have line symmetry?



Measuring in Gaelic Games



If the dimensions of a Gaelic games pitch are 137m long and 82 m wide, what is the area of the pitch?

What is the perimeter?

What are the dimensions of your school pitch? Is its area larger or smaller than the pitch described above?

A game consists of two halves of 35 minutes each and a 10-minute interval. If a game begins at 15:30, at what time should it end?

The centenary of the first public camogie match took place in 2004. In what year was the first camogie match played? In what century was that?

The first hurling All-Ireland was played in 1887. One was held every year since then, except in 1888. How many all-Ireland hurling finals have been played to date?

An Sliotar



Hold a sliotar.

Estimate what it weighs in grams.

Check your estimate.

The rules specify that it should weigh between 100g and 300g. Does the sliotar you're holding meet the requirements of the rules?

Name a sports ball that is heavier than or lighter than this?

Data

Display the information on a bar chart.



Statistics of all-Ireland hurling final winners

| | |
|-----------|------|
| Kilkenny | (33) |
| Cork | (30) |
| Tipperary | (26) |
| Limerick | (7) |
| Dublin | (6) |
| Wexford | (6) |
| Galway | (4) |
| Offaly | (4) |
| Clare | (3) |
| Waterford | (2) |
| Kerry | (1) |
| Laois | (1) |
| London | (1) |

What fraction of the finals have been won by Cork? What is this as a percentage?

What fraction of counties in the Republic have never won an all-Ireland hurling final? What is this as a percentage?

Given the above statistics, which of the following words: likely, unlikely, possible, impossible, even chance, best describe the chances of the following teams winning this year's all-Ireland hurling final?

Cork, Laois, Offaly, Kilkenny, Kerry, your county

League Tables

| DIVISION TWO GROUP C | PLD | W | D | L | GF | GA | GD | PTS |
|------------------------------|-----|---|---|---|----|----|-----|-----|
| Cork IT 'B' | 5 | 4 | 0 | 1 | 19 | 7 | 12 | 12 |
| IT Carlow 'C' | 5 | 3 | 1 | 1 | 26 | 12 | 14 | 10 |
| IT Tralee 'B' | 5 | 3 | 1 | 1 | 25 | 14 | 11 | 10 |
| LIT-Tipperary | 5 | 2 | 1 | 2 | 13 | 13 | 0 | 7 |
| IT Carlow - Wexford | 5 | 1 | 1 | 3 | 10 | 20 | -10 | 4 |
| St Patrick's College, Carlow | 5 | 0 | 0 | 5 | 8 | 35 | -27 | 0 |

Do you use league tables in PE games lessons?

Suggest some maths questions that could be asked in relation to the table above:

e.g. how many points for a win, a draw? Justify your answer

For slides

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Further Reading

- About integration:

http://www.smallschoolsproject.org/PDFS/Planning_Resources/summer2003/summer2003-integrating.pdf

- About maths and games

<http://sport.maths.org/content/>

<http://nrich.maths.org/thismonth/all/2011/06>

Images in presentation taken from the following sites

- http://www.oppictures.com/singleimages/400/CSITC9SET_1_1.JPG
- http://www.tts-group.co.uk/_rmvirtual/media/tts/images/legacy/KQUOIT.jpg
- http://www.mcsport.ie/product_images/lea053_M.jpg
- http://www.mcsport.ie/product_images/P-TUFPE14564MK8K_S.jpg
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- <http://guides.machinescience.org/file.php/29/IP/Stopwatch.gif>
- <http://image.made-in-china.com/4f0j00PMqaJculhGps/Mixed-Plastic-Racetrack-Running-Track-.jpg>
- http://gaa.ie/content/images/news/cork/Scoreboard_vLaois.jpg
- http://www.independent.ie/multimedia/archive/00938/tipp_2_938047t.jpg
- <http://www.fslelectronics.com/images/images/scoreboardsanddisplays/gaa21.jpg>
- http://www.inpho.ie/cache/inpho/b4/de/c1/13d4e5a667a4b40dd157997d98ae45bfad0e97ec8b/INPHO_00327324.jpg
- <http://mayogaablog.com/wp-content/uploads/2011/02/Scoreboard.jpg>
- <http://news.google.com/newspapers?nid=2245&dat=19531203&id=rG0zAAAAIBAJ&sjid=ye4HAAAAIBAJ&pg=5207,3105720>
- <http://alexandracollege.eu/wp-content/uploads/2009/10/Towards-Hill-16-P-%C3%A1irc-an-Chr%C3%B3caigh-0101.jpg>
- http://upload.wikimedia.org/wikipedia/commons/2/2c/Gaelic_football_pitch_diagram.jpg
- http://www.apieceofblarney.com/blog/wp-content/uploads/2011/09/gaelic_football.jpg
- <http://www.lit.ie/Sports/images1/league%20table.jpg>
- <http://www.hurling.be/images/sliotar.jpg>
- <http://enviromineinc.com/Resources/img/calculator.jpg>