

Lesson Research Proposal for 2nd Years – Graphing Data

For the lesson on 06/02/2018
At Presentation Secondary School, Ms Foley's class
Instructor: Ms Caroline Foley
Lesson plan developed by: Maureen McAdam, Caroline Foley

1. Title of the Lesson: Top of the Vlogs!

2. Brief description of the lesson

In this lesson students will try to present two sets of data in graphic form and will learn that representing some types of information does not have a single solution, i.e. there are more ways to present data than using bar charts!!!

3. Research Theme

At our School, we want

- (a) our students to enjoy their learning are motivated to learn and expect to achieve as learners,
- (b) and our teachers to work together to devise learning opportunities for students across and beyond the community.

To achieve these outcomes teachers in the mathematics department will plan learning experiences together using problem solving to develop the mathematical skills of the students at their own pace.

We live in a visual world and our students are constantly viewing data which compares two or more data sets for them to decide which product to buy or even which football player is the most effective on the field etc...

Students access social media in ever increasing numbers and social media bloggers are part of their everyday life. In presenting them with “views” of two vloggers over a two week period we hope to present them with a learning opportunity which brings their understanding of statistics beyond the maths classroom.

In the both Primary School and in the JC common introductory course the students have learned methods of presenting single sets of data.

In this lesson the aim is for the students to choose

- (i) a suitable visual method to present two sets of data at the same time for analysis.
- (ii) to decide on viewing the different visual presentations which is most suitable for the data sets with which they have been presented.

Our long term learning goal is for students to

- (i) appreciate that statistics exists in their everyday life.
- (ii) appreciate that the presentation of two or more sets of data in visual form affects how we can make choices regarding the subject of the data.
- (iii) acknowledge how Mathematics can be an effective method to communicate information (Key skill Communicating and working with others).
- (iv) be aware that there are equally valid ways of presenting data....

At the end of a lesson students will use “two Stars and a Wish”, to feedback to the teacher

- two aspects of the lesson that went well for them (they have confidence in these)
- one thing they would like to learn more about.

In using this feedback mechanism, the teacher aims to

- focus the student’s attention on the positive learning outcomes for them in the lesson
- have students identify an aspect on which they need to do some more learning.

4. Background & Rationale

(a) In both Primary school and in the Common Introductory Course, covered in 1st Year, students have been dealing with single data sets and representing the data given.

In 2nd Year students should be able to develop these skills further to include two or more sets of data. This lesson is aimed at 2nd Year students.

In an increasingly visual world we are constantly bombarded with images. We have learned to develop our opinions and ideas from these images. Students will be asked to present two sets of data. They will decide which display is best for visual effect and which is best for analysis.

(b) We as practicing maths teachers have found that the students do not automatically recognise that there are more ways than the BAR Chart to present data and that when comparing sets of data they are inclined to draw separate graphs.

5. Relationship of the Unit to the Syllabus

Related prior learning Outcomes	Learning outcomes for this unit	Related later learning outcomes
<p>In 5th class Primary the child should be enabled to</p> <ul style="list-style-type: none"> • collect, organise and represent data using pictograms, single and multiple bar charts and simple pie charts, • read and interpret pictograms, single and multiple bar charts, and pie charts, • use data sets to solve problems. <p>In 6th class Primary the child should be enabled to</p> <ul style="list-style-type: none"> • collect, organise and represent data using pie charts and trend graphs, • read and interpret pie charts and trend graphs, • use data sets to solve problems, • compile and use simple data sets, 	<p>In second year, students learn about methods of representing data. Students develop a sense that data can convey information and that organising data in different ways can help clarify what the data have to tell us. Students should be able to</p> <ul style="list-style-type: none"> • select appropriate methods to represent and describe the sample (univariate data only) • evaluate the effectiveness of different displays in representing the findings of a statistical investigation conducted by others • use pie charts, bar charts, line plots, histograms (equal intervals), stem and leaf plots and back-to-back stem 	<p>Students working at OL Leaving Cert should be able to</p> <ul style="list-style-type: none"> • describe the sample (both univariate and bivariate data) by selecting appropriate graphical or numerical methods • explore the distribution of data, including concepts of symmetry and skewness • compare data sets using appropriate displays including back-to-back stem and leaf plots • determine the relationship between variables using scatterplots • recognise that correlation is a value from -1 to +1 and that it measures the extent of the linear relationship between two variables

<ul style="list-style-type: none"> • explore and calculate averages of simple data sets. <p>The common course is intended to be covered by all students in 1st year of Post-Primary school. The student should be able to</p> <ul style="list-style-type: none"> • to pose a question and reflect on the question in the light of data collected • plan an investigation involving statistics • select a sample and appreciate the importance of representativeness so as to avoid biased samples • design a plan to collect data on the basis of above knowledge • collect the data according to the plan • select appropriate graphical or numerical methods to describe the sample (univariate data only) • use stem and leaf plots, line plots and bar charts to display data 	<ul style="list-style-type: none"> • and leaf plots to display data • use appropriate graphical displays to compare data sets 	<ul style="list-style-type: none"> • match correlation coefficient values to appropriate scatterplots • understand that correlation does not imply causality <p>In addition, students working at HL should be able to graphically</p> <ul style="list-style-type: none"> • analyse plots of the data to explain differences in measures of centre and spread • draw the line of best fit by eye • make predictions based on the line of best fit • calculate the correlation coefficient by calculator
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6. Goals of the Unit

- (a) Students will understand the different types of data and recognise each
- (b) Students will understand the different methods of collecting data and relate the issue of bias to this
- (c) Students will understand that there are numerous ways of representing data
- (d) Students will apply this understanding in picking the most appropriate way of representing this data
- (e) Students will apply their knowledge and evaluate the effectiveness of each method
- (f) Students will understand the characteristics of each method and use this to conduct numerical analysis of the data

7. The Unit Plan

Lesson	Learning goal(s) and tasks
1.	Introduction and review prior knowledge in relation to the types of data
2.	Review the methods of data collection and the importance of bias
3. The Research Lesson.	Represent comparable data in as many ways as possible and compare and evaluate the various graphical ways to represent data and determine their effectiveness
5.	Introduce the methods of numerical analysis: mean, median and mode (central tendency)
6.	Continue from lesson 5 to reinforce the analysis
7.	Introduce the methods of analysis focusing on variability: range, quartile, interquartile
8.	Review lesson 6. Introduce outliers
9.	Recap entire section

8. Goals of the Research Lesson:

a) Mathematical Goals

Students will:

- understand the various methods used to represent data.
- understand which method is the most appropriate for the data.
- use appropriate graphical displays to compare data sets.
- evaluate the effectiveness both visually and analytically of the different displays of data.

b) Key Skills & Statements of Learning

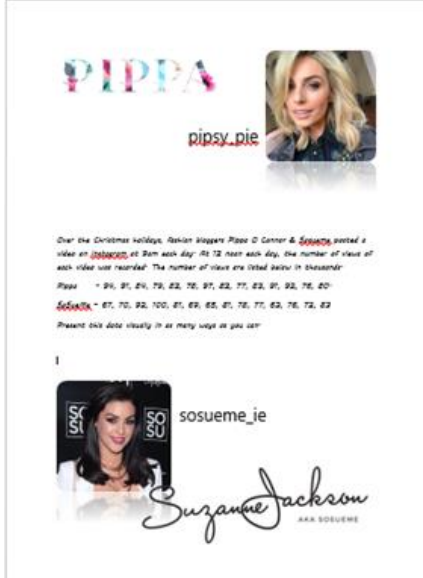
In the planning and design of this lesson the Junior Cycle Key Skills and Statements of Learning have been considered. This lesson will implement and promote JC Key Skills in the following ways:

1. Being Literate: Students will have the opportunity to express their ideas clearly and accurately.
2. Being Numerate: It will develop a positive disposition towards representing data.
3. Managing Myself: Student's will have the opportunity to reflect on their own learning.
4. Staying Well: Students' confidence and positive disposition to learning will be promoted.
5. Communicating: Students will present and discuss their mathematical thinking.
6. Being Creative: Students' will explore options and alternatives as they learn creatively.
7. Working with Others: Students will learn with and from each other.
8. Managing information and thinking: Students will be encouraged to think creatively and critically while organising and evaluating data.

This lesson is also designed to meet the following JC Statements of Learning in particular:

1. The student communicates effectively using a variety of means in a range of contexts.
15. The student recognises the potential uses of mathematical knowledge, skills and understanding in all areas of learning.
16. The students describes, illustrates, interprets, predicts and explains patterns and relationships.
18. The student observes and evaluates empirical events and processes and draws valid deductions and conclusions.

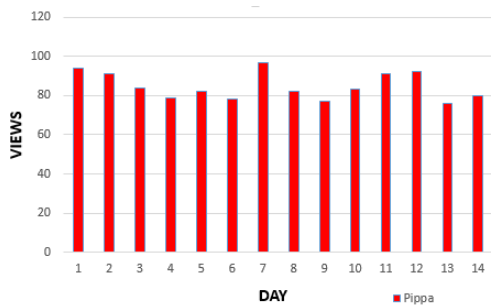
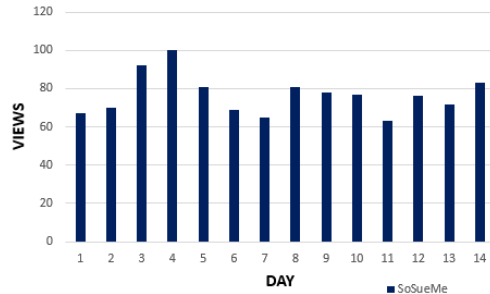
9. Flow of the Research Lesson:

Steps, Learning Activities Teacher's Questions and Expected Student Reactions	Teacher Support	Assessment
<p>Introduction</p> <p>Today we are going to use our mathematical knowledge to solve a problem. We're going to try to solve the problem by ourselves and then we're going to come together as a class and use all your knowledge to learn something new...</p>		<p>Are students motivated?</p>
<p>Posing the Task</p> <p>Over the Christmas holidays, fashion bloggers Pippa O Connor & Sosueme posted a video on Instagram at 9am each day. At 12 noon each day, the number of views of each video was recorded. The number of views are listed below in thousands.</p> <p>Pippa - 94, 91, 84, 79, 82, 78, 97, 82, 77, 83, 91, 92, 76, 80.</p> <p>SoSueMe - 67, 70, 92, 100, 81, 69, 65, 81, 78, 77, 63, 76, 72, 83</p> <p>Present this data visually in as many ways as you can.</p> <p>Clarifying the problem:</p> <p>Data is to be presented on a daily basis not as a total over the two weeks.</p>	<p>Present on the board an illustration to make the meaning of the problem easier to understand.</p>  <p>Have this visual available for students and A3 boxed paper for answers.</p>	<p>Do students understand the task?</p> <p>Are students eager to solve the problem?</p> <p>Does the task need clarifying?</p> <p>Do students understand that they should graph the figures in a way that makes it easy to compare all the data, i.e. both sets on one graph?</p>

Student Individual Work

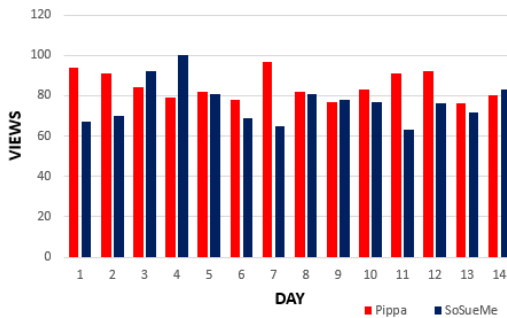
Student Response 1: Bar Chart

The students graph both sets of data on individual charts.



Student Response 2: Bar Chart

The students graph both sets of data side by side on one graph.



Students Response 3: Line Plot

The students graph both sets of data on individual charts.

As one makes class rounds look for good examples of the various methods- bar chart, line plot, pie chart, stem and leaf. Use your seating chart to record the approach used by each student. Note the order in which you will call up each student up to the board during Ceardaíocht.

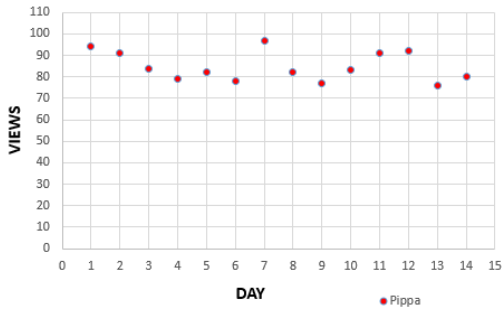
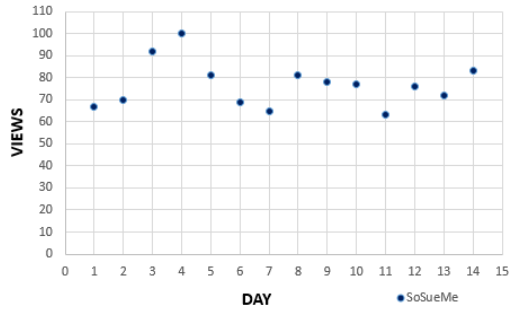
Are students able to tackle the problem?

You might ask the students who have drawn individual graphs: “is there any way of designing this graph to make it easier to compare the data?” or “Will it be easy to compare the number of view each got with one look at your graph?”

Can students convert the numerical summary into a graphically summary and think about it?

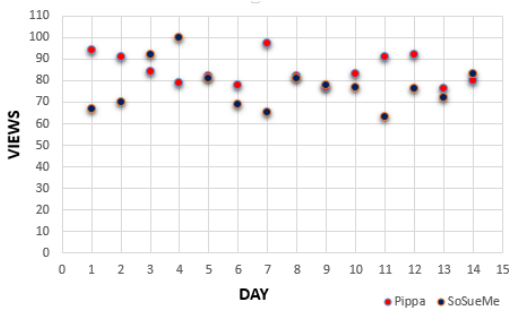
You might ask the students who have completed one graph: “Can you think of another way that you could use to graph the data?”

Do students notice that there are more than one solution to the task?



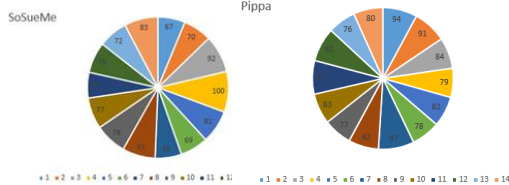
Students Response 4: Line Plot

The students graph both sets of data side by side on one graph.



Student Response 5: Pie Chart

The students graph both sets of data on individual charts.



Student Response 6: Pie Chart?

The students attempt to graph both sets of data side by side on one pie chart.

Is there a problem with the pie charts?

What is the problem?

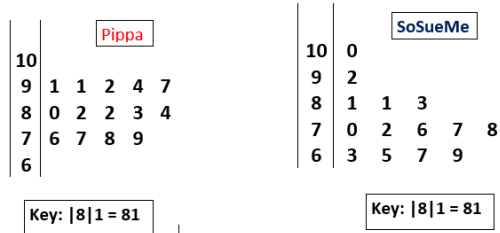
Do students notice that there is a problem with the pie chart?

Can they explain why?

Student Response 7: Stem and Leaf

The students graph both sets of data on individual charts.

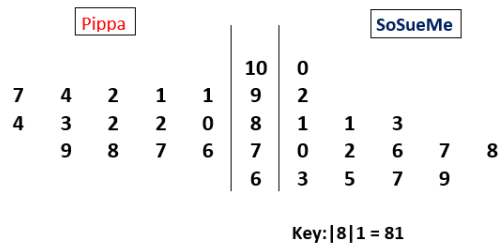
Stem & Leaf



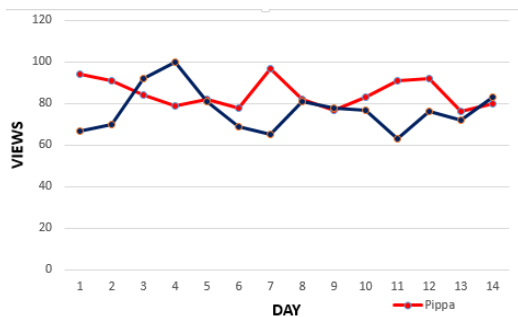
Student Response 8: Stem and Leaf

The students graph both sets of data side by side on one graph.

Back to Back Stem & Leaf



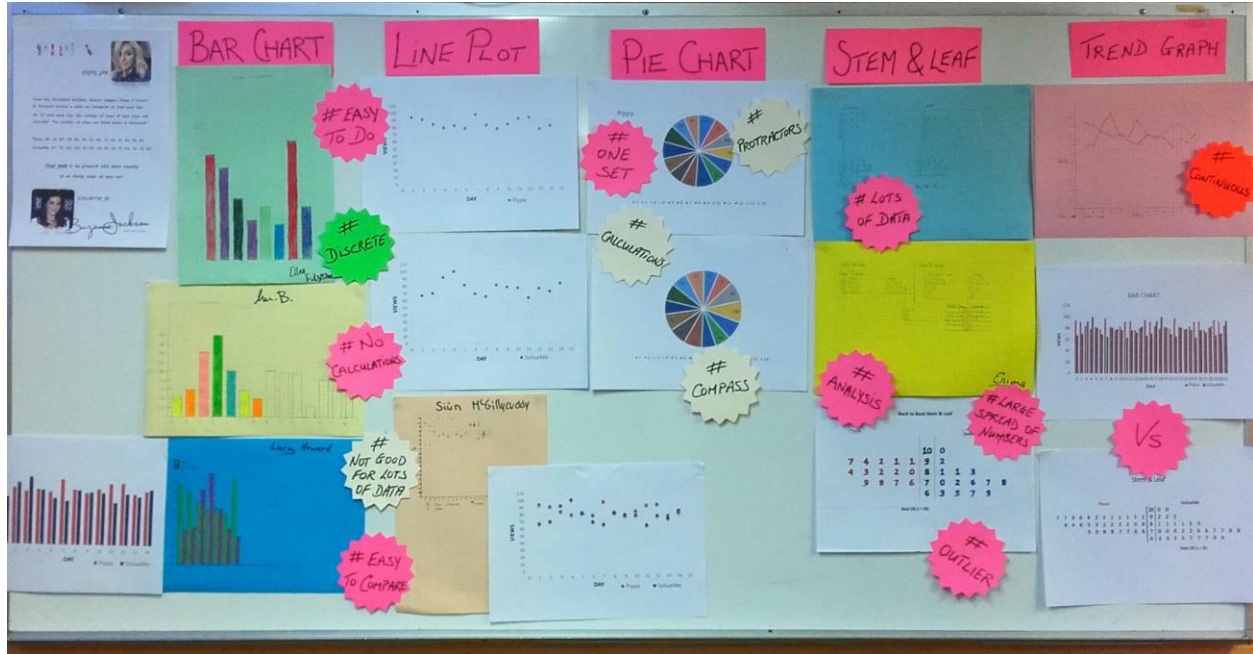
Student Response 9: Trend Graph



Can the students understand that it is not actually correct to represent the problem as a trend graph?

<p>Ceardaíocht /Comparing and Discussing</p> <p><u>Response 1:</u> Bar Chart</p> <p><u>Response 2:</u> Bar Chart</p> <p><u>Response 3:</u> Line Plot</p> <p><u>Response 4:</u> Line Plot</p> <p><u>Response 5:</u> Pie Chart</p> <p><u>Response 6:</u> Pie Chart</p> <p><u>Response 7:</u> Stem and Leaf</p> <p><u>Response 8:</u> Stem and Leaf</p> <p><u>Response 9:</u> Trend Graph</p>	<p>Response 1: Please raise your hands if you used this method, or if you would like to use this method. Why? How many of you are there? Is this a good method? Why (not)?</p> <p>Can you make an abridged version?</p> <p>Response 2: Is this better or worse? Why?</p> <p>Response 3: Same as Response 1.</p> <p>Response 4: Same as Response 2.</p> <p>Response 5: Same as Response 1.</p> <p>Response 6: Same as Response 2. Is there a problem with the pie charts? What is the problem?</p> <p>Response 7: Same as Response 2.</p> <p>Response 8: Same as Response 2.</p> <p>Response 9: Same as Response 2. Is there a problem with the trend graph? What is the problem?</p> <p>In the event that <u>no students used a particular graph to present the data</u> begin a discussion: “Let’s think about whether the data can be represented on a single graph that makes it easier to compare.”</p>	<p>Can students explain their chosen graph?</p> <p>Are students defending their ideas?</p> <p>Are they responding to each other’s ideas?”</p> <p>Have students inputted all values in order to help them think about the solution more concretely.</p>
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10. Board Plan



11. Evaluation

Evidence collected during the lesson would be way of

- observation and photographing of the students' work, collaboration with others, and the board,
- observation of participation and discussion,
- student reflection.

During the lesson the team had hoped to observe students producing a variety of suitable graphs to represent and compare the data. We had hoped that the students would actively participate in a discussion on, and thereby gain and understanding of, which would be the most appropriate graphical displays to compare data sets by evaluating the effectiveness both visually and analytically of the different displays of data.

At the end of a lesson students will use "two Stars and a Wish", to feedback to the teacher

- two aspects of the lesson that went well for them (they have confidence in these)
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In using this feedback mechanism, the teacher aims to

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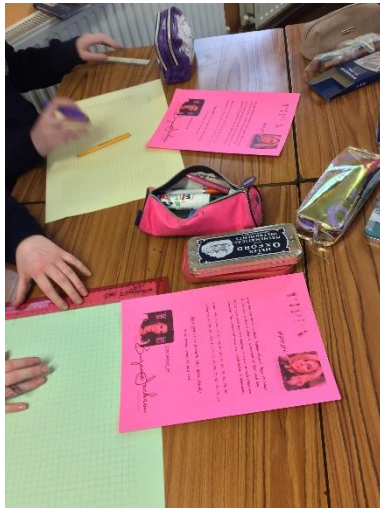
12. Reflection

What the team had hoped or expected to observe during the lesson.

- Student interacting with each other while working on the task.
- Enthusiasm for the task in hand.
- Students producing graphs of the data supplied.
- Presenting their graphs and explaining why they choose them.
- Reticence in sharing their work.
- That it would not descend into a melee...

What the team actually observed during the lesson by the team members

Students discussing the task, deciding which students would do which tasks.



“It was great to see some girls show leadership skills and take charge of their group & what graphs etc. they used to show their data.”

“Students engaging in the task with enthusiasm. I was very impressed with the work ethic of all 30 girls. There was lots of talking & questioning within the groups as they got busy! Others chatted about the spacing they would use for their bar charts!”

“I loved the way they collaborated, instead of the room becoming a noisy melee it was like a great symphony of energy and learning. During Ceardaíocht the students were enthusiastic in responding and in giving their answers.”

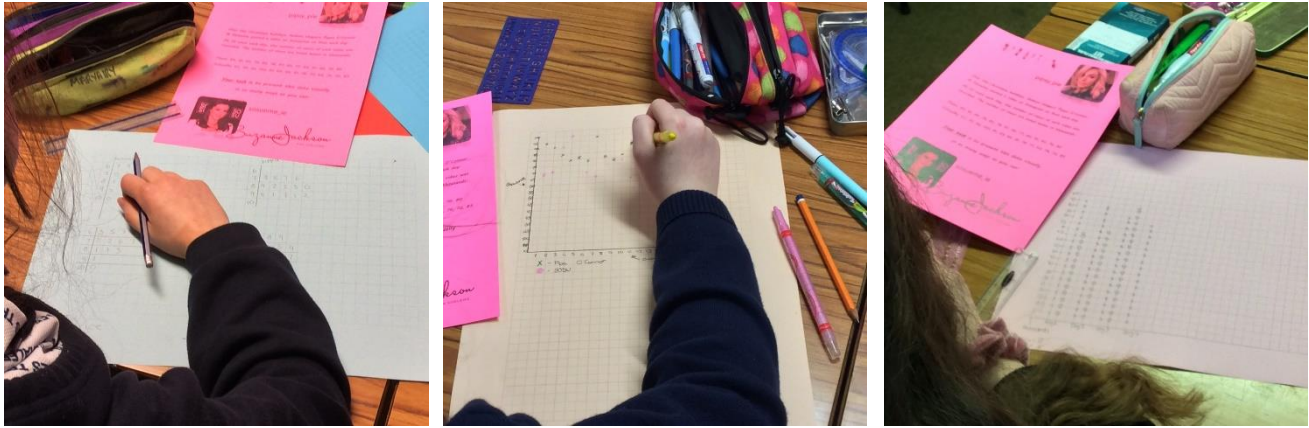
Students happy to present their graphs on the board and explain why they had chosen that particular graph.



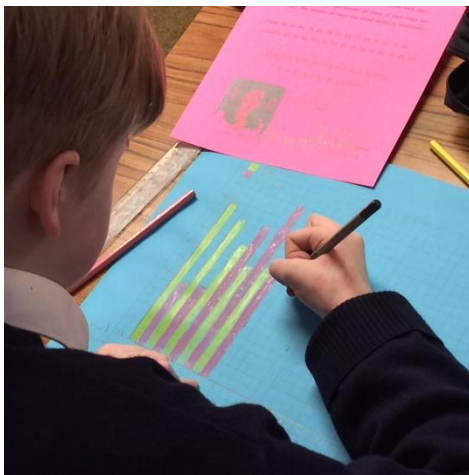
“During Ceardaíocht, all students got involved. They seemed to enjoy putting up their work on the board, signing it and answering my questions.”

Every student made some effort to present the data in graphic form.

“I feel they learned that there is more to statistics than just a bar chart!”



Major points raised during the post-lesson discussion, and the team’s own opinions.



Time was effectively used, but ten minutes was not enough for students to complete their bar charts. However, it was adequate time for stem and leaf, line plots and the trend graph.

“There were possibly too many data points for the students to graph in the 10 minutes given.”

Perhaps we could have used a smaller set of data, i.e. seven days instead of fourteen, which would have enabled bar charts to be completed in the allotted time.

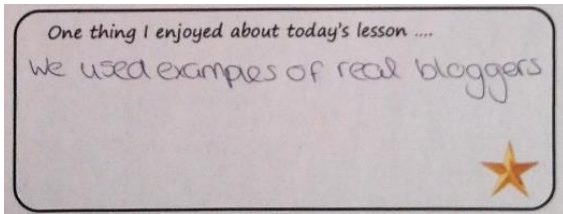
The twenty minutes Ceardaíocht promoted students’ thinking and learning by their discussion on each of the presentations and the “#” summarising.

The teacher did not deviate from plan, and from the observers point of view it flowed coherently.

The activities supported achieving the goal.



"I think the "#" idea was very age appropriate. At first it got a few giggles but then it really grew in momentum and they were eager to contribute."



Using real Vloggers whom the students were aware of and the simple idea of printing the task on pink paper got the students engaged straightaway.

What did students learn? What data do we have about whether students learned this?

It was felt that the goals of the lesson were achieved, the particular keys skills implemented and promoted, and the JC Statements of Learning met.



No Pie Chart was attempted, which was initially disappointing for the team, but the girls' reasons were that pie charts were "too difficult", "had too many calculations", and "couldn't compare the data with them." Impressed the team they did! Two pie charts had been prepared by the team and the students used these in discussion on how they could not be used to compare these two sets of data.

Three trend graphs appeared and discussion ensued as to why they should not be used in this task. Phrases such as "continuous" and "discrete", "categorical" and "numerical" were voiced.



"I really believe that all students learned something from today's lesson and will benefit from it."

One thing I learned today

Different methods of visually representing data

One thing I learned today

Different ways to represent data and when + how to use them

One thing I learned today

I learned that you can put
stem and leaf diagrams
together

One thing I learned today

THAT STEM AND LEAF
DIAGRAMS ARE GREAT FOR
ANALYSIS

One thing I learned today

There is more ways to compare
information than by using
bar charts

PIPPA

pipsy_pie



Over the Christmas holidays, fashion vloggers Pippa O'Connor & Sosueme posted a video on Instagram at 9am each day. At 12 noon each day, the number of views of each video was recorded. The number of views are listed below in thousands.

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SoSueMe: 67, 70, 92, 100, 81, 69, 65, 81, 78, 77, 63, 76, 72, 83

Your task is to present this data visually in as many ways as you can.



sosueme_ie

Suzanne Jackson
AKA SOSUEME

Reflecting on my Learning

Student:

One thing I learned today



One thing I enjoyed about today's lesson



I would like to learn more about ...

