

Counting Creatures: Exploring Data with Infants

In the March Issue of Intouch (#125) we presented the **PPDAC cycle**. The PPDAC cycle is a structure which engages children in exploring data by becoming *data detectives*. A printable PDF image of the PPDAC cycle can be found on the online version of this 'Counting Creatures' paper. Here, we are going to share the details of a data investigation, using the PPDAC cycle as a structure, taught in two senior infant classrooms in Limerick city.

Step 1: Problem (formulating a question)

We wanted young children to see data investigation as a means to solving a problem. We selected a driving question that generated curiosity and motivated children to want to collect data. The question was presented in the form of a letter read to the children by the teacher:

*Dear Senior Infants, I have a lovely story that I want to surprise the Junior Infant Class with but I am in a bit of a pickle. I am going to buy one puppet for the story but I can't decide which one. I was wondering if you could listen to the story and help me decide. Thank You,
Junior Infant Teacher*

It was necessary to discuss the problem with the class to ensure they understood what was required of them i.e. they needed to help the junior infant teacher choose a puppet to buy. They were encouraged to make suggestions as to how this problem might be solved. Children were told that they would have to collect information about the story in order to make a decision.

Step 2: Plan (planning the procedures used to collect the data)

As young children are inexperienced in collecting and recording data, they needed opportunities to practice collecting and recording data using informal tallying prior to introducing the story. Rather than teach formal tallying, our purpose was to facilitate children in using tallying approaches that felt natural to them. You could engage children in collecting data on any number of topics such as tallying the colour of cars in the school car park or the appearance of a word in a song/poem that is read aloud. In our lessons, children tallied the number of times the puppet appeared out of a box by making a mark, of their choice, on a piece of paper each time the puppet appeared (some children drew check marks, others drew circles and some wrote counting numbers). Children then counted up their marks and discussed the total number of times the puppet appeared.

Step 3: Data (the data collection process)

We created the story 'Green Monster Explores the Jungle' (you could use any story that has illustrations) for the purpose of the lessons. The story was presented as a slideshow using a data projector (or you could use a large book). The teacher discussed the cover page and the characters, author, illustrations, etc. with the children (image 1). The children were then asked which character's puppet they think the Junior Infant Teacher should buy and the reason for their decision. Before proceeding with the story tell the children that you forgot an important part of the letter!

P.S. I would really like to buy a puppet for the character that appears the most.



Image 1: teacher reads the story

The children were informed that they were going to solve the problem by finding out which character came up the most. Children were arranged in groups of 5 as there were 5 characters in the story (Blue Bird, Black Bug, Brown Bear, Green Monster and Red Rhino). Each child in a group was assigned a character and given a special tallying sheet for their allocated character. The teacher re-read the story and each child had to keep a record of how many times their character appeared. Very clear instructions were given e.g. *'Whatever animal is at the top of your sheet, you must watch out for him in the story. Every time you see him you will make a mark (a line, a circle, etc.)'* Children were reminded of the character they had to keep track of through instructions such as *'Hands up who is looking for Green Monster'*. The story was read slowly by the teacher while children kept a tally of their respective animals. Conceptually, children had no difficulty understanding the task i.e. they had to keep track of the appearance of animals. Any problems we encountered were procedural in nature i.e. missing the appearance of an animal due to not looking at the white board etc. Images 2 and 3 illustrate different (but correct) approaches to tallying used by two senior infant children.

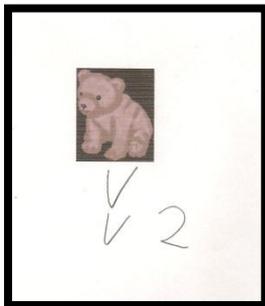


Image 2: Check marks to tally

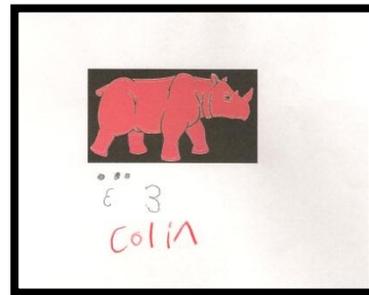


Image 3: Check marks to tally

Step 4: Analysis (the summaries and analyses of the data)

Data were summarized by constructing concrete graphs (in small groups) and a pictogram (as a whole class). While graph construction is important, the skills required are generally lower order reasoning and procedural skills. Hence we were careful to allocate sufficient time to develop higher order thinking, reasoning, and literacy skills through engagement in data analysis.

(a) Making concrete graphs

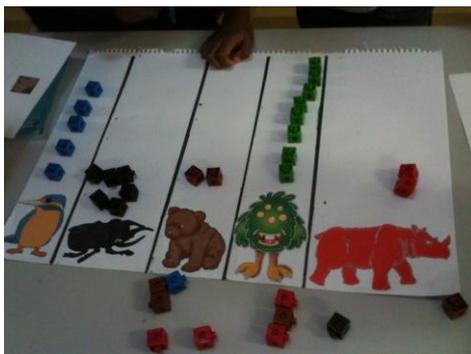
As each child in a group was given a different character, each group was encouraged to work together to represent (using cubes) the number of times each of the various characters appeared in the story (image 4). Each group was provided with chart paper on which the categories (i.e. 5 creatures) were prepared in advance. Groups used different methods to construct graphs. Some groups placed a loose

collection of cubes above the corresponding category (image 5). Others made towers which were either placed flat on the chart or 'standing up' (image 6). We briefly discussed the number of different graphs and emphasized that they all, while looking different, provided an accurate 'picture' of the collected data for that group.

If you find in your class that each group has different counts for the various creatures, you may choose to re-read the story and complete a whole class tallying activity. Alternatively you may wish to let children work with the data they have collected at this stage in order to facilitate dialogue, discovery learning and address the variation in tallies prior to creating the whole class pictogram.



Image 4: Children constructing a concrete graph



Images 5 and 6: Graphs constructed by groups

(b) Making a pictogram

Subsequently, a whole class pictogram of the data was constructed (image 7). The pictogram was displayed on the white board and was used to facilitate analysis of the data through whole class questioning.

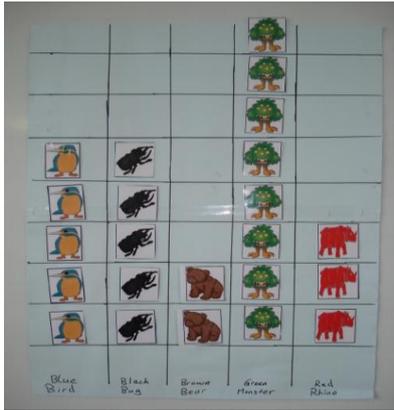


Image 7: Pictogram depicting the occurrence of creatures in the story

Data were analysed based on observation of the pictogram (displayed on the white board). Emphasis was placed on developing children's graphical literacy and reasoning skills by posing a series of questions designed to address skills in each of the following categories:

Category 1 questions: Reading the data.

These are the simplest type of question which requires the child to read information directly off the graph.

Which character appeared the most? How do you know?

Which character appeared the least? How do you know?

How many times did Blue Bird/Black Bug/Brown Bear/Green Monster/Red Rhino appear?

Did any characters appear the same amount of times? How do you know?

Category 2 questions: Reading between the data.

These questions are more complex and require the child to interpret the graph. The answer will take one step to solve and usually involves the addition, subtraction or comparison of data.

How many characters are there altogether?

How many more times did Black Bug appear than Brown Bear?

How many more times did Blue Bird appear than Red Rhino?

If the teacher had enough money to buy two puppets which two should s/he buy?

Category 3 questions: Reading beyond the data

These questions require the children to extend, predict or infer from the data. While this reasoning is quite complex, when motivated by an interesting investigation children are quite good at making accurate predictions based on their sample.

How many more times would red rhino have to come up to beat Green Monster?

If we had lost one page of the story and then found it, which animals do you think would appear on the page? Why?

Children were very able to answer the category 1 and 2 questions and, as expected, were challenged (appropriately) by category 3 questions. We notice particular problems for some children in understanding the phrase 'how many more' and found that using the term 'extra' presented considerably less difficulty.

Step 5: Conclusion (the conclusions about what has been learned)

Children's conclusions should relate back to their original question. We asked

Which puppet should the Junior Infant teacher buy? Why?

The conclusion was also used to restate the questions, outline the data collection method, and describe the outcomes from the analysis. To support this, the junior infant teacher (in one school) and the school principal (in the other school) came into the class and asked the children to explain what they did to come to their conclusion to buy the Green Monster puppet. The children were quite excited and very enthusiastic to describe their data investigation.

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