HOW WE TEACH NUMBER PATTERNS IN A LESS RESOURCED GRADE 10 CLASS

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INTRODUCTION

In our presentation we are going to show how we taught linear number patterns in a way that connects number patterns with graphs, functions and tabular representations. Our view is that through the study of patterns of change, they can get a more meaningful understanding for such characteristics as slopes, intercepts, equation of a line, etc.

WHY NUMBER PATTERNS?

Within the new CAPS documents patterns are at the core of what constitutes mathematics. Mathematics itself is defined as "a human activity that involves observing, representing and investigating patterns and qualitative relationships in physical and social phenomena and between mathematical objects themselves".

With specific reference to number patterns, the new CAPS document expects learners to:

- Investigate number patterns leading to those where there is constant difference between consecutive terms, and the general term is therefore linear.

WHAT DID WE DO DIFFERENTLY?

In the traditional approach to number patterns, learners are usually presented with what we may describe as a 'contrived situation' in which to study number patterns. For example learners might be given a number sequence such as 3, 7, 11, 15 … and asked to complete the sequence, find the difference between the consecutive terms, etc and get 'told' that if there is a constant difference between the consecutive numbers in the sequence then the pattern is linear. In our view, such kind of teaching does not empower the learners in terms of making connections and improving their problem solving skills. The result is that learners usually learn by rote the characteristic features of these different number patterns yet there are so many real-world contexts or simulations where learners can investigate, observe and generate their own number sequences. This in our view would enable learners to make more sense of these number patterns.

In this lesson, students work with number pattern situations involving tasks from a real-world context. Our activities link several aspects of algebra in that a real-world simulation is presented, the relationships between variables are explored in depth and learners are called upon to combine and apply different aspects of their algebra knowledge and skills. Consistent with one of the general aims of the CAPS document, in this lesson we intend to enable learners to *collect* data from a given scenario on plant

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growth, *organise* it into tables, *analyse* it to see if there are any patterns that emerge, *critically evaluate* the information in order to *generate* formulae that can help them to plot the information on a graph and make predictions about further growth of the plant.

In this way learners can study the concept of constant difference in context, they can see the connections between the numerical, algebraic, graphical, and tabular representations of such information. We therefore hope to enable learners to deduce for themselves that when there is constant difference between consecutive terms in a number pattern, then the terms can be represented graphically with a straight line, hence conclude that such a relationship is linear. Here is an example that will be used in developing these mathematical concepts and skills.

A TASK FROM THE EVERYDAY LIFE

The following data shows the measured heights of 4 different sunflowers on a particular day and the amount they grew in centimetres each day afterwards.

Table 1: Sunflower Growth

Sunflower	A	B	C	D
Start height in cm	3	6	6	8
Growth per day in cm	2	2	3	2

Investigate how the height of each sunflower changes over time. Is there a pattern to the growth? If you find a pattern can you use it to predict how tall the sunflowers will be in say 30 days, or in any number of days? What different representations could you use to help your investigation?

Represent this information in a table similar to the one below, showing the height of the sunflowers over a six day period for each sunflower A, B, C and D.

GROWTH HISTORY FOR SUNFLOWER A

Time in days	Height in cm	Change
0		
1		
2		
3		
4		
5		

1. Where is the start height for each plant seen in the tables?

2. Where is the length by which the plant grows seen in each of the tables?
3. What do you notice about the change between the successive outputs for each of the tables?
4. In each table identify 2 values that stay the same and 2 values that change.
5. We call the values which vary 'variables' and values which stay the same 'constants'.
6. We have identified 2 variables. Which variable depends on the other?
7. We call one variable the dependent variable and other variable the independent variable.
8. We call one variable the dependent variable and we call the other variable the independent variable.
9. Which is the independent variable and which is the dependent variable in each case above?

We also hope to enable the learners to see the connections between (a) the starting point in the numerical number pattern and the c value or y-intercept in the graphical representation, (b) the constant change or difference in the numerical representation of the pattern and the gradient of the straight line and (c) the verbal, numerical, algebraic, tabular and graphical representation of this plant growth information.

WHAT KNOWLEDGE DID WE ASSUME OUR LEARNERS TO HAVE?

We assumed our learners to be able to work with relationships between variables using tables, graphs, words and formulae. Convert flexibly between these representations. At this level it is sufficient to investigate the way output values depend on how input values vary. The terms independent (input) and dependent (output) variables might be useful.

WHAT CONCEPTS DID WE WANT TO TEACH IN THIS LESSON?

In this activity, learners:

1. Identify patterns and describe different situations using tables and graphs, words and formulae
2. Identify independent and dependent variables and constants
3. Identify 'start amount' in the table and formula and as the y-intercept of the graph
4. Identify the rate of change of the dependent variable in the table, graph (as the slope)
5. Identify linear relationships as having a constant change between successive y values (outputs)
6. Realise that tables, graphs and algebraic formulae are just different ways to represent a situation.

CONCLUSION

At the time of submitting this abstract, the lessons are still going on. So in the presentation we will then give a more detailed account of how the lessons went taking note of where learners experienced some challenges and what we did about such challenges.

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