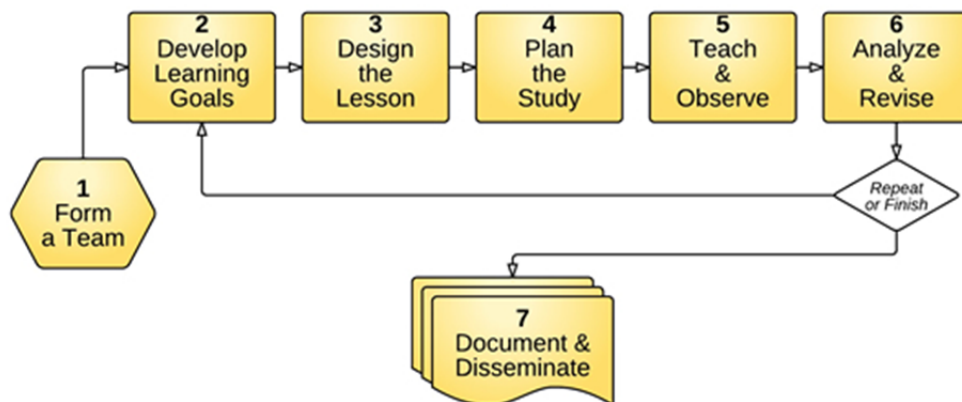


Reflections on Practice 2015

Discovering Patterns



**Pushing the Pattern - Using
a growing pattern to
introduce the notion of a
variable**

Lesson Plan for First Year Mathematics

For the lesson on 30/1/2015

At Carndonagh Community School, Siobhan Coll's class

Teacher: Siobhan Coll

Lesson plan developed by: Siobhan Coll, Hannah Hunter, Paul Browne
Regional Development Officer : Kieran Sweeney.

1. Title of the Lesson: Pushing the Pattern - Using a growing pattern to introduce the notion of a variable

2. Brief description of the lesson:

This lesson is to introduce students to patterns present in everyday life. Students will be able to describe and then define how a pattern behaves. By allowing ample opportunities for success, confidence when dealing with pattern based problems will improve. At the end of the lesson students should be able to distinguish between a constant and a variable by investigating how the pattern changes.

3. Aims of the Lesson:

- I would like my students to appreciate that patterns are a tool for making sense of certain situations and that it can be used to solve real world problems.
- I would like my students to develop their ability to manipulate pattern shapes and verbalize how a pattern is changing.
- I would like my students to appreciate that mathematics can be used to communicate thinking effectively

As a result of studying this topic students will be able to:

- Determine the characteristics of a pattern
- Describe in words how a pattern is behaving using the terms constant and variable.

4. Background and Rationale:

In a typical lesson to discover patterns, students should be allowed to discover for themselves what links the different terms together essentially what is creating the pattern. Therefore students will understand the concept. Discussion time will allow students describe their findings to each other aiding understanding and achieving the following objectives:

- Understand the concepts of variables and constants

- Relations derived from some kind of context – familiar, everyday situations, imaginary contexts or arrangements of tiles or blocks.
- How to use patterns to make predictions about what comes next

5. Research

Patterns in power point came from the website www.visualpatterns.org

Discussion with other members of the mathematics department regarding the best approach to introducing patterns while providing the opportunity for students to discover the concepts for themselves.

Active Maths 1

Teacher handbook for Junior Cycle

www.projectmaths.ie

Teaching & Learning Plan – Introduction to Patterns

Discussion of visual patterns with our Regional Development Officer.

6. About the Unit and the Lesson

Students will understand the concept of a variable and constant at the end of the lesson and be able to see how the patterns grow from stage to stage. Through simple examples a clear understanding will develop. As the students see the pattern growing it will become easier for the students to view and describe the relationship the pattern has with a variable and constant. The numerous examples of patterns will build up student's confidence. Visual learners will respond positively to the power-point presentation.

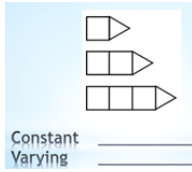
In this lesson, the focus is not just about being able to describe the keywords constant variable and pattern but to describe how all the terms come together forming a pattern.

7. Flow of the Unit:

| Lesson | | # of lesson periods |
|--------|---|---------------------|
| 1 | <p>Pushing the Pattern</p> <p>Using a growing pattern to introduce the notion of a variable</p> | 1 |
| 2 | Decreasing Visual Linear Patterns | 0.5 |
| 3 | Exploring the relationship between two variables | 0.5 |
| 4 | Generating a linear Sequence | 1 |

8. Flow of the Lesson

| Teaching Activity | Points of Consideration |
|----------------------------------|--|
| <p>1. Introduction</p> | <ul style="list-style-type: none"> Examples of everyday patterns are presented to the students. Can anyone give another example? <p>Student responses:</p> <ul style="list-style-type: none"> It is anticipated that most students will be able to give an example of a simple pattern from everyday life. E.g. 2,4,6,8 or 3,6,9 As students are describing what a pattern, they will find it hard to define exactly what a pattern is. Discussion regarding what students think a pattern is, this develops into students forming their own description of a pattern. |
| <p>2. Posing the Task</p> | <ul style="list-style-type: none"> Presenting the concept of a variable and a constant to the students through the use of several growing visual patterns. I will ensure understanding through the use of effective questioning, group work and in built tasks within the lesson. I will conclude the lesson by checking understanding through the use of a |

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| | <p>word bank and clarifying the definition of a pattern.</p> <ul style="list-style-type: none"> • I will give the students an opportunity to develop their own growing patterns. • Are students able to answer the following questions correctly? Will they use the term constant and varying without being prompted? |
| <p>3. Anticipated Student Responses</p> | <ul style="list-style-type: none"> • I expect the students to use the terminology stays the same and changing all the time. • As a result I intend to prompt the students towards the keywords constant and varying. • Students should be able to clearly see in each slide what is constant and varying. • I expect students to answer the number of triangles are staying the same and the boxes are increasing by one for slide one.  |
| <p>4. Comparing and Discussing</p> | <ul style="list-style-type: none"> • Students will be shown a number of different patterns, by working with the person beside them they will identify the variable and constant. • Extended questions will be used to test students understanding. • How many triangles and boxes will be in the 50th pattern? Will assess if students can use the pattern to predict future terms. |
| <p>5. Summing up</p> | <ul style="list-style-type: none"> • To assess students understanding of the lesson the learning outcomes will be used as an end of lesson self-assessment checklist. • Ask students what we have covered in this lesson. • Review the student's description of a pattern. Ask students how they would |

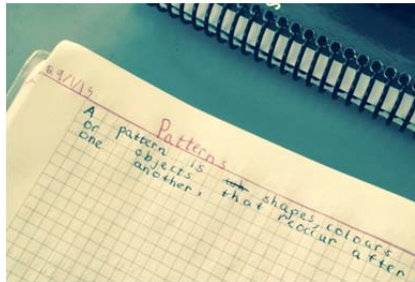

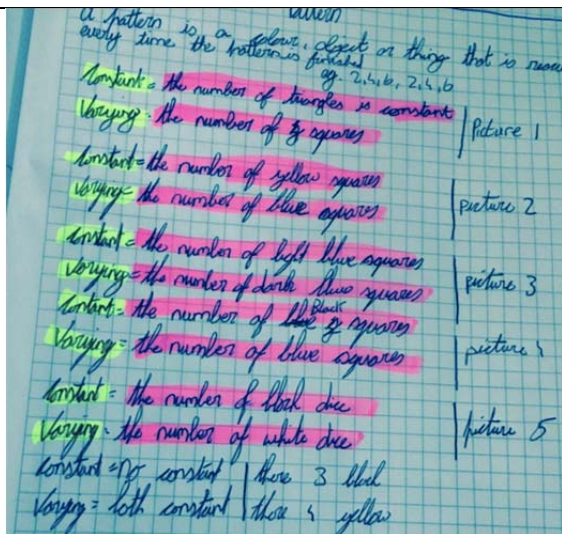
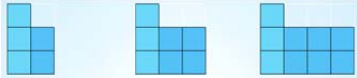

| | |
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| | <p>now define a pattern.</p> <ul style="list-style-type: none">• Has their understanding of what a pattern is now changed?• Are students now able to create a word bank of all key words used throughout the lesson. What other terms did students come up with themselves?• Are all the terms used in the correct context?• Students will be given the opportunity to create their own pattern for homework. |
|--|--|

2. Evaluation

- Kieran Sweeney the local RDO will be present during the teaching of the lesson to document student answers through photos and by filling in the observation template (see attached).
- The observer will focus on recording students' answers to both higher and lower order questions.
- Pre-lesson and post-lesson meetings will be held with Kieran to study the lesson plan in advance and then reflect immediately on the outcomes.
- An analysis of learning outcomes will be undertaken to ensure all targets are met after the teaching of the lesson.

3. Board Plan

The board plan consisted of a powerpoint presentation detailing the different patterns. I have shown what is displayed on the board corresponding with the students work at that time

| | |
|--|---|
|  <p>A pattern is numbers, shapes, colours that go in a repeated order.</p> |  <p>Patterns in Everyday Life</p> |
|  <p>A pattern is a series of objects or things that is repeated every time the pattern repeats. eg. 2, 4, 6, 2, 4, 6</p> <p>Constant = the number of triangles is constant Varying = the number of squares</p> <p>Constant = the number of yellow squares Varying = the number of blue squares</p> <p>Constant = the number of light blue squares Varying = the number of dark blue squares</p> <p>Constant = the number of black squares Varying = the number of blue squares</p> <p>Constant = the number of black dice Varying = the number of white dice</p> <p>Constant = or constant there 3 black Varying = both constant there 4 yellow</p> | <p>Pattern 3</p>  <p>Constant _____ Varying _____</p> <p>Pattern 5</p>  <p>Constant _____ Varying _____</p> |

The image shows two panels of student work. The left panel is a photograph of handwritten notes on graph paper. The top section discusses a pattern with 50th stage, 50 yellow tiles, and 49 black tiles, leading to a total of 99 tiles. It includes a list of keywords: 'Constant', 'less', 'Varying', 'Compare', and 'Recur'. A reflection question asks 'How would you now describe a pattern?' with the answer 'A pattern:'. The bottom section defines a pattern as 'a recurring object, number, thing, etc. It can also change.' The right panel is a digital interface with the heading 'Create a word bank of all key words used'. It lists possible answers: 'Increasing', 'Repeating', 'Varying', 'Constant', and 'Changing'. Below this is a 'Reflection' section with the text: 'You described a pattern in your own words at the beginning of the lesson. How would you now describe a pattern?' followed by a blank line for an answer.

4. Post-lesson reflection

- Students were able to give numerous everyday examples of patterns as expected and some students described a pattern as a recurring thing when asked to write down their own description of a pattern. At the end of the lesson the students definition of a pattern was revisited. Students had time to reflect and decide if they wanted to change their first description of a pattern. Examples of the students first thoughts on patterns are shown in the board plan.
- The use of language was as expected during the lesson, students used staying the same instead of constant and constantly changing instead of varying. I had to prompt students at the start of the lesson to use the keywords, use of the terms improved throughout the lesson.
- Students understood the concept of variable and constant approximately 15 minutes into the lesson. As students grasped the concept so early I decided to introduce n , I had not planned to get this far with the students. I started by asking the students how we could describe the number of tiles.

The total number of tiles = number of green + number of red

The students were able to describe the red tiles in terms of the green tiles

Total = number of green + (number of green – 1)

From here I told the students that to convert the word equation to a number equation we would let the number of green tiles = n

Total = $n + (n - 1)$

Total = $2n - 1$

From this the students grasped that we could find how many tiles are present in any stage of the pattern. This was a very unexpected successful outcome of my lesson.

○ Describe the number of red tiles you can see in each stage of the pattern in terms of the green tiles in each stage

○ Write down a sentence which describes the total number of tiles in each stage of the pattern.

○ Can you describe the total number of tiles in each stage of the pattern in terms of the green tiles only?

- I expected to introduce the concept of prediction using a simple growing pattern. As each stage is increasing by one, the students were able to see clearly that in the 50th stage there were 50 squares. The constant was one which the students clearly identified as staying the same in each stage of the pattern.

I used the slide above to test students' understanding of prediction. I did not intend to cover the concept in as much detail until lesson two. I asked the students if you have 50 red how many green tiles would you have? And if you have 49 green tiles how many red tiles would you have? All students grasped the concept and answered enthusiastically. This was a major breakthrough in discovering the pattern as students are able to clearly see the relationship between two variables. The higher order questions assessed student understanding of the lesson.
- A negative feature of the powerpoint presentation which needs revision is the colour scheme of the shapes in the patterns as the colours did not match the description in the slide. This was caused by sunlight reflecting off the board. A black and white colour scheme, or the use of shading, would be a lot easier for the students to see.
- An interesting question asked by one of the students during the lesson was "how many stages do you need to draw to show a pattern". A class discussion arose regarding the need for at least two stages as one stage would not give enough information to how a pattern is behaving. This insight into a student discussion shows critical thinking and analysis of what really defines a pattern.

- The students had to create their own pattern for homework. It was interesting that repeating patterns appeared as a few of the examples. During the lesson students only saw a growing pattern. This was an unexpected outcome which I consider is due to students own everyday experience of patterns and they used this association to recreate the repeating pattern.



Appendix 1 – Observation Template

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|--|-----------|-----------|-----------|
| BEGINNING OF LESSON: Observe level of difficulty with homework/previous class. If no difficulty tick the box for each student. If student has difficulty please identify issues. | | | |
| Observations | Student 1 | Student 2 | Student 3 |
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| | | | |
| Questions asked by students | Student 1 | Student 2 | Student 3 |
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