



Lesson Research Proposal for 2nd Years on Ratio and Proportion

For the lesson on Ratio and Proportion
At St. Fergal's College, Rathdowney
Date: 30th January 2018
Instructor: Alan Curran

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1. Title of the Lesson: Paper Ratio

2. Brief description of the lesson:

In this lesson, students will be given A3, A4 and A5 sheets of paper and asked to investigate any relationships between them in as many ways as possible.

3. Research Theme

At St. Fergal's College we want students to:

- a) Enjoy their learning, be motivated to learn, and expect to achieve as learners.
- b) Contribute to building whole staff capacity by sharing their expertise.

As Mathematics teachers we will actively support the achievement of our goals by providing

- a) A positive learning environment that allows for active and collaborative learning and all students contributions will be valued.
- b) A forum for sharing teaching strategies and resources within the Mathematics department and subsequently to the whole school.

4. Background & Rationale

Ratios and Proportion

Level: 2nd Years Common Level

a) Why you chose the topic

In our experience, we have found that students struggle with the concept of ratio as a relationship between two or more quantities. In the main, their approach to these problems tends to be procedural. They learn to solve proportions by memorizing the steps without having a true understanding of the method. When faced with a question in a format other than the basic, they have difficulty setting out the information and solving it. Students show some understanding when the problem is proportional but struggle with the indirect proportional problems. The student need to have a good grounding in the concept and the methods used will be of relevance across a range of areas such as probability, trigonometry, rate problems etc.

b) Our Research Findings

Our experience of teaching this topic is to present it as a procedure to be followed. We do not always give the necessary time to allow students explore and come up with their own way of answering and demonstrating their understanding. Some of us have not had formal training in Maths pedagogy. We need to change our practice in this area and help students to be more creative in their thinking and the approaches they use to solve unfamiliar problems.

5. Relationship of the Unit to the Syllabus

| Related prior learning Outcomes | Learning outcomes for this unit | Related later learning outcomes |
|--|---|--|
| 5 th and 6 th class: -identify relationships and record symbolic rules for number patterns -deduce and record rules for given number patterns <i>4:1, 8:2, 16:4</i> | Applied Arithmetic Using ratio and proportionality to solve problems | It is an integral part of problem solving for many Junior and Leaving Certificate topics, at all levels. |

6. Goals of the Unit

- To reinforce students' previous knowledge from Primary school.
- Students can distinguish between ratios and fractions
- Students will understand the difference between relative and absolute comparison.
- Students will simplify ratios of two quantities with different rates
- Students will understand the numbers in the same ratio will all have the same units.
- Students will simplify ratios given as fractions.
- Students will be able to make connections through problem solving.
- Students will solve problems involving proportional reasoning in different contexts.
- Students will value each other's work.

7. Unit Plan

| Lesson | Learning goal(s) and tasks |
|--------------------------|--|
| 1 | Introduce concept of ratio and proportion Introduce relative and absolute comparison |
| 2 | Simplify ratios including examples with fractions and different units and divide in a given ratio. |
| 3 | How to solve problems with direct proportion using the unitary method. |
| 4 The Research Lesson | Problems associated with Patterns that incorporate Direct proportion. |

8. Goals of the Research Lesson:

- Students will apply their knowledge of ratio to a Mathematical problem.
- To realise there is more than one way to solve/approach a problem.
- To encourage students to work independently and to value other students work and methods.

a) Mathematical Goals

- Students will apply the concept of ratio and proportion to solving problems.
- Students will be able to make connections to other areas through problem solving.
- Students will recognise the relationship between the paper sizes.

b) Key Skills and Statements of Learning

Being Literate: Students will have the opportunity to express their ideas clearly and accurately.

Being Numerate: It will develop a positive disposition towards problem solving.

Managing Myself: Students will have the opportunity to reflect on their own learning.

Staying Well: Students confidence and positive disposition to learning will be promoted.

Communicating: Students will present and discuss their mathematical thinking.

Being creative: Students will explore options and alternatives as they actively participate in the construction of knowledge.

Working with others: Students will learn with and from each other.


Students will be encouraged to think creatively and critically.

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

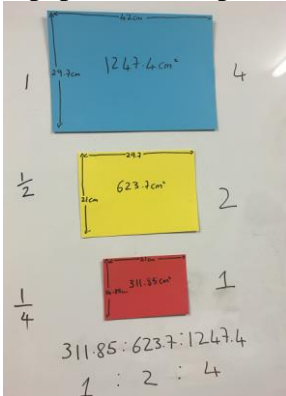
- 1 The student communicates effectively using a variety of means in a range of contexts.
- 15. The student recognizes the potential uses of mathematical knowledge, skills and understanding in all areas of learning.
- 16. The student describes, illustrates, interprets, predicts and explains patterns and relationships.
- 17. The students devises and evaluates strategies for investigating and solving problems using mathematical knowledge, reasoning and skills.

9. Flow of the Research Lesson:

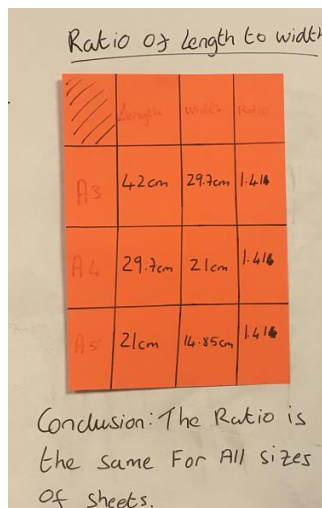
| Steps, Learning Activities Teacher’s Questions and Expected Student Reactions | Teacher Support | Assessment |
|--|---|---|
| <p>Introduction Firstly recap of previous lesson on ratio and proportion. Today we are going to use our mathematical knowledge to solve a problem. You are going to work independently and then bring your ideas together as a whole class.</p> | | <p>Are students motivated?</p> |
| <p>Posing the Task Students will be given A3, A4 and A5 sheets of paper – colour coded Question –</p> <ul style="list-style-type: none"> i. “How are the sheets related to each other?” ii. Investigate the ratio of the length to the width for each size. What do you find? <p>Students will have access to rulers, scissors, markers and ‘show me’ boards.</p> | <p>The three sheet sizes will be put up on the board with the question.</p> | <p>Do students understand the task? (If not give the prompts)</p> <p>Are students eager to solve the problem?</p> <p>Do students see the connection between</p> |

| | | |
|---|--|---|
| <p>Clarifying the problem: Possible prompts – area, length and width</p> | | <p>the sizes of the sheets</p> |
| <p>Student Individual Work Student response 1: folding of the sheets of paper and making the connection between the folded sheets</p> <p>Student response 2: Measuring the length and width of each sheet of paper with a ruler.</p> <p>Student response 3: Cutting the smaller sheets out of the large sheets.</p> <p>Student response 4: cutting the difference of the sheets away</p> <p>Student response 5: Finding the area of the sheets of paper and compare the area</p> <p>Student response 6: Observe the connection by looking at the three sheets.</p> | | <p>Observing Walking around the classroom</p> <p>Take note of student responses and choose the desired solutions.</p> |
| <p>Ceardaíocht /Comparing and Discussing Student response 1: folding of the sheets of paper and making the connection between the folded sheets</p>  | <p>“How many people used this method?”</p> | <p>Are students listening and responding?</p> |

Student response 2: Finding the area of the sheets of paper and compare the area



Student response 3: will find the ratio that connects length to width for each sheet.



“Do students know how to find the area of a rectangle?”
Are the students using ratio?

Are students finding the connections, do they need to be prompted?

Do students observe that the ratio of length to width is the same for each size of sheet?

Summing up & Reflection

Students will make the connection that the ratio of the areas in consecutive sheets is doubled
Students will discover that the ratio of width to length is 1.41 and is the same for all sheet sizes.
Follow on question for homework: Find the area and the dimensions of A0, A1, A2 and A6, A7.
Research the number 1.41 and see what is special about it ($\sqrt{2}$)

10. Board Plan

Direct comparison of the sheets

Put A5 on A4 on A3 (1 is half the size of the other)

(1 A3, 2A4's, 4A5's- layered in different colours)

Measurements of length, width and area (show on table) (area ratio 1:2:4)

Show that the length divided by the width of A3, A4 and A5 (ratio 1.41)



11. Evaluation

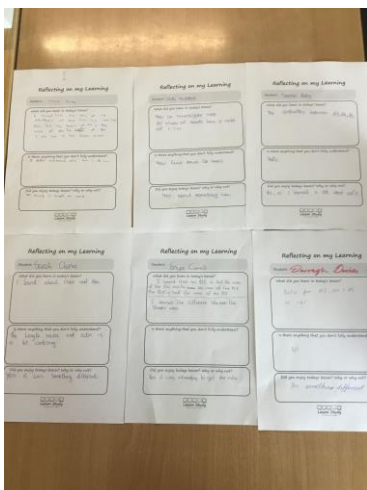
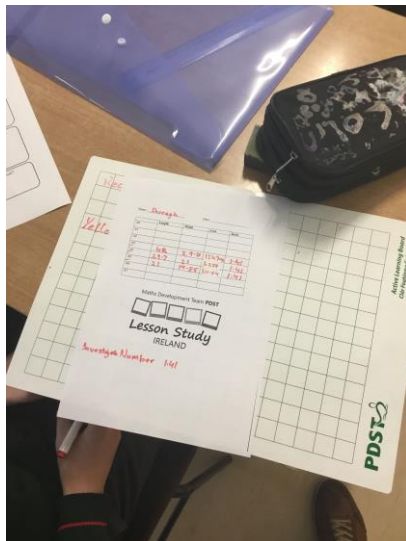
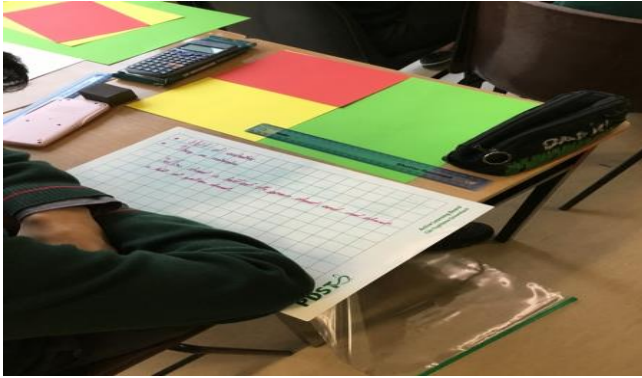
- Collect student evaluation forms
- Did students realise there is more than one way to solve/approach a problem?
- Did students recognise the relationships between the paper sizes?
- Did we identify students who did not understand the problem?
- Was the flow of the lesson coherent?
- Where the goals and research theme of the lesson met?

12. Reflection

- It took the students longer than anticipated to get started because they did not fully understand the word relationship. When this was pointed out to them they started work immediately.
- We were surprised that no student asked for clarification on this but we felt that students were not their usual selves because of the set up the lesson (different classroom, many teachers in the room etc.)
- Students began by discussing things we didn't anticipate e.g. the nature of the sheets, the shape and other shapes that could be made from them. They also focused on one size of sheet rather than all 3 sheets.
- The show me boards were used effectively.
- We felt that the students would have been more responsive and focused if they were working in pairs or groups.
- We found that they were conscious of making mistakes in front of their peers because of working independently.
- Due to time pressure and the number of students working independently, not all students work was taken into account.

- A student, while presenting their work to the class at the board, realised that she had the ratio of the areas in the wrong order but quickly corrected herself. This is something we experienced ourselves during the preparation of the lesson.
- All the goals that we set were achieved during the lesson.

Pictures taken during the lesson:



Student Homework worksheet

Name: _____

Date: _____

| | Length | Width | Area | Ratio |
|----|--------|-------|------|-------|
| A0 | | | | |
| A1 | | | | |
| A2 | | | | |
| A3 | | | | |
| A4 | | | | |
| A5 | | | | |
| A6 | | | | |
| A7 | | | | |

Investigate the significance of the number 1.41?

Maths Development Team **PDST**



Lesson Study
IRELAND