FaSMEd

Raising Achievement through Formative Assessment in Science and Mathematics Education

Sharing costs: Understanding ratio concepts

Subject:	Mathematics
Age of students:	11-14 years
Hardware:	iPad minis (1 per class or one for each student)
Software:	Socrative or Classflow, Apple airserver, OR Showme and Reflector software OR Plickers
Functionalities:	Sending and displaying, Processing and Analysing
Time:	2 – 3 hours (1 week)
FaSMEd partner:	Newcastle University
Short Abstract:	This lesson is intended to help you assess how well students are able to solve a real-world modeling problem. There are several correct approaches to the problem, including some that involve proportional relationships.

1. Content

Make sense of problems and persevere in solving them. Reason abstractly and quantitatively. Model with mathematics.

2. Activity

2.1 Aims

Understand ratio concepts and use ratio reasoning to solve problems.

2.2 Structure / Methodology

This lesson unit is structured in the following way:

- Before the lesson, students work individually on an assessment task designed to reveal their current understanding and difficulties. You then review their work and create questions for them to answer in order to improve their solutions.
- At the start of the lesson students work alone, answering your questions about the same problem. They are then grouped and engage in a collaborative discussion of the same task.
- In the same small groups, students are given sample solutions to comment on and evaluate.
- In a whole-class discussion, students explain and compare the alternative solution strategies they have seen and used.

Finally, students reflect on their work.

2.3 Technology

A PC and projector is used to show slides of sample work for students to critique, the interactive whiteboard and Promethean software allows students to annotate the sample solutions. A mini iPad is used by the teacher who takes pictures of students' solutions. Then 'Showme' software allows the photo of the student work to be projected for the whole class to view (with Reflector software which allows the iPad to communicate with the projector via the PC). The Showme software also allows the student to annotate their work from their desk (using the iPad) to emphasise particular aspects of their thinking. Classflow software and Apple airserver are also available to support this process.

Teachers have observed that while the process of critiquing other sample solutions is a valuable element of the formative process, the knowledge that their solutions can be displayed for other students to view also has an impact on the quality of the students' work.

2.4 Aspects of Formative Assessment

- Clarifying/ Understanding/ Sharing learning intentions and criteria for success.
- Engineering effective classroom discussions and other learning tasks that elicit evidence of student understanding.
- Providing feedback that moves learners forward.
- Activating students as instructional resources for one another.
- Activating students as owners of their own learning.

The technology supports these strategies through sending and sharing information for the whole class.

3. Further Information

Here are some statements of teachers, who taught this lesson:

Initial assessment task- this told me that the class didn't understand that we needed a fair solution and that they didn't really understand what a fair solution meant. Because of the confusion with the problem I then made a much more simplified version (two children and two blocks to get to school). We came up with solutions to this problem and critiqued each other's using reflector and the interactive whiteboard. This teased out the concept of a fair solution and most students then understood this.

I was surprised at how many different topics actually arose from this lesson, maybe I should have thought about it a little more. We covered perimeter, we covered addition, we covered ratio, money. We also covered averages when we were looking at the distances travelled because we measured each distance with a ruler and therefore the results weren't exactly the same each time. I was also very surprised at how some of the class retained the information through to the end and were able to replicate the process to get a correct solution to a different but similar problem.

4. References

Full task can be found at: http://map.mathshell.org/lessons.php?unit=6200&collection=8

Reflector software: http://www.airsquirrels.com/reflector/

Showme software: http://www.showme.com

Classflow software: https://classflow.com