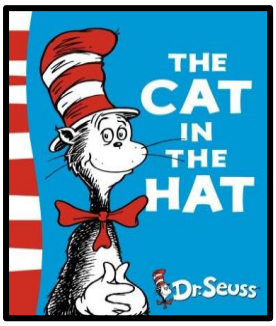

Story: The Cat in the Hat
Author: Dr. Seuss
Illustrator: Dr. Seuss

Teacher: Toby Russo
Setting of the class/school: A mixed ability class at a primary school in Melbourne, Australia
Age group: 10-12 year olds (Year 5/6)
Number of children in the class: 25

Learning intention: To apply our understanding of proportional reasoning to a mathematical investigation
Key mathematical vocabularies: Elapsed time, proportional reasoning, ratio, seconds, minutes, hours
Resources needed: A copy of the 'The Cat in Hat' story book

Synopsis:
The story begins when Sally and her brother are home alone on a cold and wet day. As they sit around pondering what they will do all day, a strange character – the Cat in the Hat – shows up to provide entertainment. Despite the protests of the pet fish, the Cat in the Hat proceeds to have lots of fun and make a mess of the house, with the help of his friends, Thing One and Thing Two. However, to the surprise of the children (and the fish), the cat cleans up the mess in no time at all, and then he leaves just before their mother comes home.

Starter / Teaching input (15 minutes):
Once I have finished reading the story to my class (see Figure 1), I then elicited class discussion with a focus on directing students' thinking towards the mathematical context of the investigation. Some questions I asked included: "How long do you think the Cat was in the children's house? How long do you think it took the Cat to clean up the mess at the end of the book?". Students speculated that the Cat could have been there for a reasonably short time ("*I reckon only 20 or 30 minutes")* or for longer *("Probably 2 or 3 hours as their mum was out for a while*"), but there was a general consensus that the Cat cleaned up very quickly (*"Maybe in like a few seconds!", "I don't think it took more than a minute or two, he was super quick"*).

Main activity (30 minutes):
The main activity involved children solving four problems, which allowed for differentiation as they are designed to be increasingly challenging, with the final problem an open-ended challenge. The students were encouraged to clearly articulate their mathematical processes in their written work as they would be required to explain these processes at the end of the lesson. For the sake of brevity, only Problem 1 is included here: *"With the help of Thing One and Thing Two, The Cat in The Hat made an absolute mess of the house! However, using his special machine, he cleaned the mess in almost no time! Imagine the Cat in the Hat arrived at 11am and was busy making a mess until 1:30pm! However, he took only 30 seconds to clean up! How much longer did it take him to make the mess than to clean it? How many times faster does he clean than make mess?".* Most students in the class worked through the first problem with relative ease. Having recently completed a unit exploring elapsed time, students were able to determine that the cat spent 2 hours and 30 minutes at the house and 30 seconds cleaning up (note: a small number of students included the cleaning up time *in* the 2.5 hours, and they were encouraged to clearly read the wording of the question, as this different response has an impact on later questions). Several students used a timeline to help visualise this problem, while others used mental strategies, but all concluded that the *time difference* was 2 hours 29 minutes and 30 seconds (see Figure 2).

The next part of Problem 1 is the first time students are required to apply proportional reasoning: *How many times faster does he clean than make mess?* A small number of students did not understand the difference between this and the first question i.e. they applied additive thinking when they needed multiplicative thinking. A group of six students who were struggling with this problem were involved in an impromptu mini-lesson where the idea of 'how many times faster' was stripped back with some more simple examples (e.g., "If you take 20 minutes to eat breakfast and I take 5 minutes, how many times faster am I", etc.). Once we had addressed this misconception and these students now understood the problem as one of proportional reasoning, I asked *"What do we need to know first to solve the problem*?". One student replied "*Well if we want to know how much faster he cleaned than make the mess, we need to work out how many minutes it took to make the mess"*. So we worked together to determine 2 hours and 30 minutes is actually 150 minutes, and because it took 30 seconds – or half a minute to clean up – then cleaning was 300 times faster (because ½ goes into 150 300 times). Most of the students who worked independently used this same strategy, although

two students decided to convert 2 hours and 30 minutes into seconds to solve the problem (although their ratio was initially incorrect, due to a miscalculation of the total number of seconds as 6300 rather than 9000).

Plenary (15 minutes):
The plenary session provided students with a chance to share their learning process, with a focus on strategies used to solve the problems. Initially students shared their work in small groups and then some explained their process to the whole class. I then concluded with a short 'definition task', where I challenged the students to work in pairs to define the term 'proportional reasoning' and then share with another pair, discussing similarities and differences. We concluded with a whole-class discussion about the concept of proportional reasoning, and most students acknowledged that before the lesson they had no idea what it meant, but now felt they understood it (some 'very well' and others 'reasonably') and could solve more problems based on this concept.

Reflection:
Starting the lesson with a story picture book, particularly a familiar and fun book such as the Cat in the Hat, helped pique students' interest. During our reflective discussion after the lesson, there was an overall positive response to the learning task. Students seemed to like the connection between the story and the mathematics ("The story was to do with the lesson so it made the maths more fun"). I have always loved reading story picture books to my upper primary students and have recently begun to make this common link between narratives and mathematical tasks. There seems to be a pervasive negative attitude towards mathematics among particular learners and, from my experience, the use of a simple and enjoyable story picture book can help engage these students by lightening the mood and making the learning more contextual and fun.

Figures:

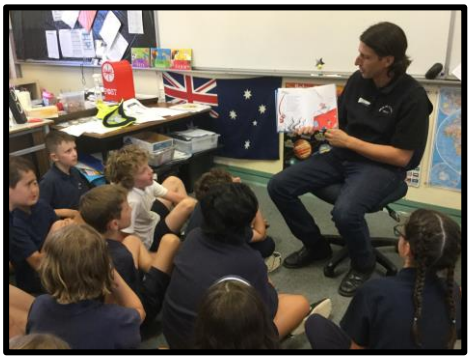

Figure 1: The students were read the story to during the starter

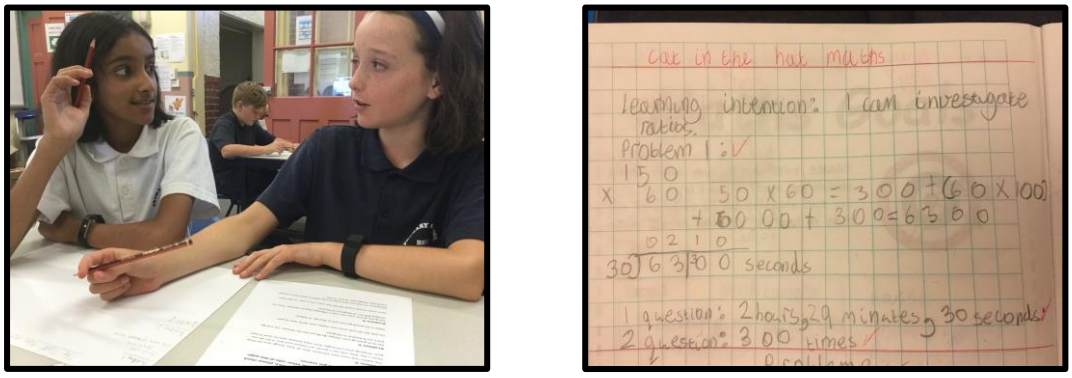

Figure 2: Students working together to solve Problem 1