

**LEARNING ABOUT SELECTING  
CLASSROOM TASKS AND  
STRUCTURING MATHEMATICS  
LESSONS FROM STUDENTS**

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# Abstract of the abstract

As part of a larger project, we examined how students describe their ideal mathematics lesson.


We found that the students' comments were similar to the characteristics that are often used by researchers to delineate the features of effective teaching. ...

Teachers are encouraged to pay attention to opinions of students on the pedagogies they value.

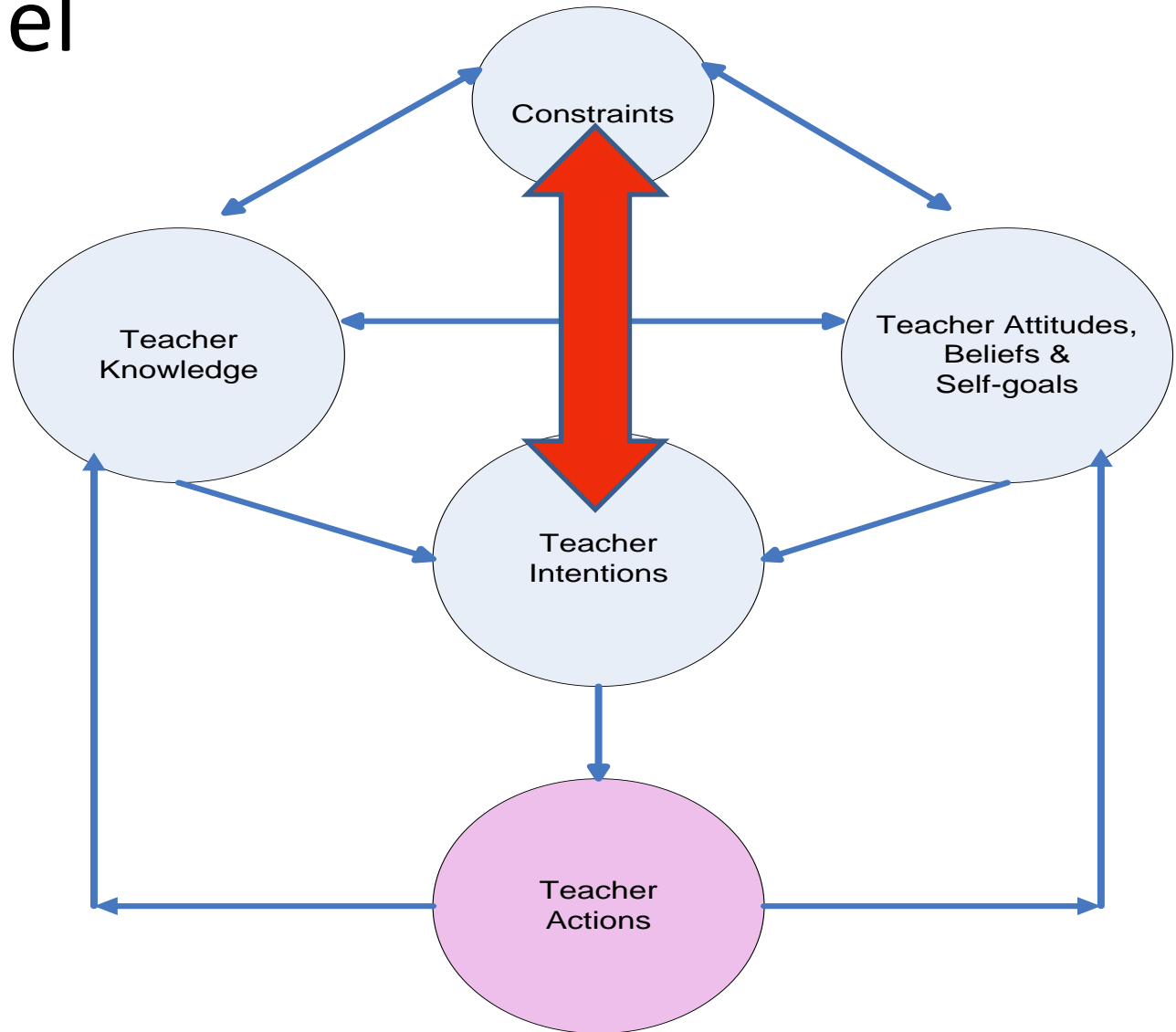
# Overview

- This research is conducted with Doug Clarke and Barbara Clarke
- The data presented here are:
  - Some quantitative data from a survey
  - Some student essays
  - Some qualitative responses from the survey

# Our task model - Stein, et al. (1996)

- mathematical task as represented in curriculum materials, and
  - mathematical task as set up in the classroom,
  - mathematical task as experienced by students
  - create the potential for students' learning.
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# Our teaching model



# The question guiding this aspect of our work was:

- What can we learn from what students say, unprompted, about the characteristics of tasks and lessons that they value?

# The approach is particularly informed by

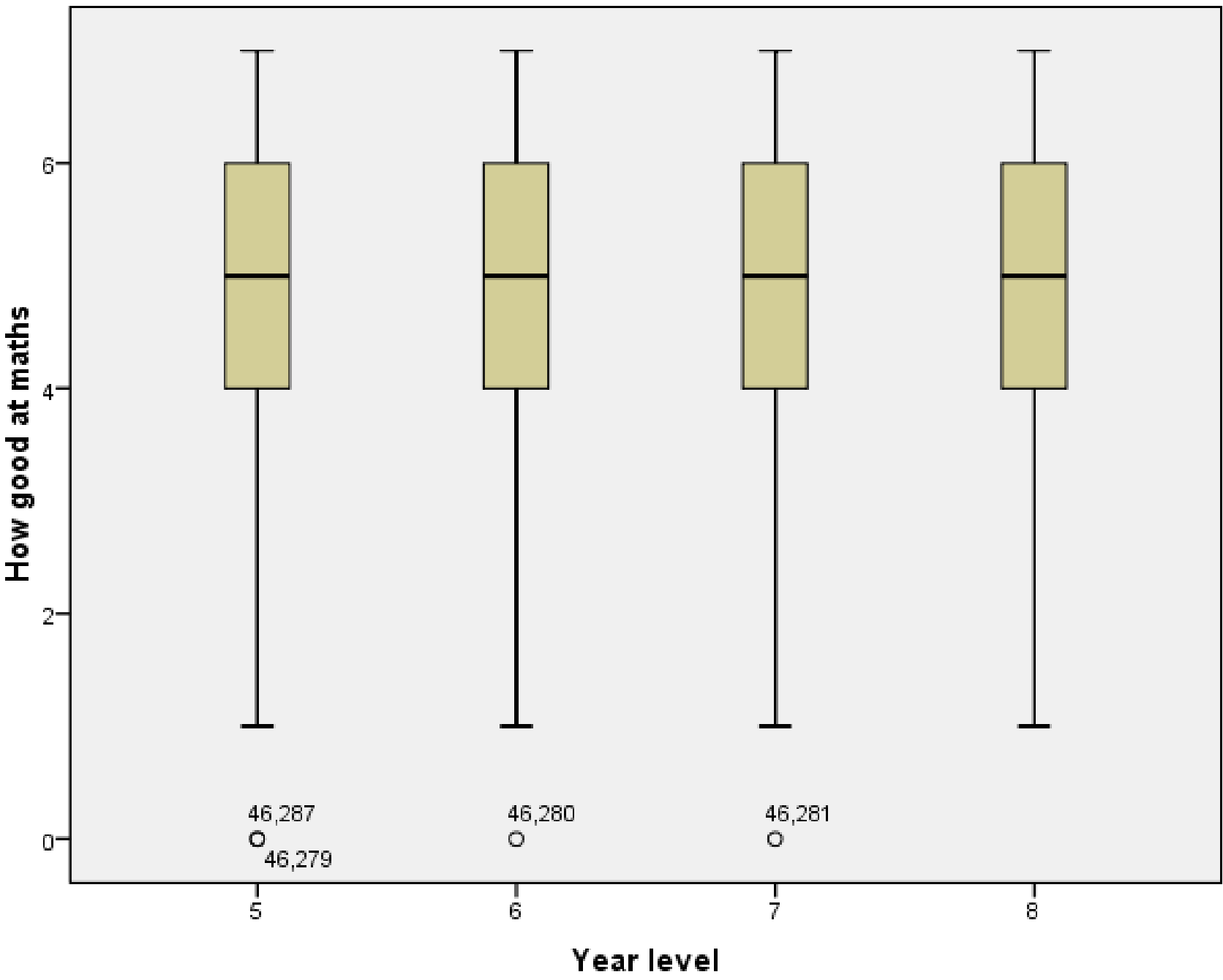
- Zan and di Martino (2010) ...emphasis should move from measuring attitudes to describing them. ...
- They argued for more narrative approaches to describing student attitudes, including with large samples, with the goal of understanding behaviour.
- We ...sought to extend this to seeking students' views about tasks and lessons.

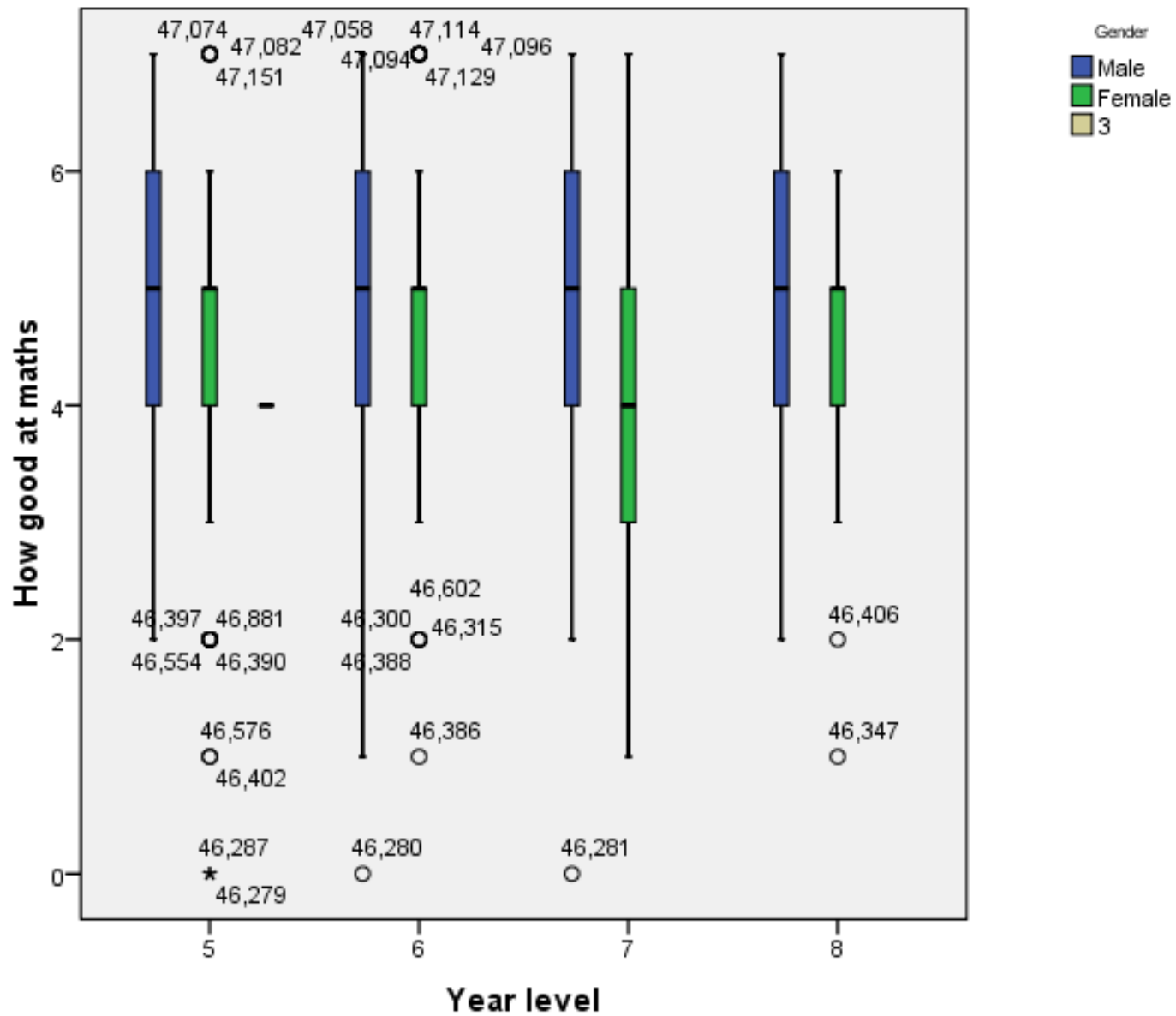
From the survey



## Self ratings of perception of mathematics in % (n = 930)

Rating	How good are you at maths? (Q1)	How happy are you in maths class? (Q2)
0	0	1
1	1	4
2	3	9
3	11	18
4	21	22
5	33	24
6	24	15
7	8	8





While there was not much difference overall between levels, there was a big difference (mean 3.5 to 5.5) between classes

# Some implications

- At each of these middle years levels there is a range of satisfaction and confidence, and teachers should be aware of this
- Teachers make a difference and they teacher needs support to both find out the students levels of satisfaction and confidence, and to do something about it if they are low

## Qu 9

In this table there are three maths questions that are pretty much the same type of mathematics content asked in different ways.

Put a 1 next to the type of question **you like to do** (learn) most, 2 next to the one you like (learn) next best and 3 next to the type of question **you like** (learn) least.

**We don't want you to work out the answers.**

Movies tickets are \$13 for adults and \$7 for children. How much does it cost for 2 adults and 4 children to go to the movies?  (word problem)	
2 adults and 4 children went to the movies. They spent \$120 on tickets. How much might the adult and children's tickets cost?  (open-ended)	
$(2 \times 13) + (4 \times 7) =$  (number work)	

## Preferences for liking, and learning from, the task types as a % (Q9)

Task	Like most	Learn most
Number work	54	40
Word problem	35	23
Open-ended	12	37

## Comparing preferences for LIKE MOST the low and high and *good* group as a % (Q9)

Task	Low group	High group
Number work	44	60
Word problem	42	26
Open-ended	12	16



Comparing preferences for LIKE LEAST the low and high and *good* group as a % (Q9)

Task	Low group	High group
Number work	32	21
Word problem	11	25
Open-ended	54	53

## Comparing preferences for LEARN MOST the low and high and *good* group as a % (Q9)

Task	Low group	High group
Number work	42	33
Word problem	21	24
Open-ended	34	44

## Comparing preferences for LEARN LEAST the low and high and *good* group as a % (Q9)

Task	Low group	High group
Number work	36	40
Word problem	34	38
Open-ended	28	21

Another set of data

- We sought students' views on lessons and teaching through a particular prompt seeking narrative responses. The particular prompt of which was:
  - Write a story about your ideal maths class. Write about the sorts of questions or problems you like to answer, what you like to be doing and what you like the teacher to be doing in your ideal maths class.

- The following is an example of a typical student's essay, presented as it was written:
  - When I do maths I enjoy doing hands on activities and outside activities. I enjoy hands on activities because sometimes I get to eat it like fairy bread fraction, chocolate fraction and I enjoy outside activities because we need to go out side once in a while and I enjoy maths that has lots of answers to it and I like group work because I can contribute with other people and I like my teacher because she helps us for our maths.
- (boy, grade 5)

- My ideal maths class would be hands on work where we would make something. But we would use lots of different types of maths for example measurement, sums, fractions and percentages. It should be challenging and we would work in groups. If we got stuck on something, we would sit down with the teacher and work it out together. The thing that we make should be something we could use in our every day lives. It should also need to be researched on the computer and maybe in books. We would not use calculators because I don't really learn anything from them.
- (boy, grade 6)

- Each of the responses was read, and a preliminary set of codes established. A second reader then used the first set of codes and added others as appropriate. Where a sentence or phrase could be categorised in two places, this was done.
- We sought responses from students in two schools that were part of another aspect of the TTLM project. The responses were somewhat idiosyncratic to the school so they are reported separately.



# In the first school there were 39 students

- 30 students included a desire for materials in their ideal lessons, and some mentioned specific examples such as teddy bears, robots, alarm clocks, class market, and mapping. Fourteen students mentioned a connection to practical aspects such as food, money, and newspapers.
- These are not the structured materials that teachers would naturally expect to see in such responses.

- There were 25 specific mentions of working in groups as part of their ideal class, and a further 15 mentions of working in pairs. Note that there were also 9 students who wrote that they preferred to work alone.

- There were 22 students who wrote that they liked to be challenged, and 15 students wrote that they liked open-ended tasks or those that had more than one answer.
- 16 students wrote that they liked clarity in both the lesson goals and in teacher explanations.
- 21 students liked to be helped by the teacher although this was subtle, with many wanting time to work on the task first

- There were also 25 specific references to working outside (12 Year 5, 13 Year 6). Given that one suspects that this happens quite rarely, this is a surprising result.
  - Note also that some students in the survey also mentioned going outside as their best lesson.

# In the other school

- there were three mixed Years 5 and 6 classes involving 65 students.

- 19 specifically mentioned fun or enjoyment,
- 22 mentioned games,
- 17 mentioned specific hands-on activities,
- 13 mentioned specific measurement activities  
15 gave examples that connected learning to their lives.
- 18 students saw their ideal lesson as being outside!

- 50 students wrote that the ideal lesson included working in groups, in pairs, or with friends, but 10 wished to work alone.

- 22 students mentioned explanations and 7 referred to the teacher's interactions with students.
- 26 students claimed to like a challenge.
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- Both schools were technology rich, and it was interesting that this was mentioned by very few students. Perhaps they saw the availability of technology as a given, but the scarcity of such mentions may require some further investigation.

# In summary

- The students were extraordinarily articulate about what they wanted in their maths lessons
- The first characteristic of the responses is the diversity of aspects on which the individual students commented, suggesting that there is no commonly agreed ideal lesson, and there are many ways to teach well.

- The ways of working in class are clearly important for students, and however the teacher intends that the student work, the reason for this needs to be clarified for the students..

- In synthesising the responses, students like lessons that
  - used materials (although these were not structured materials),
  - were connected to their lives,
  - involved games,
  - were practical with some emphasis on measurement,
  - in which they worked outside,
  - with the method of grouping being important, and
  - over half of the students claim to like to be challenged

A further data set

# The relevant prompt

- Think about all the maths lessons you have EVER BEEN IN. Now think about the best maths lesson you have EVER BEEN IN. Describe what you did in that lesson.

# Some examples of what they wrote

- We played the grand final of maths football. You have to answer questions and if you get them before you aponint (sic) the football goes closer to your goal. We won.
- We did long jump outside and then we measured everyones and then put it in a chart.

- All responses were read and preliminary categories for grouping the students' responses identified. The various responses were then coded by a second researcher, and adjustments made to the categories.



# Examples of statements so categorised

..

- *game that taught us maths* “we coloured in some boxes on a fraction we roll 2 dice whatever fraction you get you colour in”.
- *particular topic* “we added fractions. We learnt how to add them with different denominators (sic)”, “algebra (sic) would be the best lesson because I was good at it”, “I liked percentage” “when I was learning about decimals”, “learnt how to add and subtract mixed numbers and turn them into improper fractions”.

- *particular operation* statements such as “I was starting to learn multiplication and I got it so easy and I loved it.”
- *used or made a model* general statements such as “when we did hands on activities” “smarties maths. We used smarties to work out fractions (colours “when we were making the maps of a town with 24 houses”, (!) “when we drew Cardoids, Mystic Roses Hyperbola”.

# *categories of the “best” mathematics lesson (n = 940)*

<b>Category of response</b>	<b>Total</b>
Game that taught us maths	184
Competition or test on maths we know	83
Outside activity	59
Particular topic e.g. Measurement	395
Real-life problem e.g. Water in tank, to make food	49
Used or made a model e.g. Pita bread for fractions	258
Particular operation e.g. Multiplication	119
Learned mathematics I didn't know before	16

# *Combined categories of responses to characteristics of best lesson (n =940)*

<b>Category of response</b>	<b>Total</b>
Engaging pedagogies (Game, outside activity, real life, etc)	633
Topic, operation, or learned maths	530

- In summary, the main impression from these responses is their diversity, and there is clearly a range of ways in which students respond to lessons.
- There were two trends in their lesson descriptions of, on one hand, students recalling effective teaching of a content topic, whereas there were others who remembered interesting aspects of the pedagogy.

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