

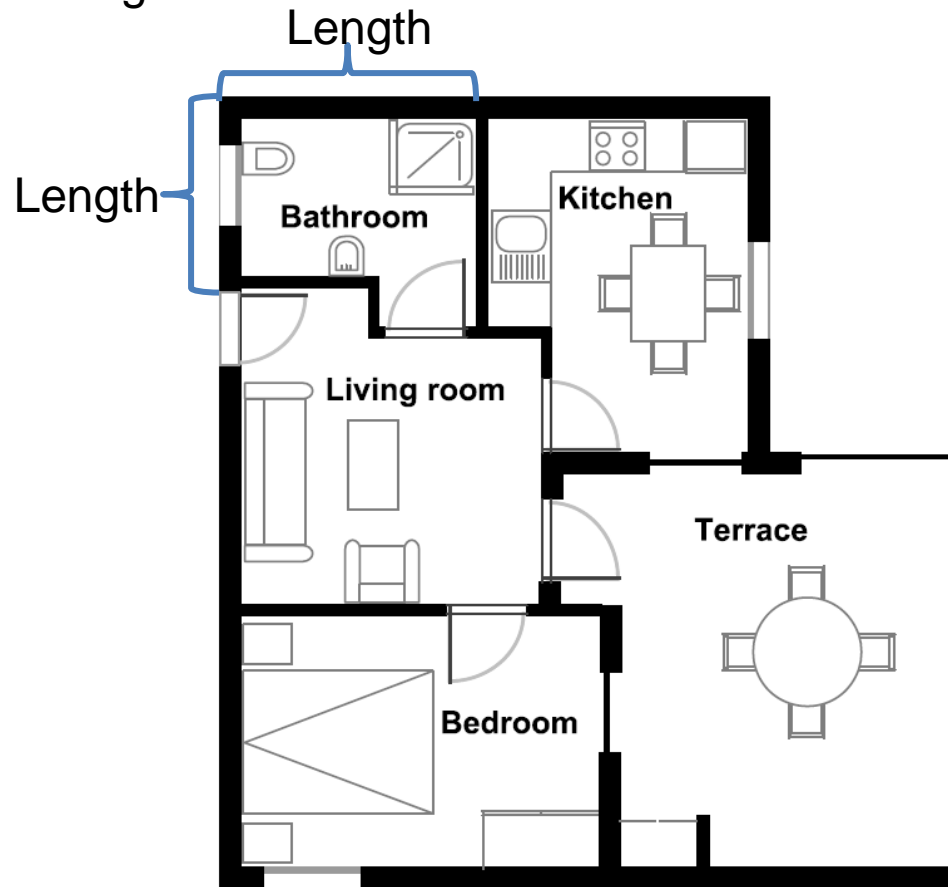
# **FOSTERING STUDENT ENGAGEMENT IN MATHEMATICS LEARNING: THE ROLE OF TASK DESIGN**

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# Apartment Purchase Task

Peter is thinking about buying an apartment. There are many ways to **estimate the total floor area** of the apartment (including the terrace and walls).

One way is to add up all the floor areas of every part of the apartment after taking the various measurements of lengths.



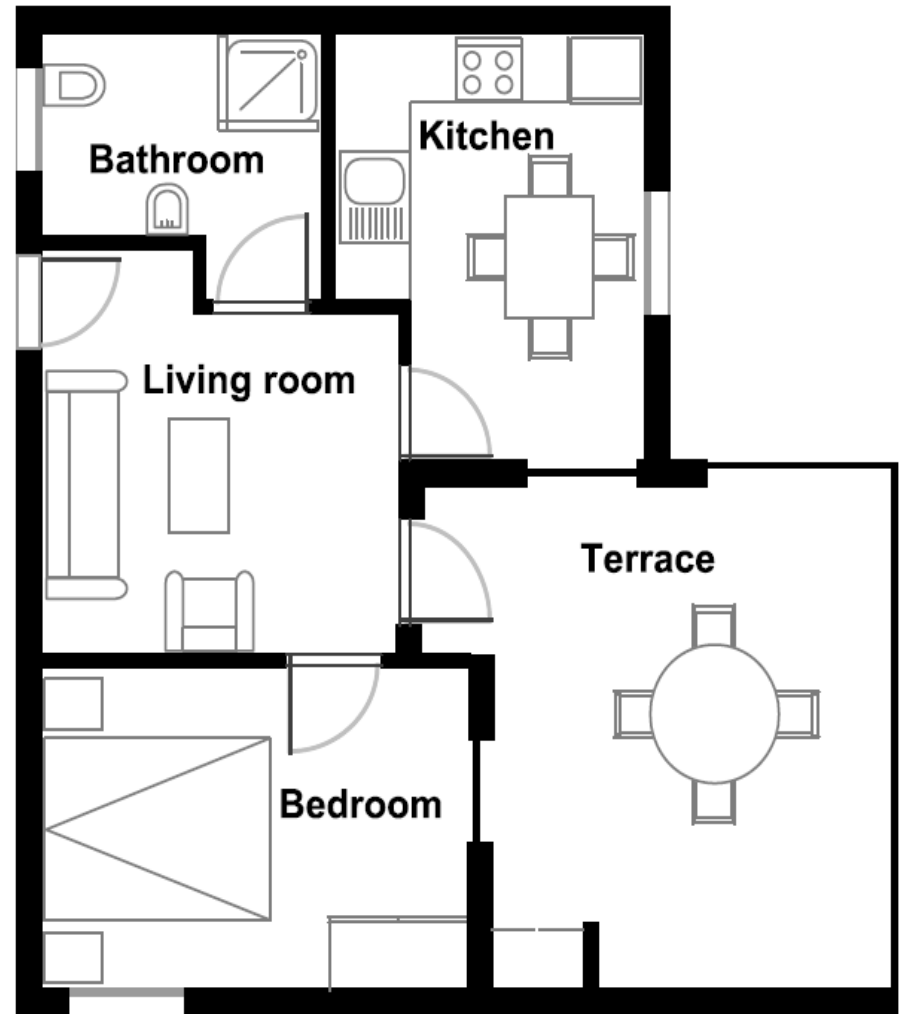
# Apartment Purchase Task

Find the most efficient way of estimating the total floor area of the apartment by just taking only 4 measurements of length.

How many different combinations of 4 lengths do you take measurements of?

How do you ensure you have considered all possible different combinations?

How are all the various combinations related to each other?



# Mathematical Literacy

*Mathematical literacy* is an individual's capacity to **formulate**, **employ**, and **interpret** mathematics in a **variety of contexts**.

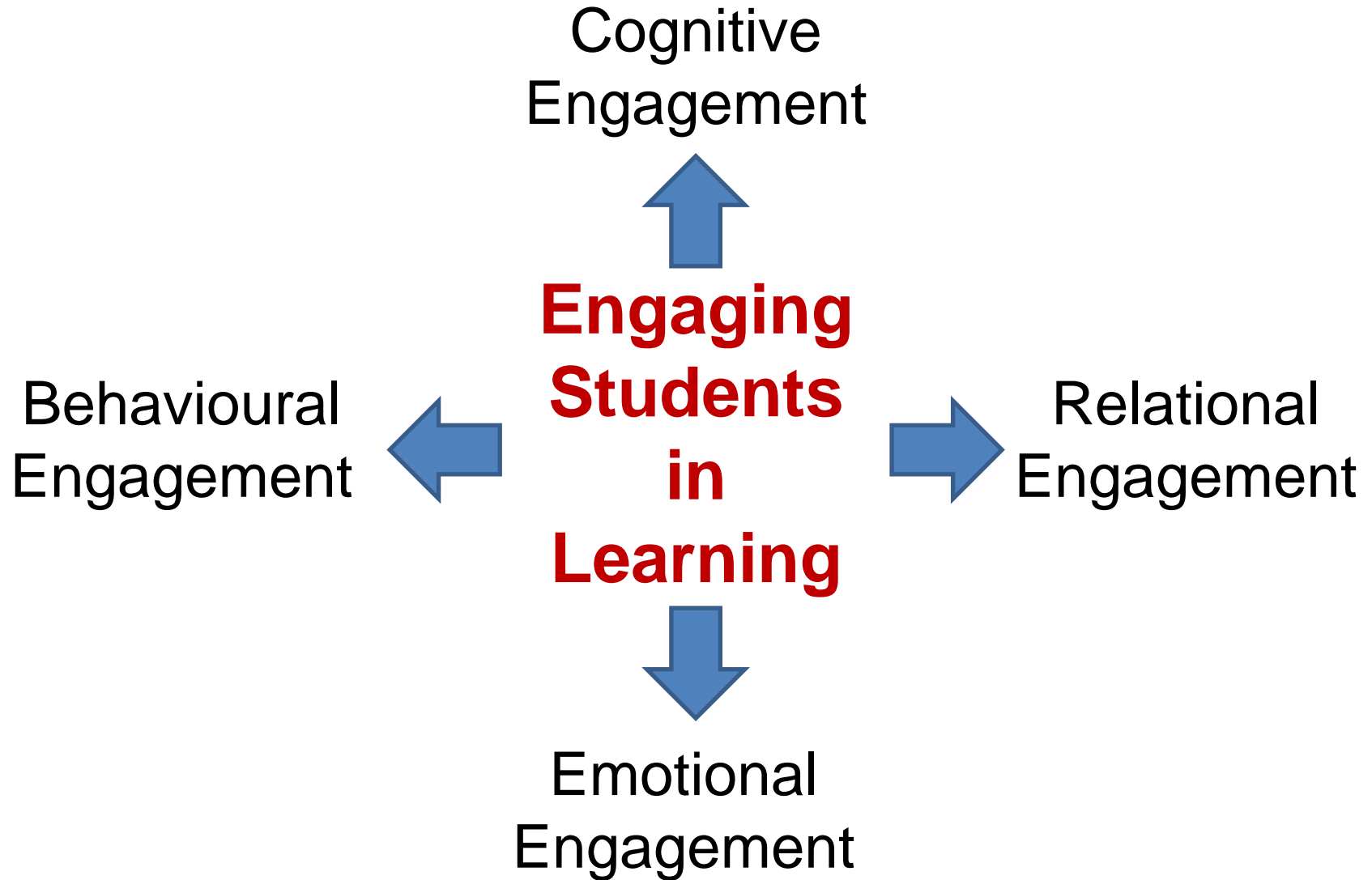
It includes **reasoning mathematically** and using mathematical concepts, procedures, facts and tools to **describe**, **explain** and **predict** phenomena.

It assists individuals to recognise the **role that mathematics plays in the world** and to make the well-founded judgments and **decisions** needed by constructive, engaged and reflective citizens.

Does a mathematical task alone  
lead to engaged learning?

Multiple Dimensions of  
Engaged Learning

# Dimensions of Engagement



# Facilitating Engaged Learning in Mathematics

# TLLM RESOURCE: PETALS™ Framework

## Five Facets:

- Pedagogy
- Experience of Learning
- Tone of Environment
- Assessment
- Learning Content



**Student-  
Centredness**

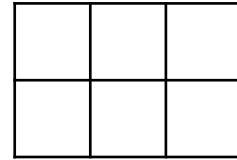
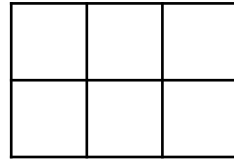
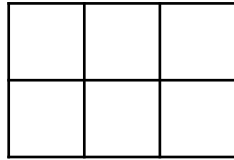
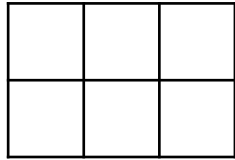
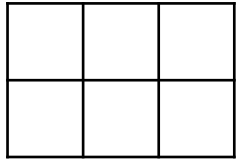
These five facets are **intertwined** and **interdependent** so that students will be engaged in learning



Can mathematical tasks be designed to contribute towards engaged learning while delivering learning content and experiences?

**Multiple Dimensions of  
Engaged Learning**

# Colouring Task



...  
(more  
rectangles  
provided)

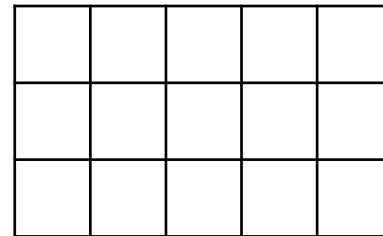
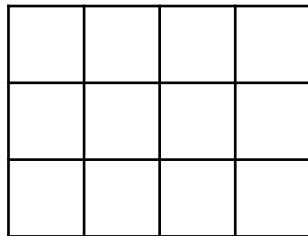
(rectangles are made up of 1-cm squares)

- Rule: For every **one** square coloured in **red**, **two** squares have to be coloured in **blue**.
- Follow the rule and colour the first rectangle fully.
- Follow the rule and colour the other rectangles in as many different ways as you can. (You need not use up all the given uncoloured rectangles)
- How many different ways can you colour the rectangles?
- What fraction of the first rectangle is coloured red?
- Did the fraction of red squares stay the same for all the rectangles you coloured?

# Colouring Task (continued)

- Circle the rectangles that are symmetrical after colouring.
- Compare the area of red squares with the area of blue squares in each rectangle. What do you notice?
- If we **keep the rule** and coloured these rectangles instead (see below) , will the ratio of the number of red squares to the number of blue squares be the same as what you see in the other rectangles before?

Explain what you think before you colour the rectangles to check.



# Some Task Design Suggestions for Engaged Learning in Mathematics

- Use (meaningful) Real-World Contexts?
- Maintain some degree of open-endedness for discussion?
- Connections between concepts?
- Non-routine?

[Ideas from OECD (2013), Galbraith (2006), Sullivan (1992)]