

# The FOCUS Framework: Snapshots of mathematics teacher noticing

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Mathematics & Mathematics Education

**TRANSFORMING TEACHING  
INSPIRING LEARNING**

# Mathematics Teacher Noticing

What it is and why it matters

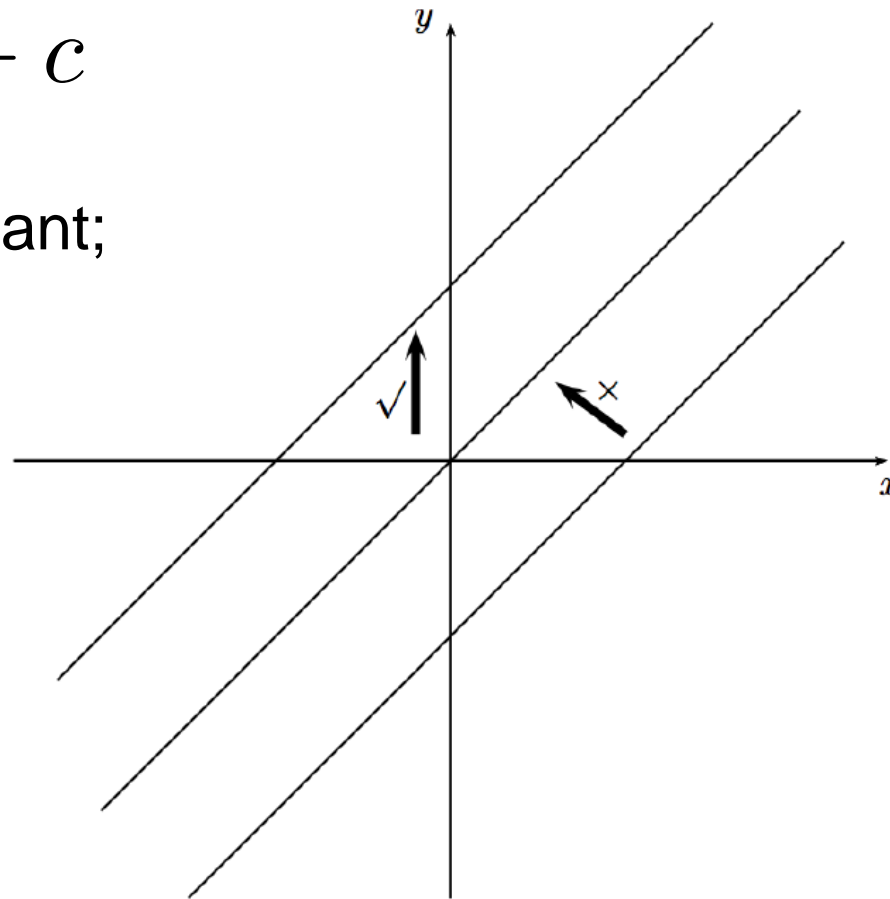
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# Anticipated but not quite there...

$$y = mx + c$$

Keep  $m$  constant;  
vary  $c$

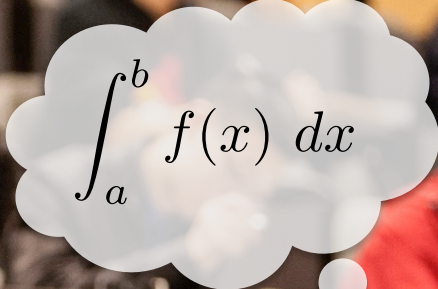


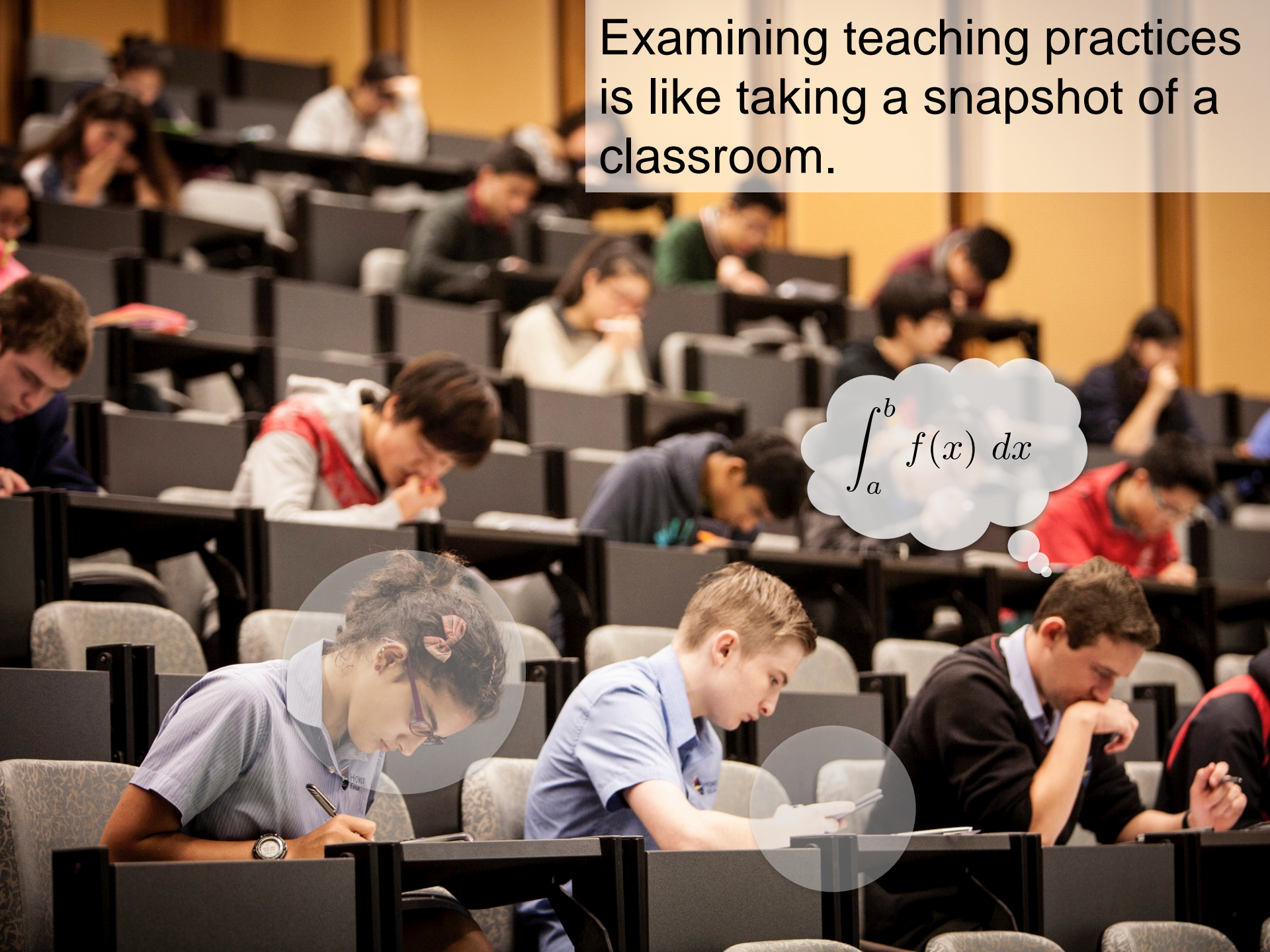
Learning from teaching to improve teaching requires teachers to develop the *eyes to see*, the *ears to hear* and the *mind to think*.

Mathematics Teacher Noticing



Examining teaching practices is like taking a snapshot of a classroom.


$$\int_a^b f(x) dx$$

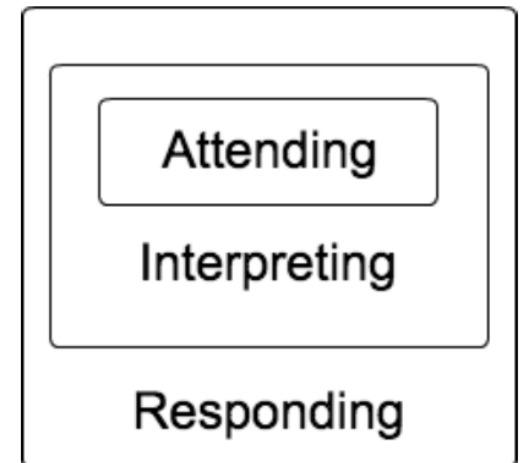


# Professional Vision

## Mathematics Teacher Noticing

... the process of attending to students' mathematical ideas, and making sense of the information to make decisions in an instructional context.

(Jacobs, Lamb, & Philipp, 2010; Mason, 2002; van Es & Sherin, 2008).





## A set of practices...

Systematic reflection, recognising,  
preparing and noticing, and validating with  
others

The aim is to bring to mind a  
different way to act.

(Mason, 2002)

# Gaps in researching math teacher noticing

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# An overview of the field

- No specific focus (Star & Strickland, 2008) versus explicit focus (Levin, Hammer & Coffey, 2009)
- Relationship between the three component skills (Barnhart & van Es, 2015)
- Generally focused on reflection about lessons and video clips of lessons
- A few studies looked at lesson planning and lesson delivery (e.g., Santagata, 2011)
- Predominantly pre-service teachers

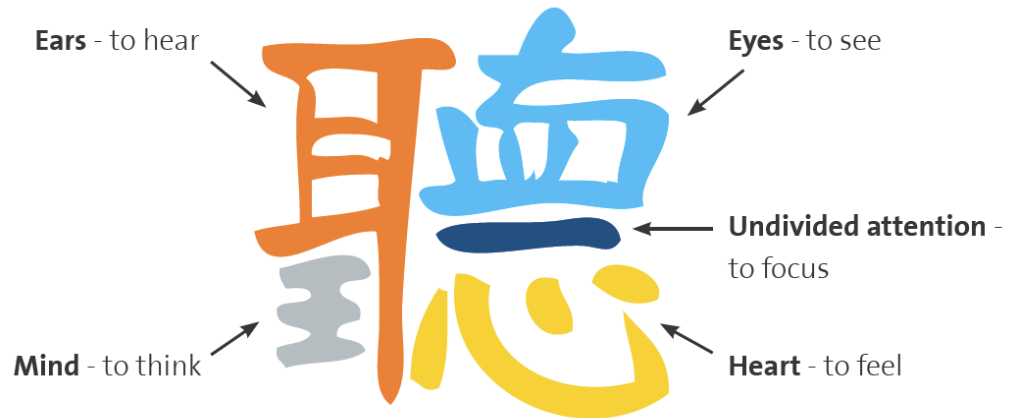
# Productive Noticing?

- Not all noticing is productive
- But what's considered productive?
- In my study,
  - Productive classroom practices that enhance or promote students' mathematical reasoning

# Productive Classroom Practices



Designing tasks that  
reveal student thinking



Listening and responding to  
student thinking



Reflecting about  
student thinking

# Key Questions

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# What teachers notice

Is an explicit focus for noticing useful to encourage more productive noticing, and if so, what kind of foci can be used?

# How teachers notice

How do teachers interpret and make sense of instructional details that leads to decisions that are productive with respect to enhancing students' mathematical reasoning?

# Why teachers notice the way they do

What are, if any, the changes in teachers' resources (mainly knowledge), orientations, and goals (ROGs) with respect to teaching for mathematical reasoning when they begin to notice more productively?

# Methodology

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# A Design-based Research

Singapore

3 schools: 2 Sec and 1 Pri

36 teachers

Lesson Study

Data Condensation

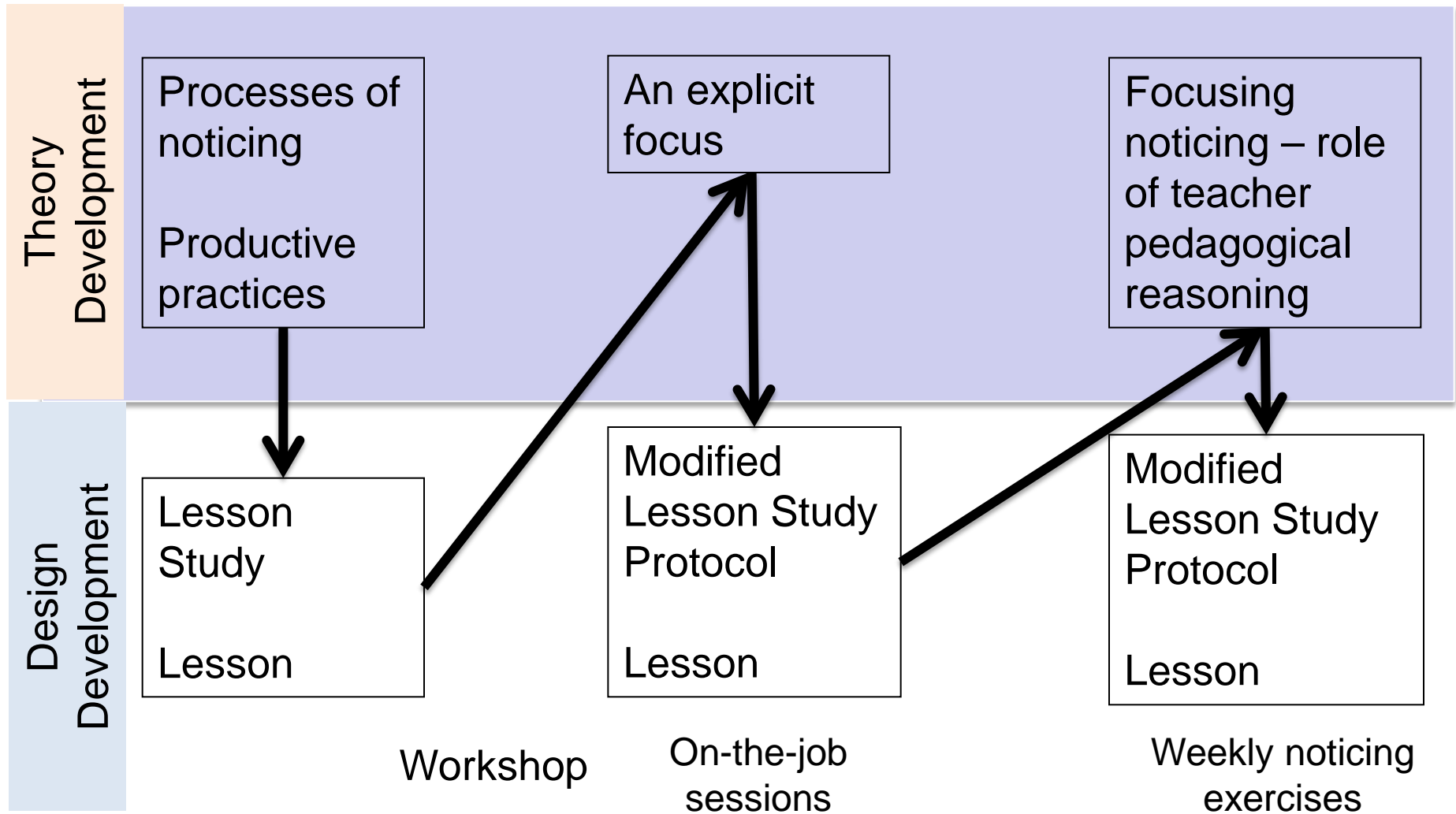
Episode Selection

Thematic Analysis



**Phase 1**   **Phases 2 and 3**

# Development of the FOCUS Framework



# The FOCUS Framework

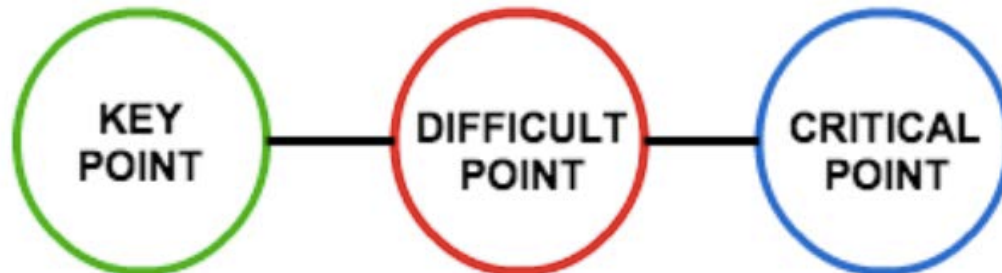
Focus and Focusing

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# An Explicit Focus

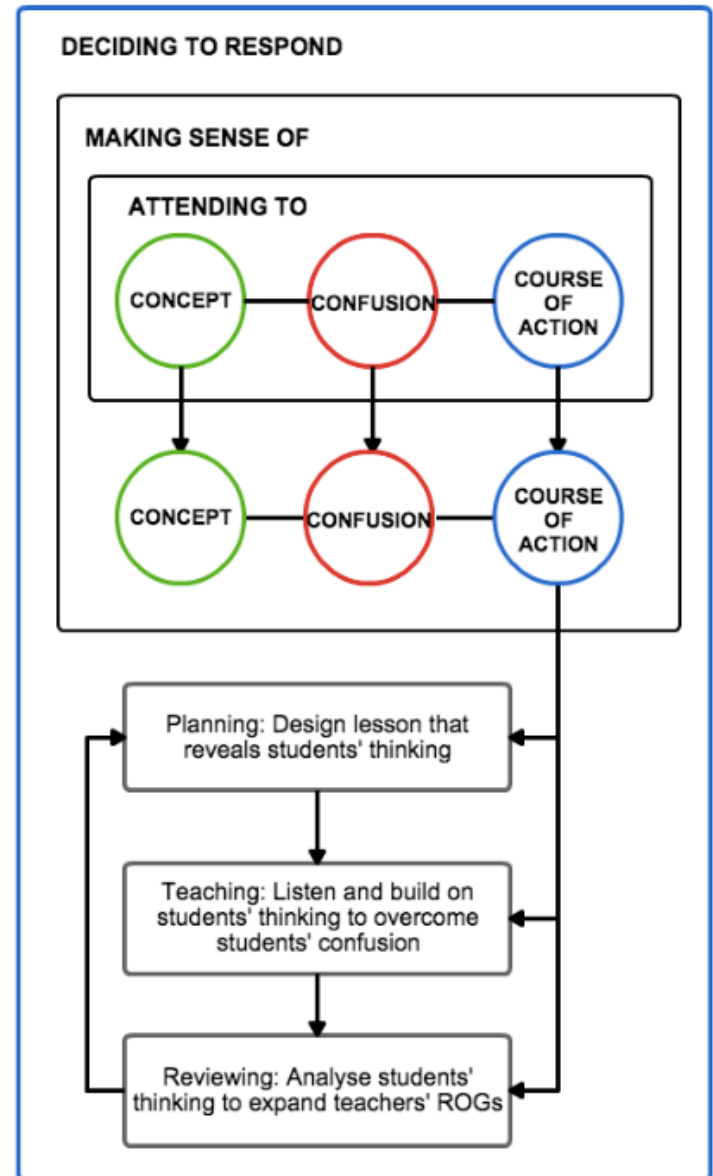
- Drawing on the Three Point Framework (Yang & Ricks, 2012)
  - Key Point: Concept
  - Difficult Point: Confusion
  - Critical Point: Course of action or response
- Alignment between the 3 focal points





# Focusing Noticing

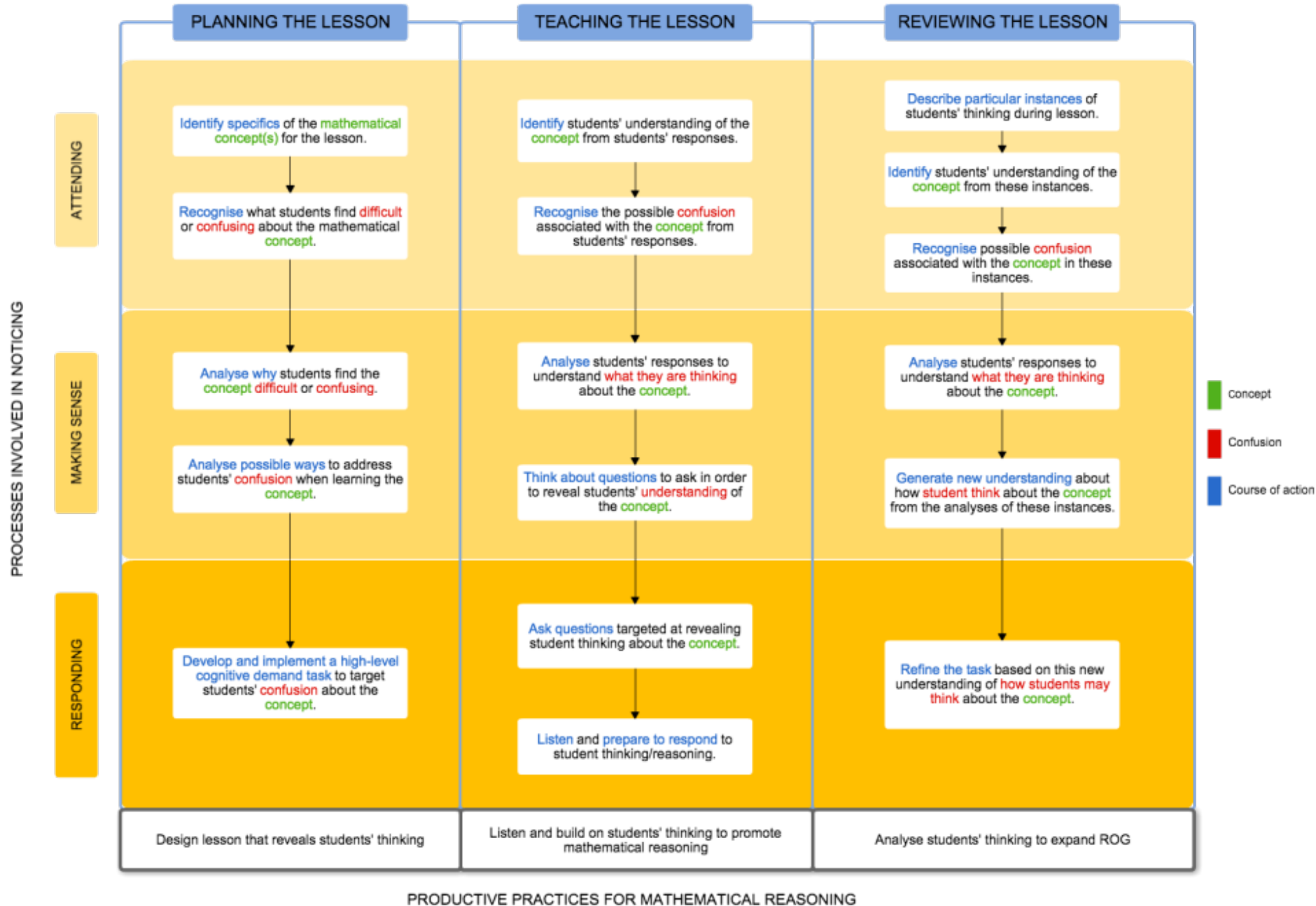
- Responding in a way that aligns the three focal points is not trivial
- Relies on the “making sense” component
- Pedagogical reasoning



# 'Bokeh' – Selective Focus



PROCESSES INVOLVED IN LEARNING FROM PRACTICE



■ Concept  
■ Confusion  
■ Course of action

# A close-up view

PROCESSES INVOLVED IN NOTICING

ATTENDING TO

MAKING SENSE OF

DECIDING TO RESPOND

## PLANNING THE LESSON

She **identified** the concept of **gradient** as "rise over run".

She **recognised** that students had problems **identifying the run** in a coordinate system.

She did not analyse why students have difficulties with **finding the run**.

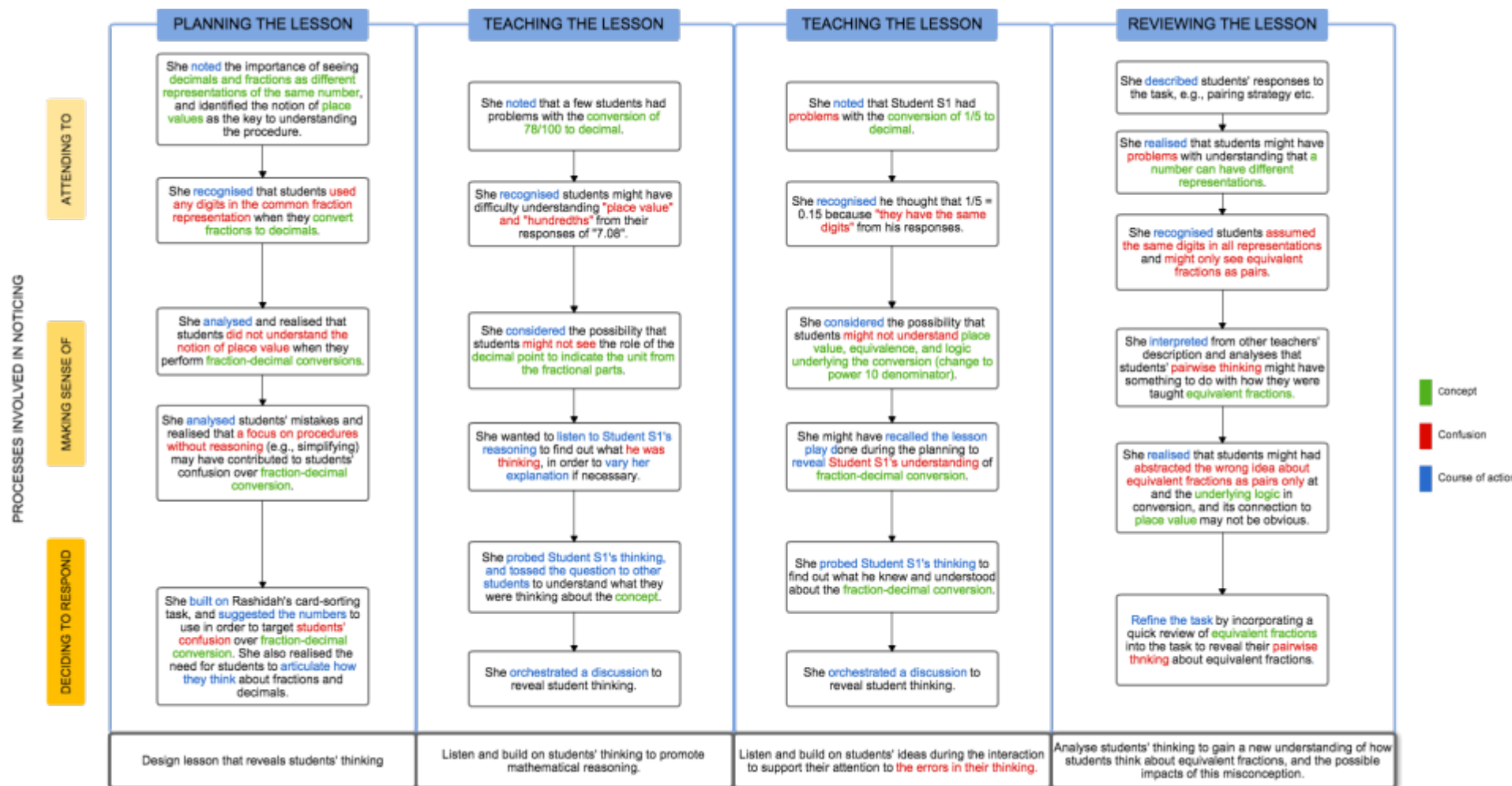
She did not understand why the concepts highlighted by Edwin were crucial for students' understanding of gradient.

She decided to spend "two to three minutes to teach about rise and run", without making reference to what was discussed about concept and students' confusion about the distances.

The lesson design did not address students' thinking

- Concept
- Confusion
- Course of action

# A wide-angle view



█ Concept  
█ Confusion  
█ Course of action



# Key contributions

- Characterise the notion of productive noticing
- The FOCUS Framework
- Extends the investigation of noticing to include planning (with teaching and reflecting)
- An extensive look at in-service teachers' noticing
- Productive noticing can potentially expand teachers' clusters of ROGs



# Implications for researchers

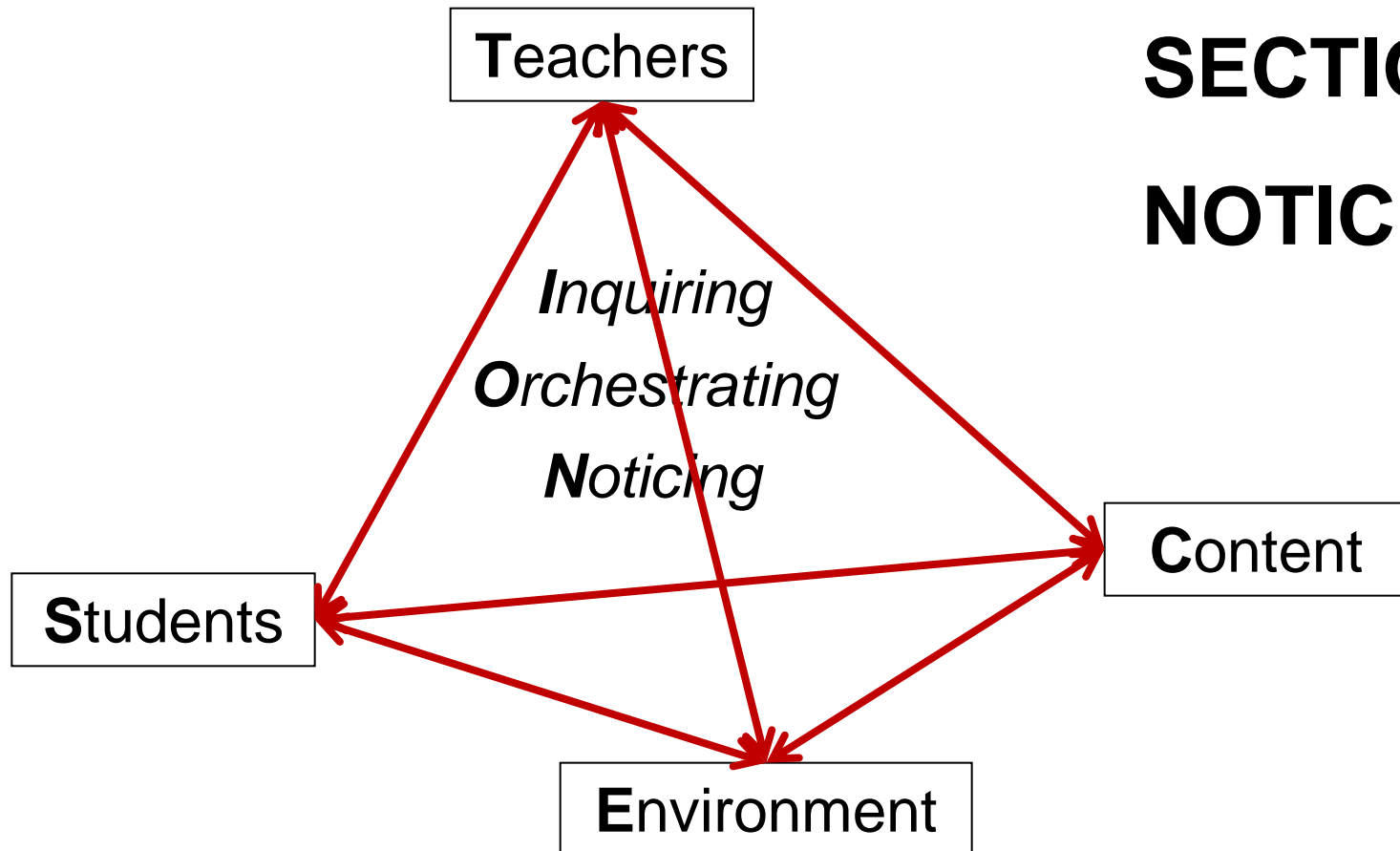
- Research tool to analyse teacher noticing
- Design considerations for planning professional development activities to enhance teachers' noticing expertise

# Implications for improving practice

- Productive noticing is highly consequential
- Reflection tool
- Has the potential to expand a teacher's ROGs (resources, orientations and goals)



# Future Research



**SECTION  
NOTICES**

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