

### Critical and Creative Thinking in Mathematics

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#### Source: Screenshot from <a href="https://www.youtube.com/watch?v=xPPaWTuoyzQ">https://www.youtube.com/watch?v=xPPaWTuoyzQ</a>



# **Session Objectives**

- Revise the Curriculum Capabilities and specifically, Critical and Creative Thinking
- Share a range of Critical and Creative thinking routines
- Provide examples of how to easily implement routines
- Motivate and encourage you to implement critical and creative thinking routines in your setting.
- AITSL standards addressed today: 2.1, 2.2, 2.5, 6.2

# Curriculum Capabilities and Gonski 2.0



#### Recommendation 7

"Strengthen the development of the general capabilities, and raise their status within curriculum delivery, by using learning progressions to support clear and structured approaches to their teaching, assessment, reporting and integration with learning areas."

Source: https://docs.education.gov.au/system/files/doc/other/662684\_tgta\_accessible\_final\_0.pdf

# **Curriculum Capabilities**



 The Victorian Curriculum F–10 includes capabilities, which are a set of discrete knowledge and skills that can and should be taught explicitly in and through the learning areas, but are not fully defined by any of the learning areas or disciplines.



- Responding effectively to environmental, social and economic challenges requires young people to be creative, innovative, enterprising and adaptable, with the motivation, confidence and skills to use critical and creative thinking purposefully.
- Explicit attention to and application of thinking skills enables students to develop an increasingly sophisticated understanding of the processes they can employ whenever they encounter both the familiar and unfamiliar, to break ineffective habits and build on successful ones, building a capacity to manage their thinking.

# Why did I develop a passion for Critical and Creative Thinking?



- Involve the learners in the process.
- Encourage problem solving and grappling with questions that have more than one answer
- Promote Mathematics as a broad, rich, subject area.



# Map of Understanding

Use these questions to shape your students' thinking!



Consider different viewpoints What's another angle? Reason with Evidence Why do you think so?

Make Connections How does this fit?

Wondering What am I

curious about?

UNDERSTANDING

Uncovering Complexity What lies beneath the surface?

#### Describe what's

there What do you see / notice?

Build Explanations What's really going on here? Capture the heart & form conclusions What's at the centre of this?

> Understanding Map Adapted from Culture of Thinking Project Harvard Project Zero Resources



### We Are Learning To – as questions.



# We Are Learning To – as questions.

- What are the Curriculum Capabilities, and specifically, Critical and Creative Thinking?
- Why should we promote Critical and Creative Thinking in Mathematics?
- What are thinking routines that promote critical and creative thinking? How can I implement these?
- AITSL standards addressed today: 2.1, 2.2, 2.5, 6.2



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#### WALT questions and encouraging curiosity

aths Inquiry What is data? How do we read graphs to Get information? uning in - We analysed graphs h groups. MISS C then asked us to represent What questions can we lata from a table. We chose ask about graphs? now to do it. We posed questions about each other's Our information isn't perfect YET because We are just learning how to do this







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# **Mystery Maths Jars**





## **Mystery Maths Jars**







# Maths reflections through Maths Tales

Maths Tales Independent Schools Kristin Humphreys Holifadili Aradio Aradili Aradilia 107111/10711/1/PU



#### **Excellent resource:**



How to Promote Engagement, Understanding, and Independence for All Learners

Search "Visible Thinking Core Routines" for excerpts.



#### Maths Tales Project



# USING THE WHEEL Classroom Thinking Activities





#### Chalk Talk













#### See Think Wonder



## See Think Wonder – 3D Shapes







## **Yellow Thinking Wheel**

CLASSROOM SKILLS SUB-ELEMENTS THINKING ACTIVITIES ELEMENTS Explanation Reflect Thinking about Game: observe Reflecting on thinking details & build Explain thinking and (metacognition) expectations (Project Zero, n.d) processes Check Process I used to think. Reflect on Now I think ... (Ritchhart et al. processes 2011, p. 154) Identify Transfer knowledge Seperate EL: into new Cooperative group problem solving cards contexts Smaller parts of int for Mathematics. E.g. Check the Clues Smaller ideas Transfer (Dunstan et al., 2014) nent Headlines: create a Apply "Headline" about learning o reflect on ideas. Enrich (Ritchhart et hing al,2011, p. 111) ing Think Board Claim, Support (Stroud, 2016) Question (CSQ) (Ritchhart et al., 2011, p. 191)





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#### **Check the Clues**







# Imagine possibilities and connect ideas

"Gee Whizz!" Prove it!" or "What makes you say that?"





# **Reflecting on learning**



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#### **Addition Headlines**





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# Integrating critical and creative thinking into the Mathematics classroom:



#### Benefits:

- Student ownership
- Deeper thinking relies on student ownership and sharing of ideas
- Deeper Mathematical learning
- Connections to lots of learning areas and external learning kids made these naturally
- Every lesson was rich with language and discussion
- Growth mindset I felt a shift in students' mindsets this was notable in discussions which moved to language like "I used to think... but now I think... and "A problem I had was..." or "A mistake we corrected was..."

# Integrating critical and creative thinking integration the Mathematics classroom:



#### Things to think about:

- How to teach thinking skills you must allocate adequate time
- Kids don't always love thinking deeply (particularly some bright students used to getting all the answers right)
- How will you record / honour their thinking?
- What will you need to implement this?



# Implementing in your classroom

Choose one lesson that you might teach next week.

- Choose a section of the wheel
- Create an idea or activity
- Share with a peer.

Things to think about:

- Will you assess this thinking? If so, how?
- What will you need to implement this?



# Reflection – Create a headline!



# Final thought...



#### Jo Boaler 🤣 @joboaler · 11h

- you cuber

Imagine if maths was taught as an art. Students would be invited to play and explore patterns & learn mathematical relationships, with no tracking, sorting or testing. We would replace fear with curiosity, equity & a love of all mathematical ideas. #Limitless





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