Australia's Journey: Integrating Computational Thinking, Data Science and AI in Mathematics

Curriculum Development and Policy Implementation in K-12

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Australian perspectives

Instructions: *Create map of earth with Australia at the centre*

"ChatGPT can make mistakes. Check important info."

Australian government policy sequencing

Computational thinking phase (<2020)

- – Digital Technologies curriculum introduced (nothing in mathematics)
- – Teachers developed in classrooms INFORMING standards
- – Professional learning infrastructure

Australian government policy sequencing

Computational thinking phase (<2020)

Curriculum Redesign (2020 – 2022)
- Australian Curriculum v9.0 development
- Consultation: educators, industry, academics
- Computational thinking integrated into mathematics
- Standards set BEFORE tools mandated

Australian government policy sequencing

Computational thinking phase (<2020)
Curriculum Redesign (2020 – 2022)

Development
- Australian Curriculum v9.0 (ACARA, 2022)
- Wide consultation: educators, industry, academics
- Standards set BEFORE tools mandated

In the curriculum (standards)
- Computational thinking embedded in Mathematics F-10
- Statistics & Probability includes data science concepts
- Explicit AI connections through Algebra, Space, Measurement
- Digital technologies curriculum
- Year 9 & 10 Data Science elective

Supporting Resources
- Cross-curricula links
- Digital Technologies Lesson Plans across subjects
- Mathematics Hub (curriculum resources)

A closer look: two State approaches

1. Pragmatic use

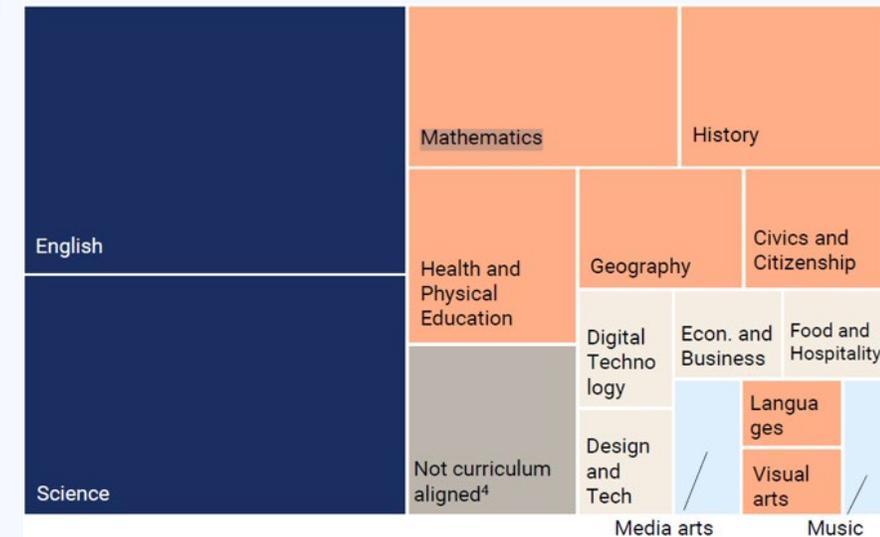2. Enacted mathematics i.e. mathematical modelling, computational thinking

1. South Australia: Pragmatic use

EdChat trial - Custom Educational Chatbot
    – Developed by SA Department for Education +
    Microsoft (2023)
    – Built on ChatGPT with enhanced safety
    features
    – Data stored in Australia, not shared with
    ChatGPT servers

Trial Results (secondary students):
    – 93% of student prompts curriculum-related
    – Students used it for:
    – alternative explanations of complex
    mathematics problems
    – practice quizzes with adjustable difficulty

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Examples of student use in mathematics:
- –"Explain this calculus concept differently"
- –"Quiz me on probability - start easy, increase difficulty"
- –Breaking down word problems

2. Victoria: enacted mathematics

Current approaches Mathematics
- Computer algebra system (CAS (>2010)
- Algorithmic thinking in curriculum (2015)
- Pseudocode and flowcharts (2024)
- Data Science in Statistics strand (2024)

Cautious Approach to AI:
- Victorian Curriculum v2.0
  - Computational thinking in Mathematics F-10
- GenAI Policy (June 2024)

Computational thinking approaches involve experimental and logical analysis, empirical reasoning and computer-based simulations.
Computational thinking skills provide students with a strong foundation for understanding and working with digital tools including AI systems, as part of a mathematical problem-solving process, preparing them for future career pathways in AI development, data science, engineering and other STEM related fields (ACARA, 2022).

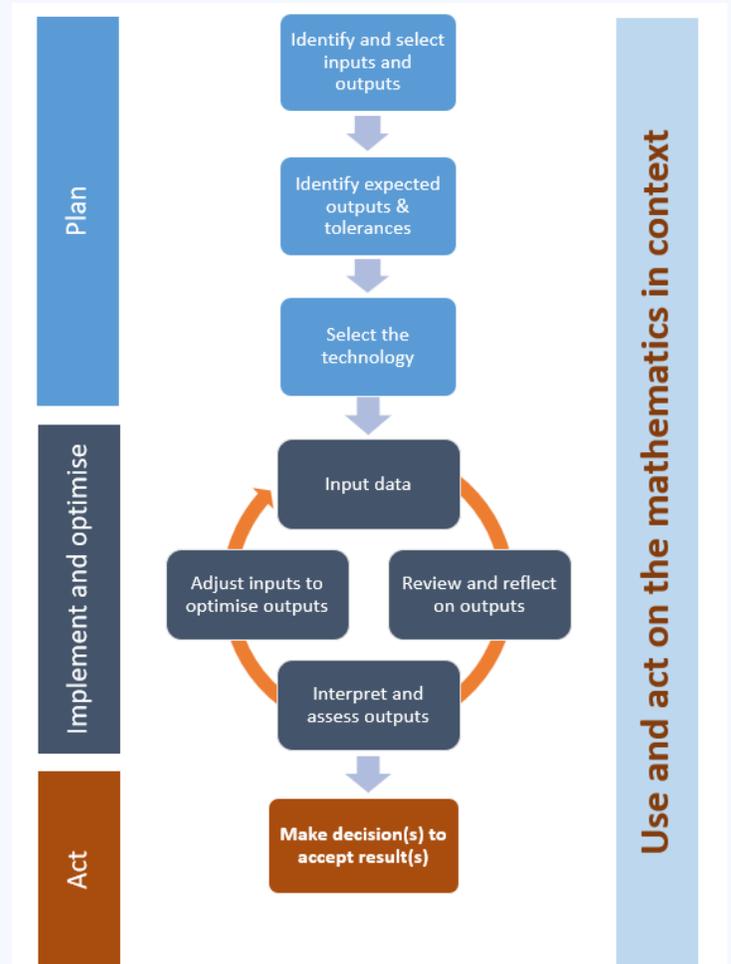# 3. Victoria: Vocational mathematics

First attempt nationally to explicitly integrate systems thinking and data science – "Systematics"

– Non-academic

– Final 2 years of school

– A curriculum aimed at utilizing technology to solve real world mathematics problems

Focuses on:

– Understanding and use of systems and processes

– Includes: scheduling, planning, organizing data using technology

– Applied contexts: personal organizers, scheduling apps, work placement calendars

– Teaches how systems interact with data (automation, digital workflows)

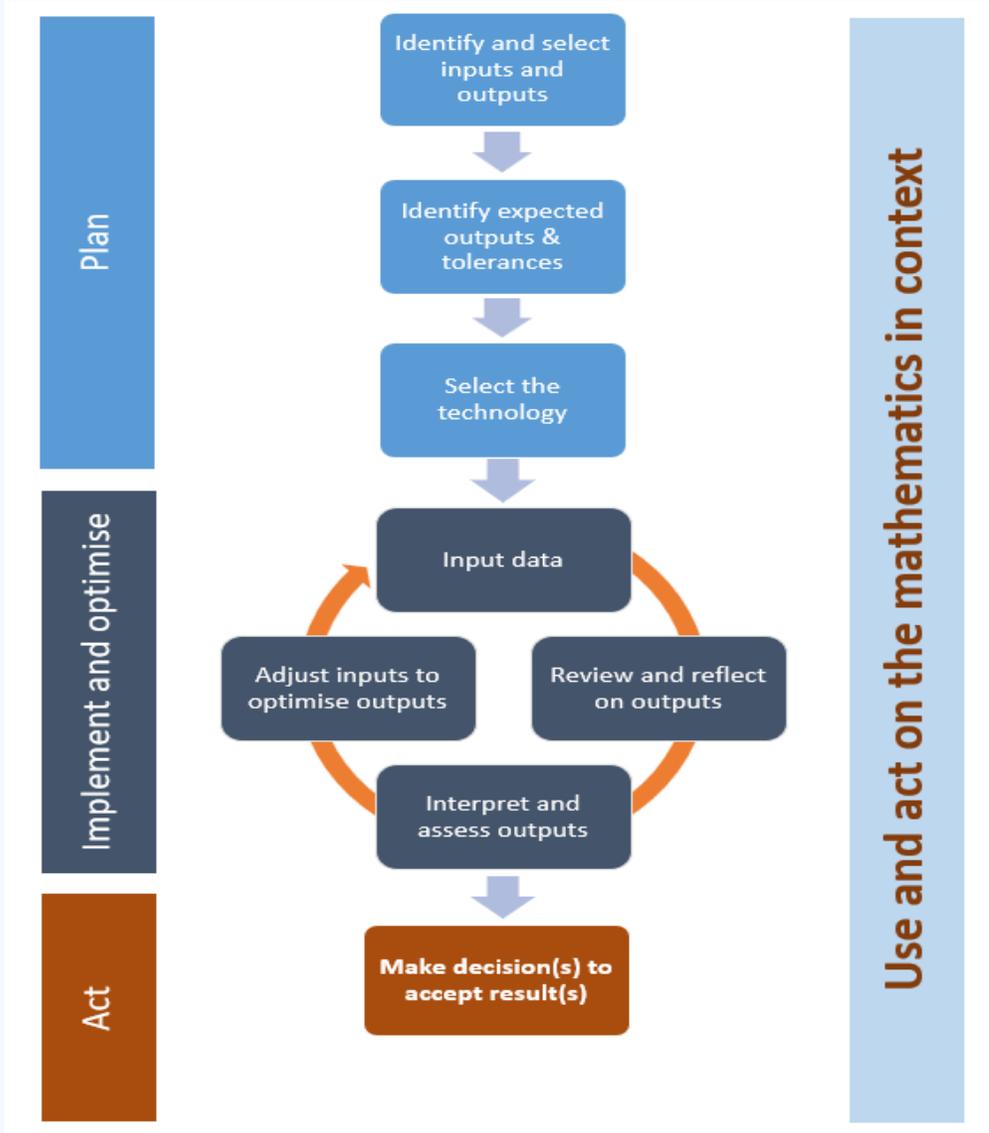*Curriculum Development and Policy Implementation in K-12*

3. Victoria: Vocational mathematics

Significance: Embeds computational/systems thinking in vocational mathematics education

Prepares students for automated workplace systems

Current challenges for Australia (2026-2028)

Policy

- School and system wide policy coherence
- Policy dissonance across the States and Territories

Curriculum

- Curriculum frameworks and supports
- Statistics strand currently includes data science + AI (insufficient time)

Teachers' capacity:

- How to use AI
- Data literacy
- Types of tools and systems
- Responsible use
- Mathematical applications

Future directions for Australia

Mathematics curriculum Review 2027

Policy Priorities

- National framework and consistency in approaches especially to AI
- Professional learning for teachers
- Equitable technology access
- Re-focus to "understanding" the mathematics

Future Curriculum Priorities

- Dynamic simulations using real-world data
- Emphasise understanding over calculation
- Explicitly include Data Science
- Teach critical data literacy
- Integrate systems thinking

in K-12

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Questions and thank you

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Australian framework for generative AI in schools

Australian Curriculum and Assessment Authority

Computational thinking in the Australian mathematics curriculum

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