Computational Thinking to Artificial Intelligence – Understanding how computers think to make computers seem to think like humans

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AI and coding (Jensen Huang, NVIDIA)

AI Overview

Yes, NVIDIA CEO Jensen Huang made waves by stating that the need to teach coding or learn traditional programming languages is essentially ***over****.*

The Core Philosophy

Programming in Plain English: Huang argues that AI acts as a universal programmer. Because AI can generate code, human communication (prompting in natural human language) replaces the need to manually type syntax-heavy languages like Python or C++.

The "Technology Divide" is Closed: He believes AI has democratized software development, making everyone a programmer without needing a computer science degree.

Focus on Domain Expertise: Instead of focusing on how to code, Huang urges students to focus on domain expertise—such as biology, education, farming, or manufacturing. The ultimate value now lies in understanding the specific problem you are trying to solve and using AI to execute it.

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AI and coding

What the Tech World Thinks

While Huang's viewpoint is highly influential, it has sparked plenty of debate:

The Critics: Many educators and software engineers argue that learning to code is still vital for developing computational thinking, logic, and a deep understanding of software systems.

The Nuance: Many industry leaders clarify that while the barrier to entry has lowered, professionals who can understand what the AI is writing, troubleshoot, and build complex system architectures remain in high demand.

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Working Definition based on Stephens and Kadijevich (2020)*

- *Computational Thinking* (CT) consists of the four components: decomposition, abstraction, algorithmisation, and automation.
- *Algorithmic Thinking* (AT) consists of decomposition, abstraction, and algorithmisation.
  - AT is one form of mathematical reasoning, required whenever one has to comprehend, test, improve, or design an algorithm.
- Putting the two descriptions together, we have that *CT* is thus "*AT* with a computer".

* Stephens, M., & Kadijevich, D. M. (2020). Computational/Algorithmic Thinking. In Lerman, S. (Ed.), Encyclopedia of Mathematics Education (pp. 117–123). Springer.

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Royal Society description of CT*

- The Royal Society (RS, 2011) describes CT "as enabling persons to recognise aspects of computations in various problem situations, and to deal with those aspects, by applying tools and techniques from computer science" (p. 377).

* RS. (2011). Shut down or restart? The way forward for computing in UK schools. The Royal Society. https://royalsociety.org/~/media/education/computing-in-schools/2012-01-12-computing-in-schools.pdf

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PM Lee Hsien Loong at the Smart Nation Launch (24 Nov 2014)

- "We need the right organisations, the right skills, the right mindsets to be a Smart Nation.
- We have to start with our education system.
- We are equipping students with up-to-date knowledge and skills to use the technology.
- But schools must also teach students how to create the technology of the future;
  - teach them to code,
  - to prototype and build things,
  - to fail fast and learn quickly,
  - to use the latest gadgets, the latest tools and be up with the latest technology."

https://www.pmo.gov.sg/newsroom/transcript-prime-minister-lee-hsien-loongs-speech-smart-nation-launch-24-november/

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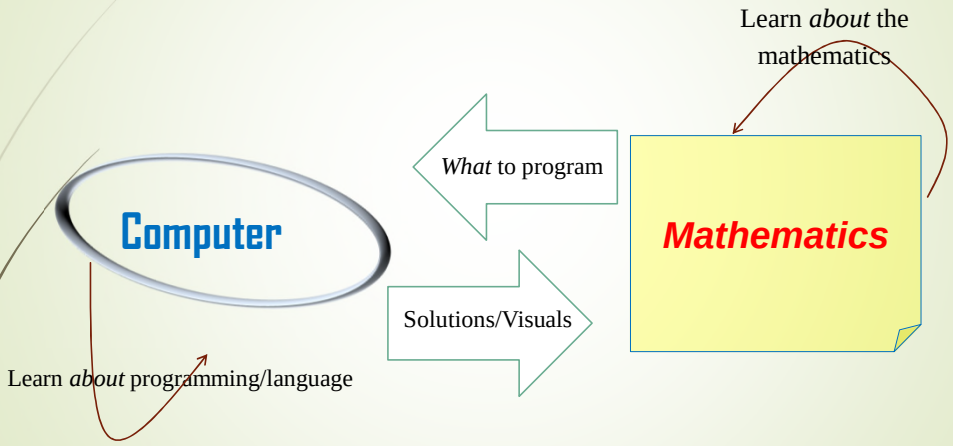
Infuse CT as a tool in Maths Education



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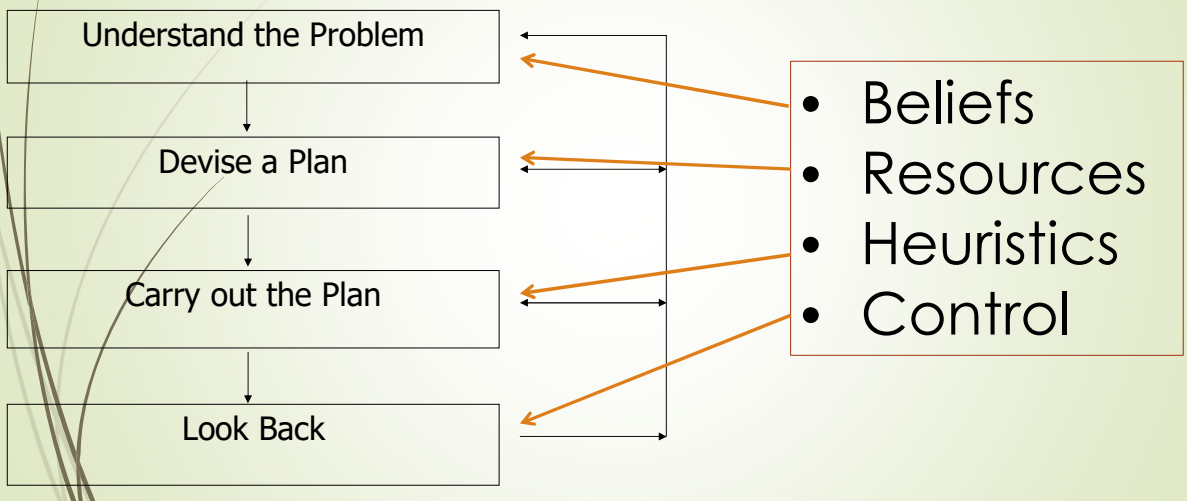
Polya's 4-stage Problem-Solving model with Schoenfeld overlay



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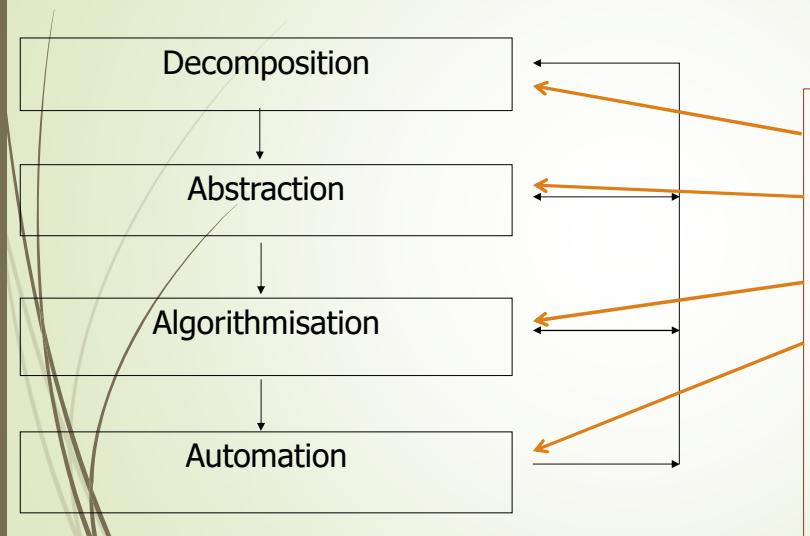
Polya-like 4-stage CT model with Schoenfeld overlay



- Beliefs
  - Fail fast, learn quickly
- Resources
  - Loop, conditional, data structure
- Heuristics
  - Pattern recognition
  - Generalisation
- Control
  - PRIMM

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Water Recycling

Speech By Mr Lim Swee Say, Acting Minister For The Environment And Minister Of State For Communications And Information Technology At Changi Water Reclamation Plant Ground Breaking Ceremony At 10am On 25 May 2001 https://www.nas.gov.sg/archivesonline/data/pdfdoc/2001052507.htm

This combination of 'adding' to and 'multiplying' of our water capacity is a highly promising and effective approach in sustaining adequate water supply for the long term.

To illustrate, if we increase the supply of fresh water by 20% and at the same time reclaim 30% of the used water, we will be able to increase our total water capacity by as much as 70%!

Yes, it is possible to achieve an increase of 70% in water capacity with an increase of only 20% in water sources, if we are able to capitalise on the combine [sic] effect of supply expansion and water reclamation.

- Explain Mr Lim's calculation.

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