A Digital Decade of Technologies PD: What We Have Learned and Where to Next.

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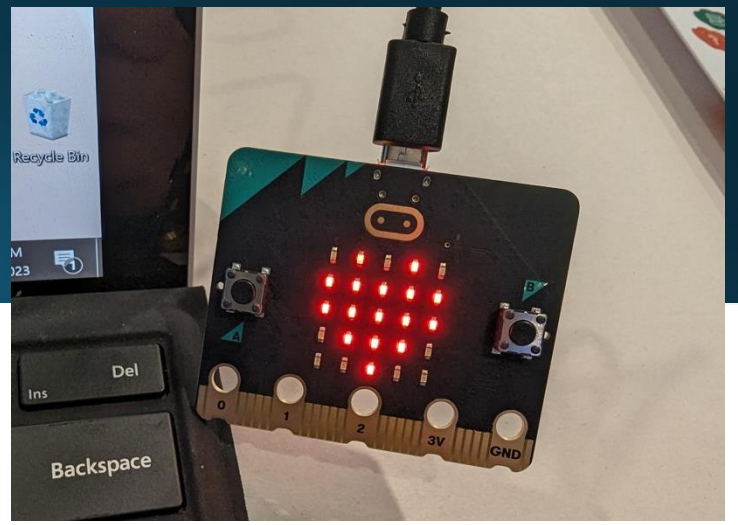
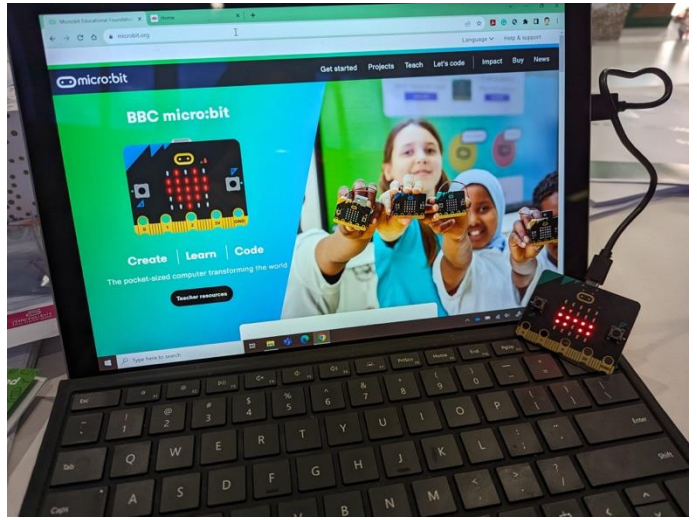
School of Education, University of Newcastle

AARE 2025

Overview



- The program: Coding & STEM 4 Schools (CS4S)
  - Professional learning (PL) events run on campus at the University of Newcastle
  - Focused on supporting teachers with the implementation of the Digital Technologies curriculum
- How we improved the events over the last 10+ years
- What we've found from designing and running the workshop
- What we think is next in technologies PL



Team

Dr Daniel (Dan) Hickmott

Dr Katie Waters

Prof. Elena Prieto-Rodriguez

+ Many other academics, research assistants, admin staff and teachers that have presented at our events, contributed to running workshops, or helped behind the scenes.

Digital Technologies in NSW

Syllabus	Year Levels
Science and Technology	K-6
Technology	7-8
Computing Technology	9-10
Enterprise Computing	11-12
Software Engineering	

The CS4S Program

- 2013, started with the Google's Computer Science (CS) 4 High School grant that Elena received

- Initial focus was on technology teachers of years 9 – 12
  - showcasing different tools for teaching CS
  - career opportunities for their students

- As we ran the workshops through the years and DT curriculum was endorsed in 2015, focus and audience was broader – supporting teachers at all levels (K-12)

- NESA – Majority of Professional Development workshops / conferences were NESA accredited – this was vital

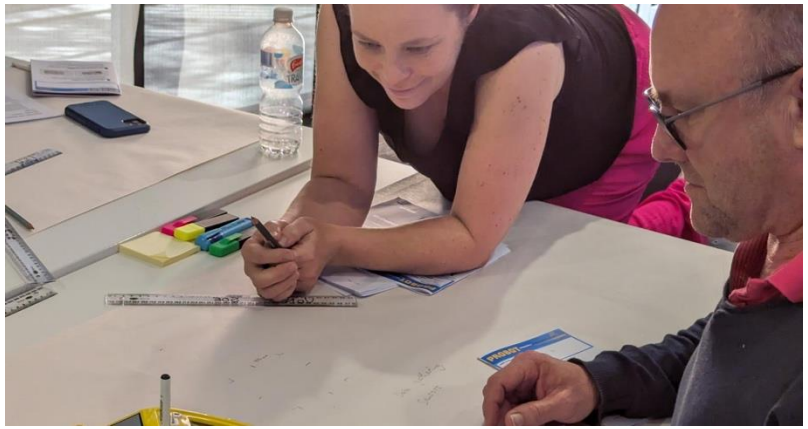
Program evolution (2013-2016)

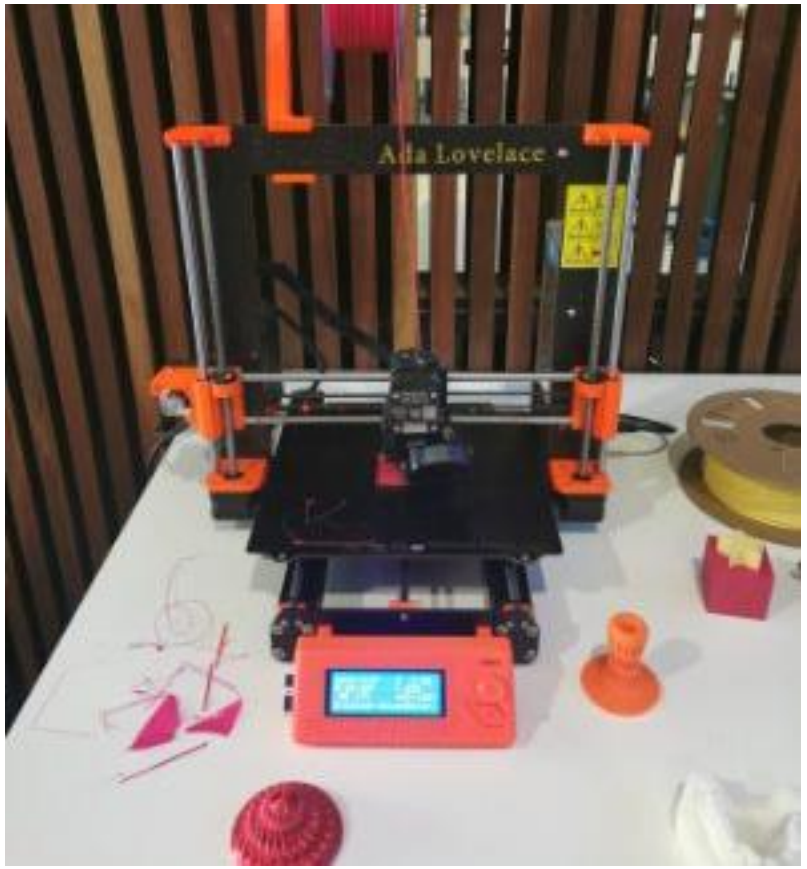
Year	Events
2013	3-day workshop
2014	2-day workshop
2015	2-day workshops: • Introductory • Advanced
2016	2-day workshops: • Primary school • High school


Google
K-6 STEM

Program evolution (2022-2024)

Year	Events
2023	**2-day STEM conference / Workshops** **Day 1** • Introduction – STEM Education – An integrated approach • Microbits for beginners • Microbits for Maths, Science & Literacy **Day 2** • Introduction – Experiential Learning & Unpacking K-2 Maths Syllabus • Robotics for beginners • Creative coding – linking to the 2024 K-2 Maths syllabus • Procedures in programming – how to? • Using sensors (lights, touch, sound) to navigate a device • Stop Animation • Tinkercad • 3D printing




Ada Lovelace


MY DAD IS A ROBOT
how to CODE a rollercoaster
how to CODE a sandcastle
Pippa and Drônie
ONCE UPON A TIME ONLINE
Swoosh, Glide and Rule Number 5
THE GREAT DIVIDE
IF THE WORLD WERE 100 PEOPL

2023

Program evolution (2022-2024)

Year	Events

2024	**2-day STEM conference / Workshops**
	Day 1
	• Introduction to 2024 Syllabus
	• Microbits
	• Scratch Jr
	• Scratch 3.0
	Day 2
	• Filming: iMovie
	  • Animations | Stop Motion
	  • Green Screening
	  • Do Ink
	  • iMovie templates
	  • Digital Story Telling
	• Movie Time

Research and feedback

- We used surveys, interviews and focus groups to capture feedback and suggestions for improvement at each event
  - Strong positive feedback throughout the years

- Main approach for feedback and evaluation was through pre and post surveys, program satisfaction and rating usefulness
  - Some open-ended questions

- Started using the TSECT instrument - Teachers' Self-Efficacy in Computational Thinking (Bean et. al, 2015) as a measure for understanding the impact of programs

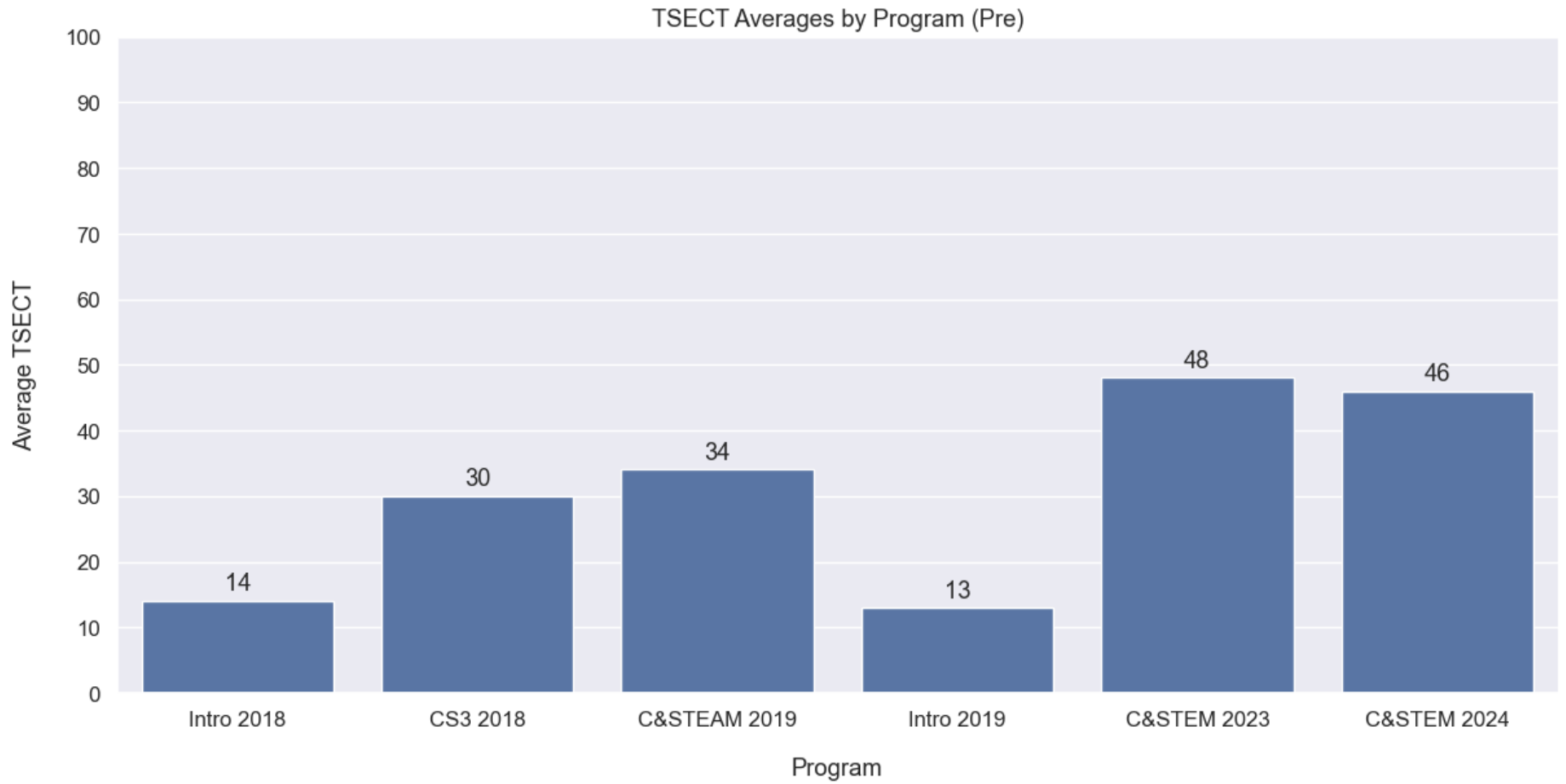
Teachers Self-Efficacy in Computational Thinking (TSECT

- An instrument that we adapted, had 14 items, first 8 of them were aligned with computational concepts as defined by Brennan and Resnick (2012)

Item		Wording
I can teach students to write programs that …		
1	execute a step-by-step sequence of commands	
2	uses loops to repeat commands	
3	respond to events like pressing a key on the keyboard	
4	do more than one thing at the same time	

- All items used a 100-point scale where: 0 = cannot do, 50 = moderately I can do, 100 = highly certain I can do. Summarised as a score between 0 - 100

What we found – teachers' self-efficacy



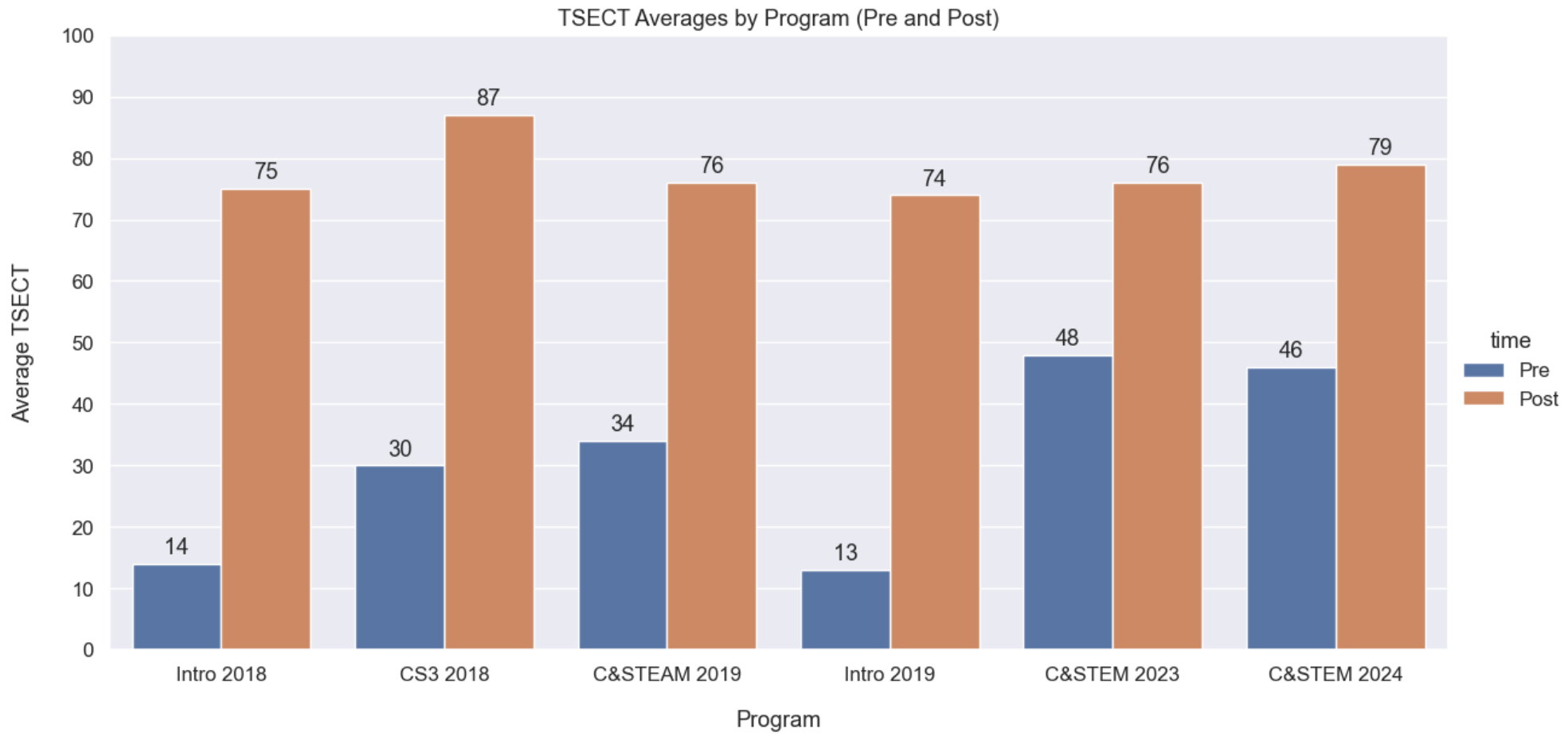
What we found – teachers' self-efficacy

So, I don't think I really had any sort of conscious experience prior to the course, and if someone had said to me prior, 'Okay, we want you to teach coding' I would have probably just hid in the corner. (Letitia*, Coding in Stage 3 - 2018)

I think…. for myself and…. for most people, the challenging thing is it is not feeling confident in my own abilities with understanding…. the language of it. (Remy*, Coding in Stage 3 - 2018)

*pseudonyms

What we found – teachers' self-efficacy gains



What we found – teachers' self-efficacy gains

"I knew absolutely nothing about coding before completing this program. I now feel confident and inspired to include teaching coding in a variety of KLA's." (Inger*, Coding in Stage 3 - 2018)

*pseudonym

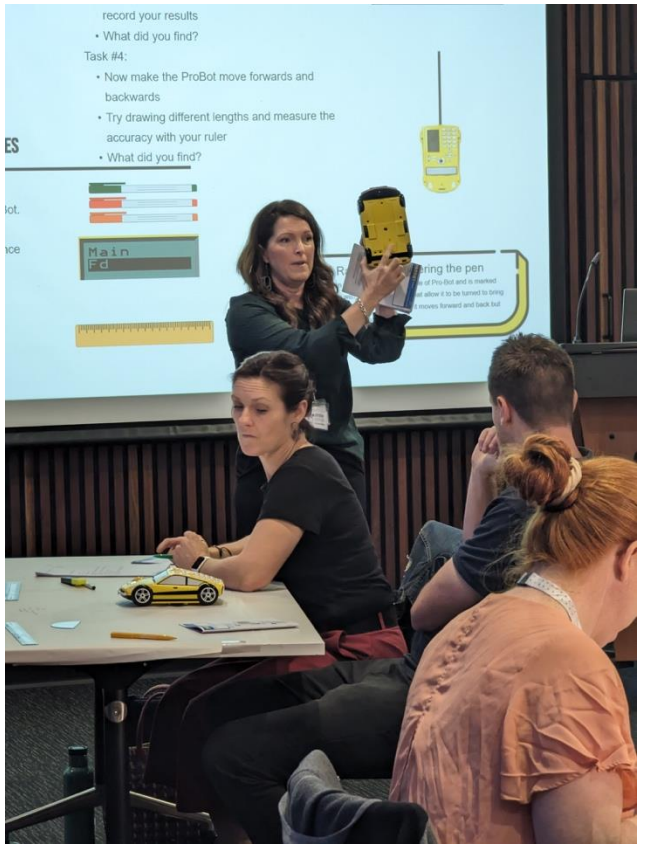
What we found – time

- Challenging to find a time that works for everyone

- Teachers spent personal time on completing courses, self-directed learning related to Coding & STEM:

> *You certainly spend a lot of your own personal time getting it all ready. There's no way you can do all of that in the normal amount of time you have here at school.* (Alicia*, Coding in Stage 3 - 2018)

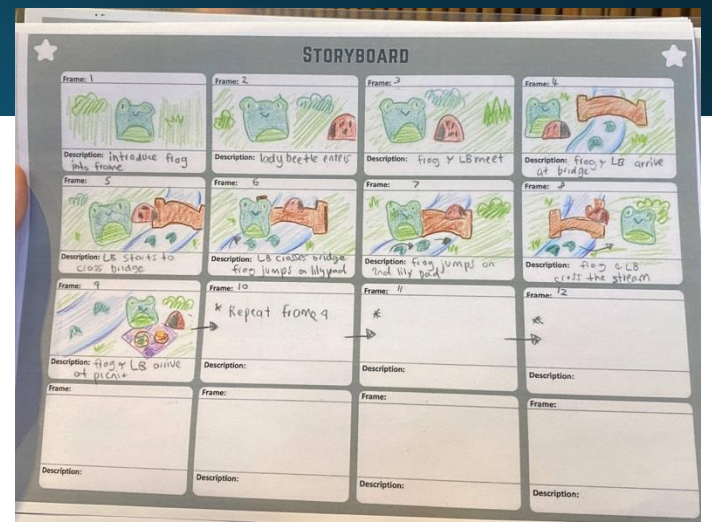
- Importance of integration – some teachers saw opportunities to 'tick off' boxes from different syllabuses in Coding lessons to save time

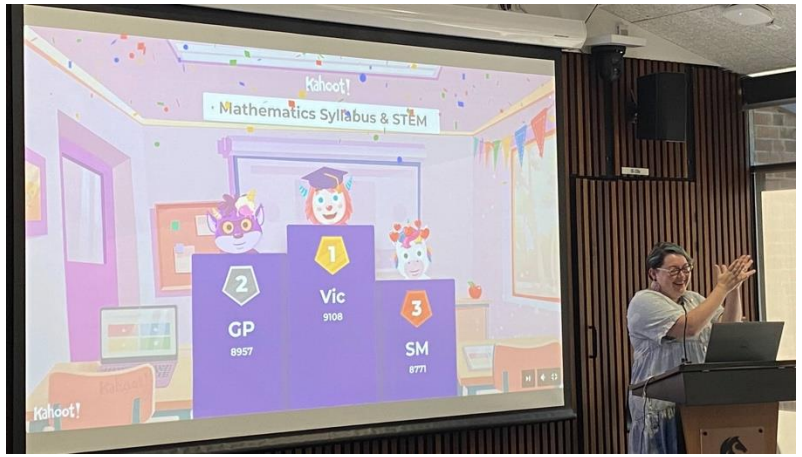


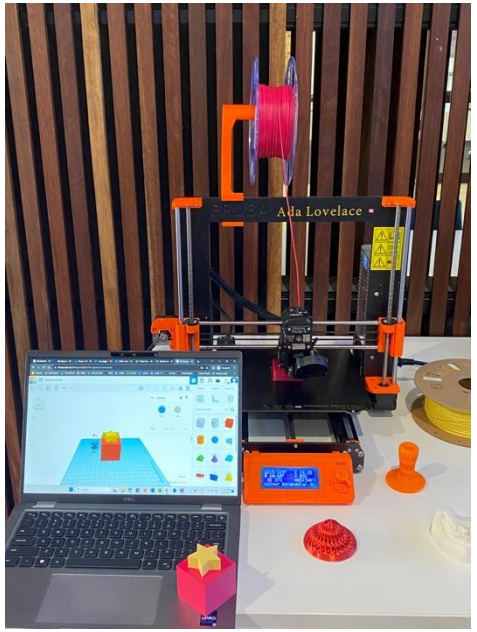
* pseudonym

What we found – practical resources

- Teachers valued practical resources that they could use in their classroom with minimal effort
  - Reduced talks, increased the hands-on activities
- ‘Unplugged’ resources were helpful, particularly for K-6 teachers
  - csunplugged.org
- Collaborative unit planning sessions were well received and good opportunity for teachers to work together







Teachers' voices and reflections

- Appreciation for ongoing mentoring and resource access.

- Value of professional community and peer learning.

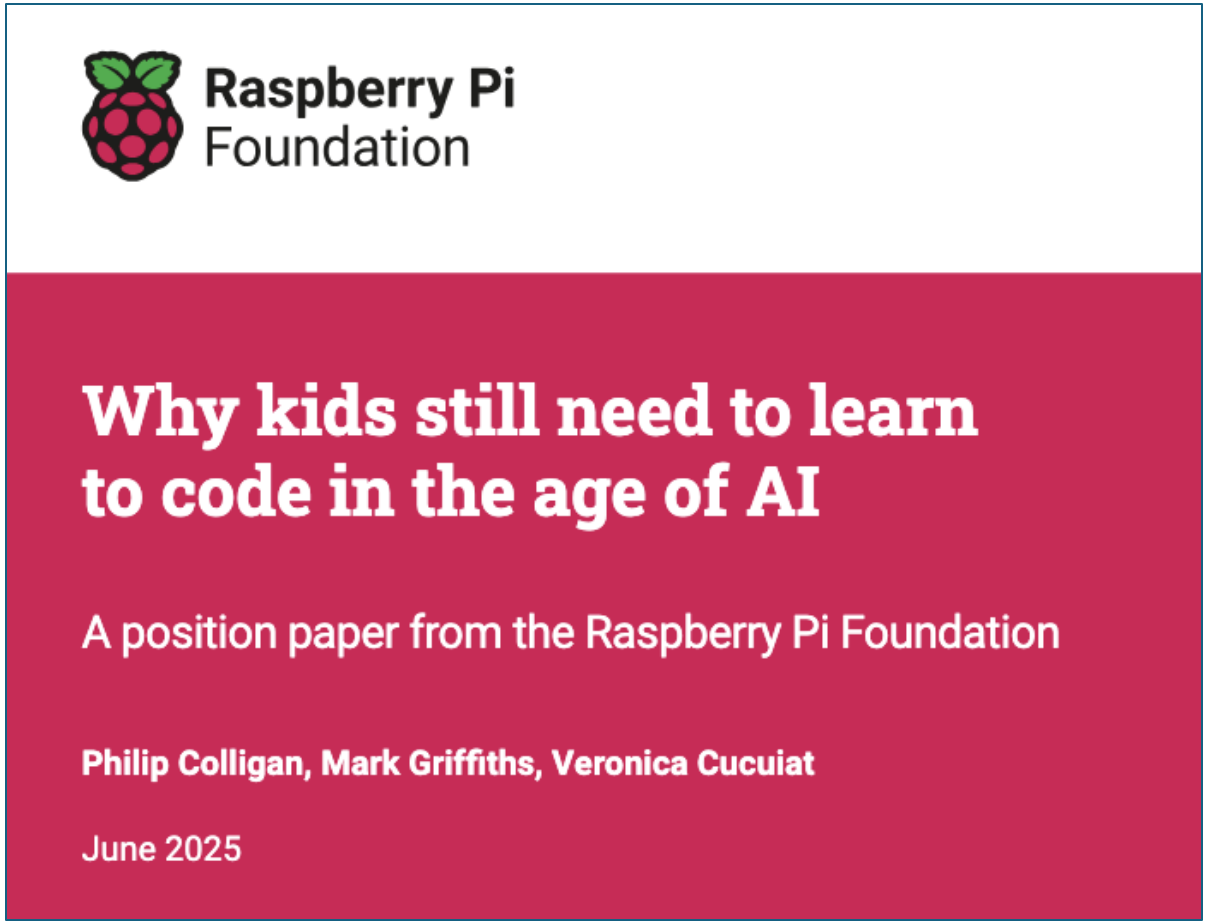
'Thank you for all your advice and help this professional development was key for me as I am developing a coding and robotics courses within our school's context and was struggling with how to get started. You have made me realise how fun, engaging and easy the process will be. Thank you!' (2023 participant)

'Fun and interesting workshop. Would love to bring more staff back to upskill and inspire them in practical ways to integrate technology into the classroom.' (2024 participant)

Where to next?

- Focus on future priorities: AI literacy, data fluency, sustainability.
- Evolving PD models: scalable, embedded, and flexible.
- Equity, access, and teacher agency remain key themes.
- Collaboration for the next digital decade.

Where to next



(Link to online article with paper)

Resources

- hckmd.com/cs4s
  - Resources
  - Research
  - Tools
- cs4s.github.io/resources
  - Activities
  - Program schedules

hckmd.com/cs4s

References

- Bean, N., Weese, J., Feldhausen, R., & Bell, R. S. (2015). Starting from scratch: Developing a pre-service teacher training program in computational thinking. *Proceedings - Frontiers in Education Conference, FIE, 2014*, 1–8. https://doi.org/10.1109/FIE.2015.7344237

- Brennan, K., & Resnick, M. (2012). New Frameworks for Studying and Assessing the Development of Computational Thinking. *Proceedings of the 2012 Annual Meeting of the American Educational Research Association*, Vol. 1, Vancouver, 13-17 April 2012 http://scratched.gse.harvard.edu/ct/files/AERA2012.pdf