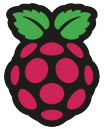
Engaging primary (K-5) computing teachers in culturally relevant pedagogy through professional development

October 2023
#RPFSeminars



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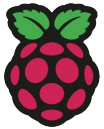
About our research centre and work to date



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Culturally Relevant Pedagogy for Computing

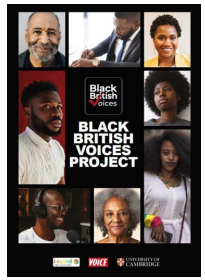
“The aim of the Centre is to increase our understanding of teaching and learning computing, computer science, and associated subjects, with a particular focus on young people who are from backgrounds that are traditionally under-represented in the field of computing or who experience educational disadvantage.”

www.computingeducationresearch.org

Why look at culturally relevant pedagogy (CRP)?

- 13% attainment ‘gap’ between the likelihood of white students and students from BAME backgrounds getting a 1st or 2:1 degree (Black, Asian and Minority Ethnic Student Attainment at UK Universities, published May 2019)

- 95% of respondents believe the UK’s curriculum neglects Black lives and experiences (Black British Voices report, published Sept 2023)



- Equity approaches also extend to social class, and schools must do more to challenge unconscious bias against children from working-class backgrounds (Elliot Major, 2023)


Social mobility

Warning over unconscious bias against working-class pupils in English schools

Social mobility expert says mindset in many schools requires children to be 'middle-class clones' to succeed

Sally Weale

https://www.theguardian.com/society/2023/oct/03/warning-unconscious-bias-working-class-pupils-schools-england

Why look at CRP in computing?

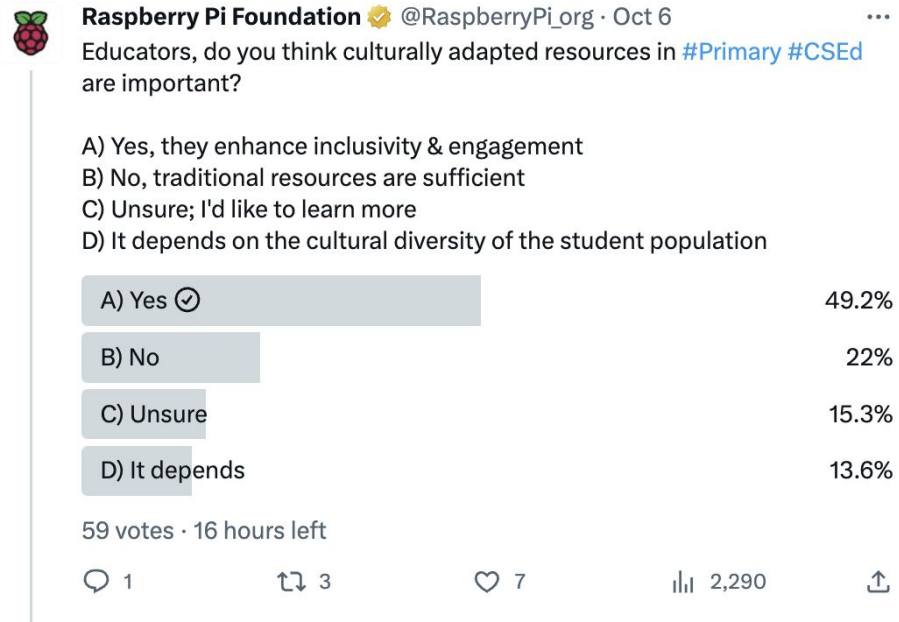
Since 2014, all children should be taught computing in England

2021 - 19% of IT specialists identified as female (BCS)
2021 - 3% of Tech workers identified as Black (Hired data)
2020 - 22% of CS undergraduates identified as female (UCAS)
2020 - 15% of CS A level students identified as female (Ofqual)
2020 - 21% of CS GCSE student identified as female (JCQ)

Fewer female, Black and ethnic minority students and workers in the CS field
(e.g. Kemp, 2019, UK Tech Workplace report)

What do teachers and educators think?

LinkedIn



X / Twitter

Culturally Relevant Pedagogy for Computing

2021

- Initial project to develop a set of guidelines (researchers and teachers working together) rpf.io/crp-guide

2022

- Operationalising the guidelines into 10 Areas of Opportunity to prompt teachers to reflect on how to adapt teaching to be culturally relevant to learners
- Study with 19 teachers (primary and secondary)

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Culturally Relevant Pedagogy in the Computing Classroom

Summary of our work so far

- Watch a video about culturally relevant pedagogy in the classroom
- Look at a poster from our research
- Use the guidelines that were created by researchers and teachers
- Read a review of the research about CRP
- Read our open-access paper about computing teachers' culturally responsive classroom practices

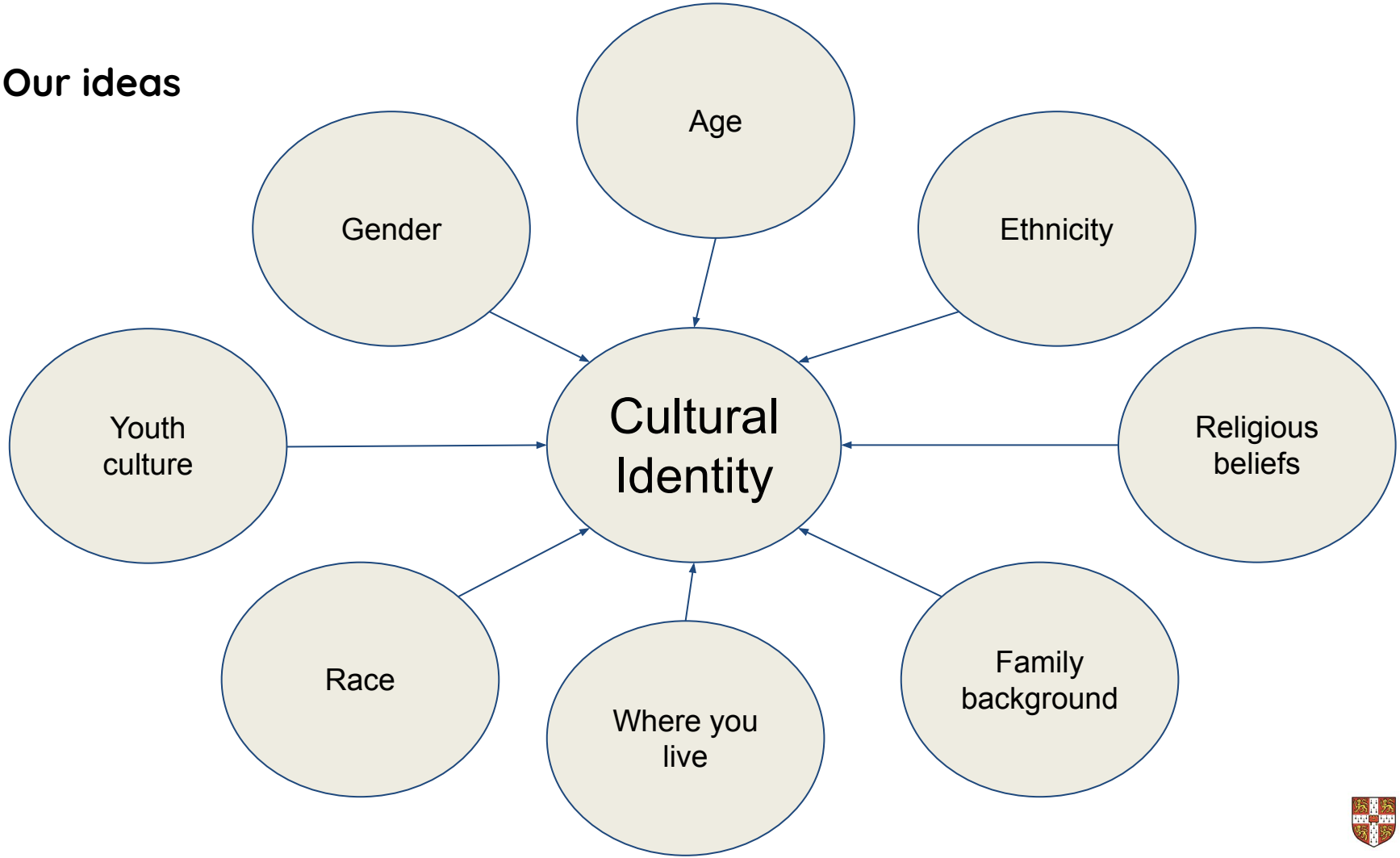
Introduction activity

What contributes towards your cultural identity?

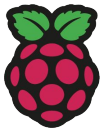
Please type your answers into the chat

They can be one or two words, or maybe a short phrase

Our ideas


Age
Gender
Ethnicity
Youth culture
Cultural Identity
Religious beliefs
Race
Where you live
Family background

About this study



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Who worked on this research project

Hayley Leonard

Katharine Childs

Jane Waite

Bobby Whyte

Sue Sentance

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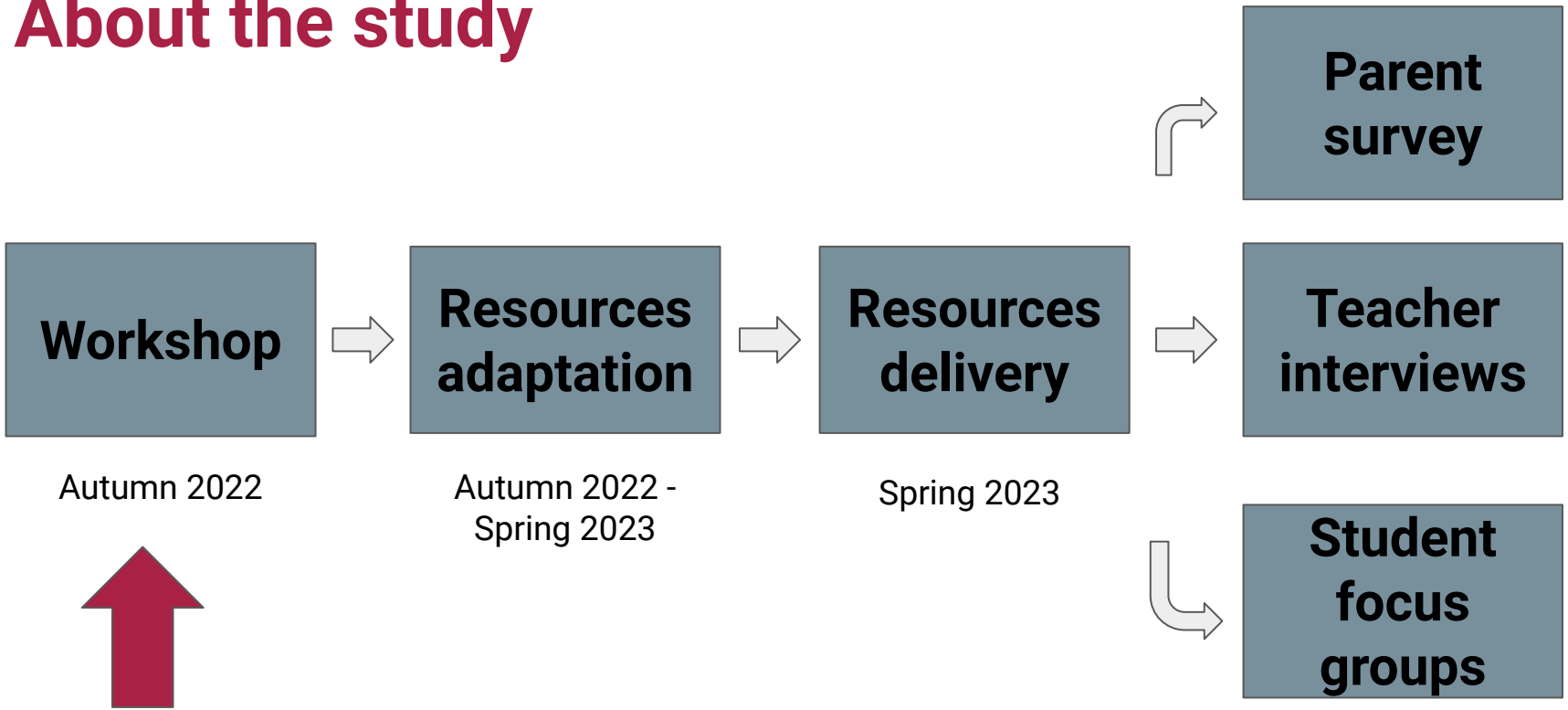
Other project members during the year: Bonnie Sheppard, Lynda Chinaka, and Andrea Kocis.

Thanks to Cognizant for funding this project

cognizant

About the study



Culturally relevant and responsive theory

- Introduced by Ladson-Billings (1995)
- Three fundamental pillars
  - academic achievement
  - cultural competence
  - critical consciousness
- Culturally responsive teaching (Gay, 2000) and computing (e.g Scott et al 2010)
- Localising in England (e.g. Leonard and Sentance, 2021)

Equity education initiatives in England

	Multicultural education	Social justice education	Culturally relevant pedagogy
Focus	Celebrating diversity	Recognise, interrupt and dismantle existing biases within the education system	Recognise that the education system is not culture-neutral and systemic biases may cause learners to underachieve or be marginalised
Aim	Create positive interactions across differences to promote social harmony	Develop learners' critical consciousness towards social and educational inequity	Incorporate learners' cultures and experiences into the curriculum
Examples in England	**Ofsted Equality, Diversity and Inclusion Statement** **British Values**	**Decolonising the curriculum**	**Areas of Opportunity for adapting computing resources**

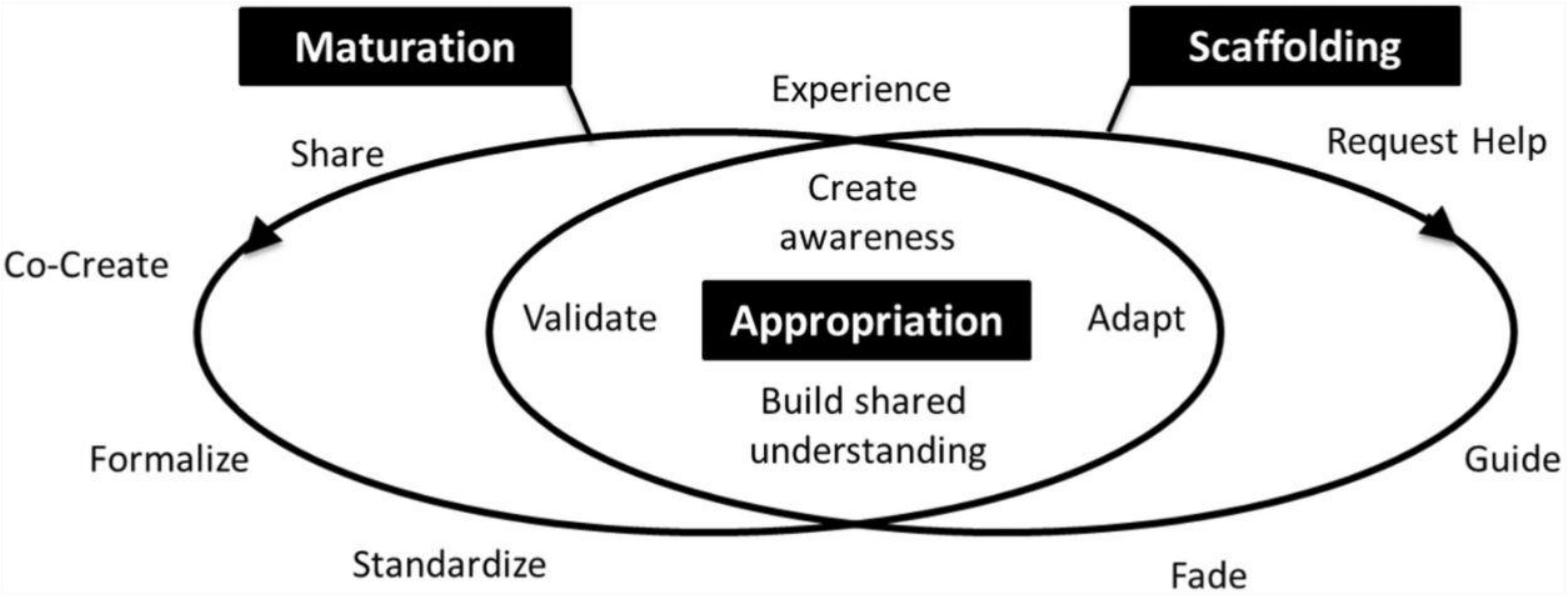
Adapted from Hammond (2021)

Areas of opportunity framework

Who	1. Find out about learners 2. Find out about ourselves as teachers
What	3. Review the content 4. Review the context and examples
How	5. Make the learning accessible to all 6. Provide opportunities for open ended and problem solving activities 7. Promote collaboration and structured group discussion 8. Promote student agency through choice 9. Review the learning environment e.g. learning materials
Why	10. Review related policies, process and training in your school and department

The 10 AOs are framed as opportunities or prompts for teachers to reflect on their practice.

Knowledge appropriation model



(Ley et al, 2020)

Research questions

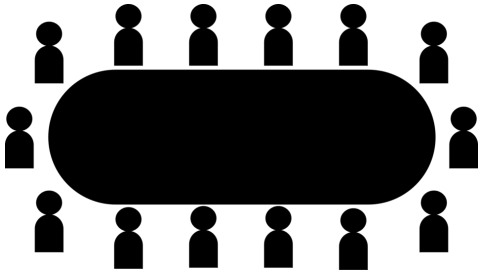
RQ1: What effect do collaborative professional development activities have on teachers' confidence, attitudes and perceptions of CRP in primary computing lessons?

RQ2: To what extent do teachers start to appropriate knowledge through collaborative professional development activities on CRP in primary computing lessons?

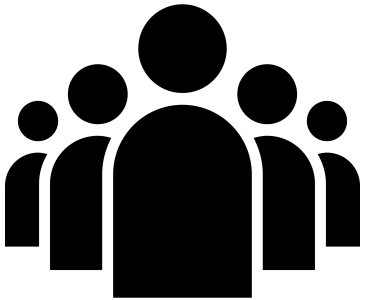
Participants

- 13 primary school teachers recruited
- 10 identified as female, 3 as male
- 9 teachers described their ethnicity as white, 2 as Asian or Asian British, 1 as Arab (more diverse than the general teaching population)
- 5 teachers were computing specialists (more than average)

About the workshop



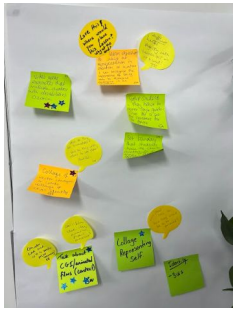
Whole group



Small groups

Lesson 1: Changing digital images	1. Know ourselves & learners	2. Content and contexts • Review the content • Review the contexts and examples	3. Pedagogy • Promoting collaboration • Making learning accessible • Reviewing the materials and environment • Promoting student choice • Adding open-ended activities	Other opportunities for change
Introduction: What is photo editing? Learners discuss what they think photo editing is, what they'd expected to see in an edited image, and whether they have ever done any editing themselves.			*Include demonstration so prior experience isn't a prerequisite*	
Activity 1 - Improving photos and fixing mistakes: Teachers model and then learners improve photos by rotating and cropping them in software.		*Discuss selfie culture (e.g. facial filters)*		
Activity 2 - Cropping images: Learners change focus of photos by cropping a print-out.				
Activity 3 - Cropping images using a computer: Teachers model and then learners crop an image using software. They then save their image.				
Plenary - Image composition: Teachers explain what "composition" means. An example of cropping is used to demonstrate.			*Pre-teach challenging vocabulary to support EAL students*	

Booklet for each teacher



Collaborative working wall

Units of work to be adapted

Year 4 Unit - Photo editing
Learners will develop their understanding of how digital images can be changed and edited, and how they can then be resaved and reused. They consider the impact that editing images can have, and evaluate the effectiveness of their choices.

An example of a photo editing activity in the original unit of work

Year 5 Unit - Vector Graphics
Learners learn how to use different drawing tools to help them create vector drawings. Learners recognise that images in vector drawings are created using shapes and lines, and each individual element in the drawing is called an object. Learners layer their objects and begin grouping and duplicating them to support the creation of more complex pieces of work

An example of a vector graphic activity in the original unit of work

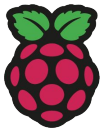
Data collection and analysis

- Pre- and post-survey investigating:
  - **confidence** to develop and adapt resources
  - **attitudes** adapted from Goode et al, 2021
  - open questions about barriers and benefits

- Wilcoxon signed-rank tests

- Interpretivist analysis of open questions

What did we learn?



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Quantitative data (pre and post workshop confidence)

After the workshop teachers were significantly more confident to adapt resources for **themselves** so that they were culturally relevant:

↑ 10 teachers reported an increased confidence
↓ 0 teacher reported a decrease in confidence
= 3 stayed the same

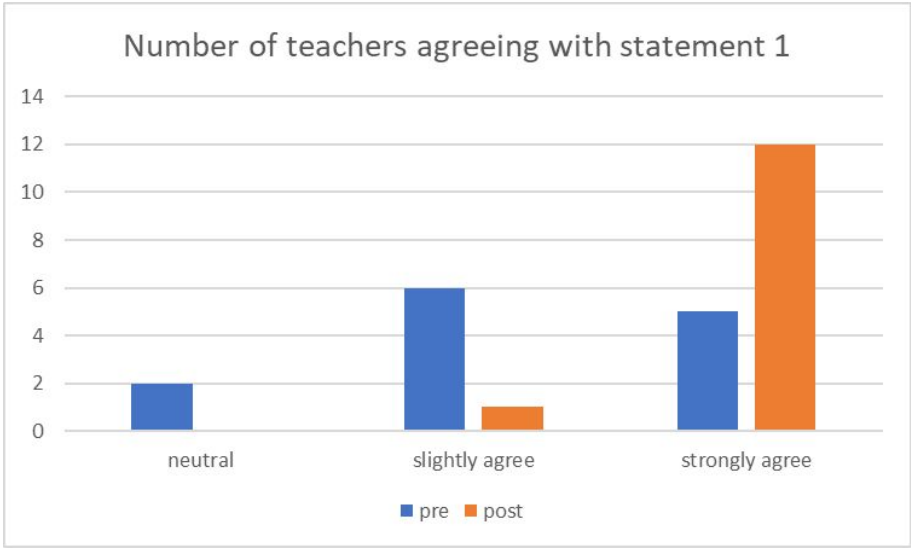
… and were significantly more confident to adapt resources for **others**

↑ 8 teachers reported an increase in confidence
↓ 0 teacher reported a decrease in confidence
= 5 stayed the same

For both these questions the median responses rose from teachers having **little confidence** to adapt to being **very confident** to adapt for CRP.

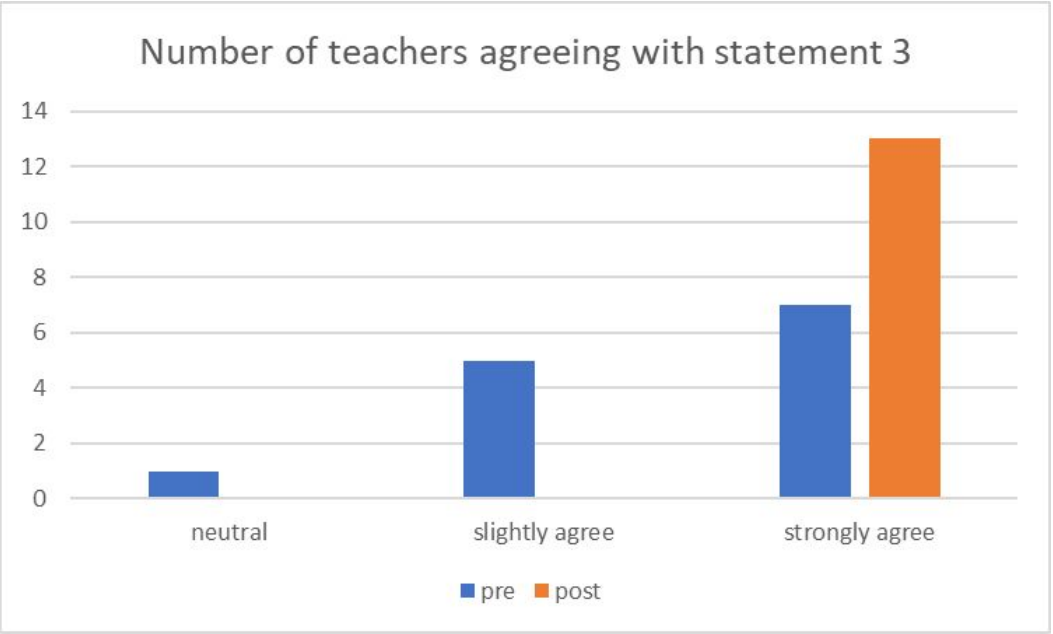
Quantitative data (CRP attitude statements)

Statement 1
An important part of being a computing teacher is examining one's own attitudes and beliefs about class, race, gender, disabilities, and sexual orientation.
↑ 7 ↓ 0 =6



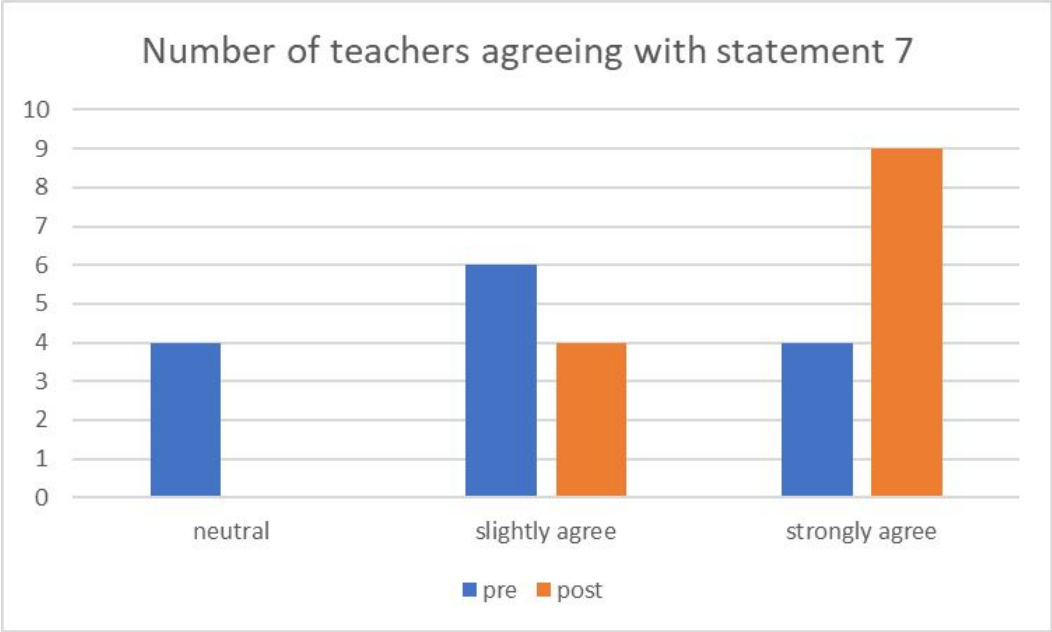
Quantitative data (CRP attitude statements)

Statement 3
Part of the responsibility of the computing teacher is to challenge teaching practices that maintain societal inequities.
↑6 ↓ 0 =7



Quantitative data (CRP attitude statements)

Statement 7
It is important to allow student choice when designing computing activities.
↑6 ↓ 1 =6



Qualitative results

Four themes were derived from the teachers' comments about the workshop:

1) Teachers' increased understanding of CRP
2) Benefit to learners
3) Reflections on translating learning to own practice
4) The benefit of peer discussion

"The dedicated time and value-added from peer discourse made this authentic and not just token activities in a box." (Teacher 303)

RQ1 The effect of professional development

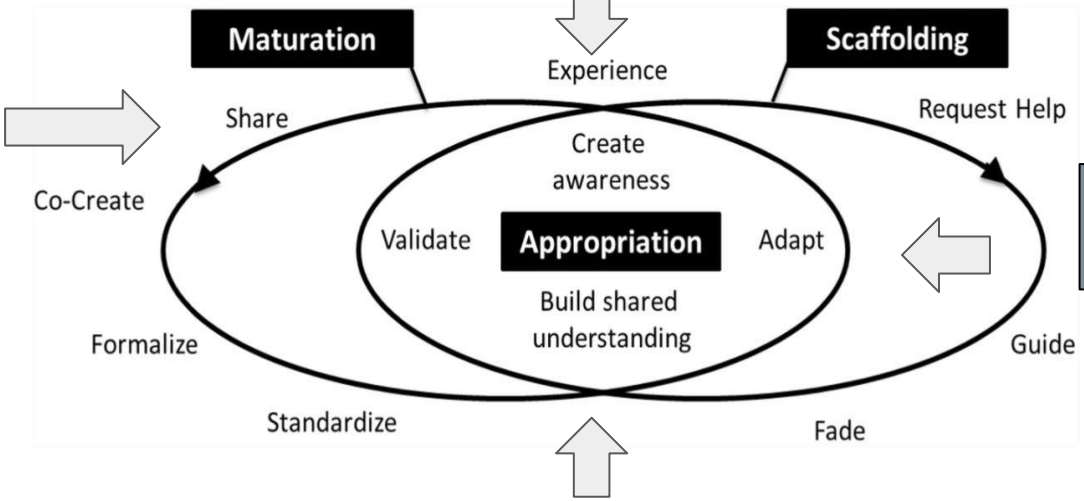
- Increase in confidence levels suggests that teachers have the tools to **apply the principles** (c/f Brown et al, 2019; Brown-Jeffy & Cooper, 2011)

- **Consistency with US research** from Goode et al (2021):
  - examine own attitudes
  - challenge inequitable practices
  - allow student choice
  - openly discuss issues relating to inequity

RQ 2 Knowledge appropriation of CRP

Participant recruitment

Group discussions



Creating a plan

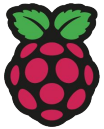
Small group work

What's next?

- Pilot of localising professional development in England has shown promise
- Opportunities to test further in other contexts
- All research instruments used in the workshop are available here

Thank you for listening

Follow our work at: http://computingeducationresearch.org



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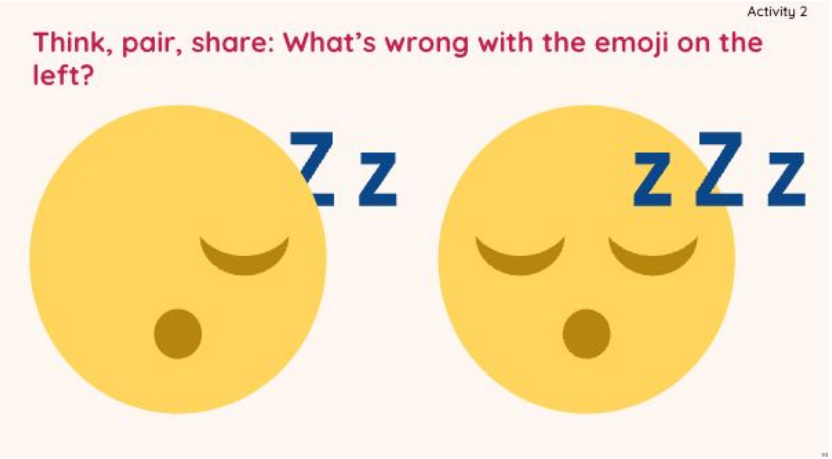
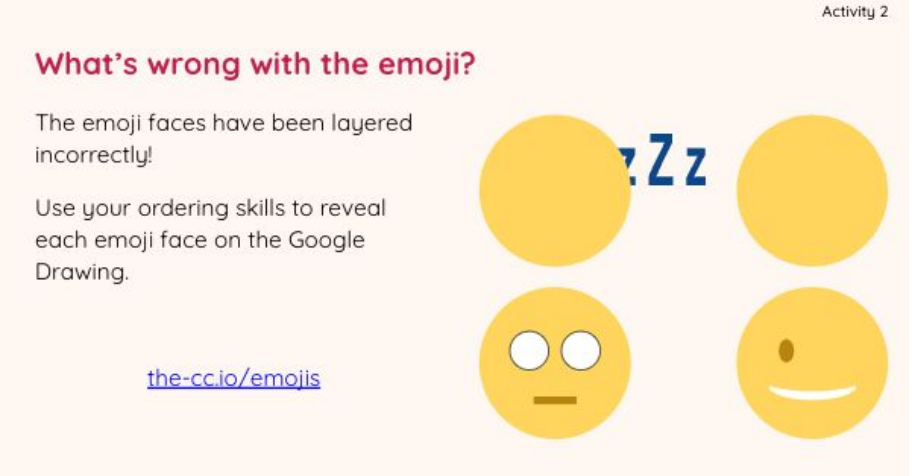
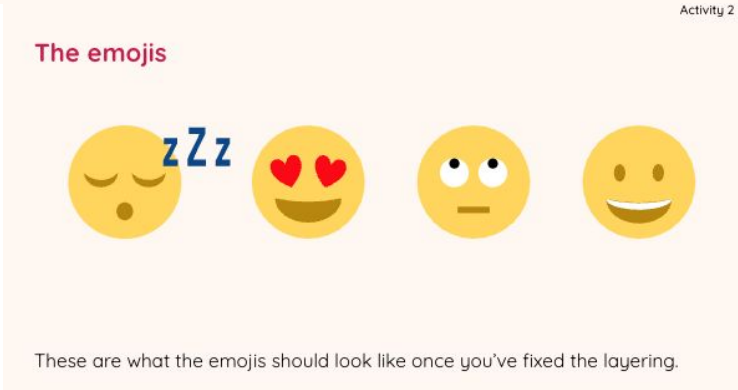
Emoji activity





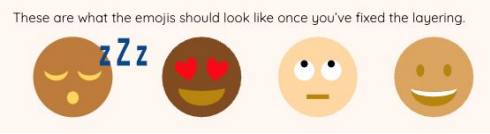


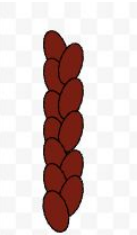
What is already culturally relevant about this activity?

How could this activity be adapted to be more culturally relevant?

Some adaptations we* made

- Added the story of Rayouf Alhumedi, a 15-year-old Muslim girl who began a campaign to introduce an emoji of someone wearing a hijab **(Content)**
- Adapted the emojis to represent a more diverse set of users **(Materials)**
- Adapted a modelling activity to that it was about creating a braid **(Context)**
- Created a set of assets that students could use to create their own emoji **(Content, Activity, Materials)**

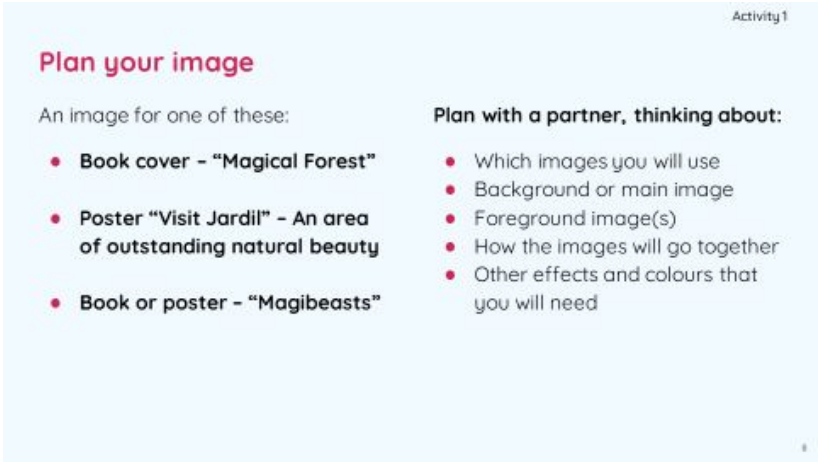


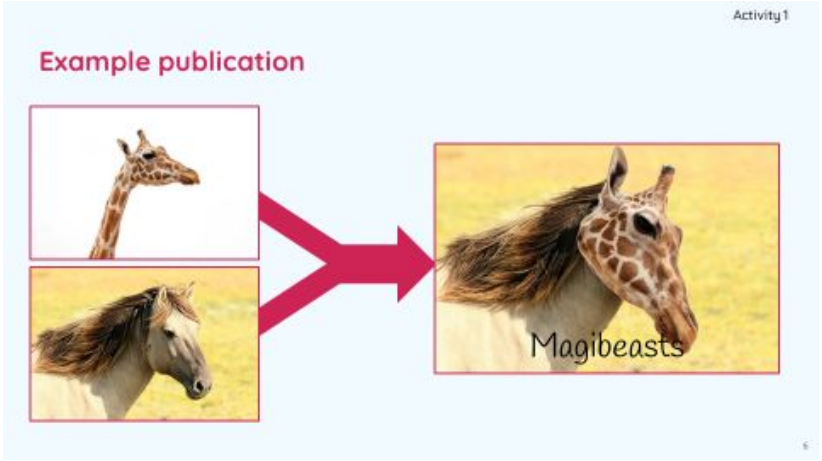


*Teachers and researchers working together

Breakout groups - Image editing activity

Context: Students have already learned skills such as copying, colouring and cloning images and now need to apply their skills in a practical activity





What is already culturally relevant about this activity?

How could this activity be adapted to be more culturally relevant to your learners?

Breakout groups discussion questions

1) What are some specific examples of culturally relevant teaching practices that have been successful in your own classrooms?

1) How can schools and computing educational initiatives support teachers in their efforts to integrate culturally relevant pedagogy into their teaching practices?