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

October 2023
#RPFSeminars
About our research centre and work to date
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)

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?

Do you think culturally adapted resources in primary computer science education are important?

The author can see how you vote. Learn more

A) Yes ✅ 65%
B) No 14%
C) I'm not sure 10%
D) It depends 11%

449 votes • Poll closed • Remove vote

Raspberry Pi Foundation 🤝 @RaspberryPi_org • Oct 6

Educators, do you think culturally adapted resources in #Primary #CSEd are important?

A) Yes, they enhance inclusivity & engagement 49.2%
B) No, traditional resources are sufficient 22%
C) Unsure; I'd like to learn more 15.3%
D) It depends on the cultural diversity of the student population 13.6%

59 votes • 16 hours left

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)
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

- Cultural Identity
- Age
- Gender
- Ethnicity
- Religious beliefs
- Race
- Family background
- Where you live
- Youth culture
- Where you live
About this study
Who worked on this research project

Hayley Leonard  Katharine Childs  Jane Waite  Bobby Whyte  Sue Sentance

Other project members during the year: Bonnie Sheppard, Lynda Chinaka, and Andrea Kocis.
Thanks to Cognizant for funding this project.
About the study

- Workshop: Autumn 2022
- Resources adaptation: Autumn 2022 - Spring 2023
- Resources delivery: Spring 2023
- Parent survey
- Teacher interviews
- Student focus groups

Introduction Literature Methods Results Discussion
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

<table>
<thead>
<tr>
<th>Focus</th>
<th>Multicultural education</th>
<th>Social justice education</th>
<th>Culturally relevant pedagogy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Celebrating diversity</td>
<td>Recognise, interrupt and dismantle existing biases within the education system</td>
<td>Recognise that the education system is not culture-neutral and systemic biases may cause learners to underachieve or be marginalised</td>
<td></td>
</tr>
<tr>
<td>Aim</td>
<td>Create positive interactions across differences to promote social harmony</td>
<td>Develop learners’ critical consciousness towards social and educational inequity</td>
<td>Incorporate learners’ cultures and experiences into the curriculum</td>
</tr>
<tr>
<td>Examples in England</td>
<td>Ofsted Equality, Diversity and Inclusion Statement</td>
<td>Decolonising the curriculum</td>
<td>Areas of Opportunity for adapting computing resources</td>
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<td></td>
<td>British Values</td>
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Adapted from Hammond (2021)
Areas of opportunity framework

1. Find out about learners
2. Find out about ourselves as teachers
3. Review the content
4. Review the context and examples
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
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

Booklet for each teacher

Collaborative working wall
Units of work to be adapted

<table>
<thead>
<tr>
<th>Year 4 Unit - Photo editing</th>
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<tbody>
<tr>
<td>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.</td>
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</tbody>
</table>

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

<table>
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<tr>
<th>Year 5 Unit - Vector Graphics</th>
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<tbody>
<tr>
<td>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.</td>
</tr>
</tbody>
</table>

*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?
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.
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

Maturation
- Experience
- Co-Create
- Share
- Formalize
- Standardize

Scaffolding
- Request Help
- Guide
- Adapt
- Fade
- Build shared understanding
- Validate

Appropriation

Group discussions

Creating a plan

Small group work

Introduction → Literature → Methods → Results → Discussion
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
Emoji activity

Think, pair, share: What’s wrong with the emoji on the left?

What’s wrong with the emoji?
The emoji faces have been layered incorrectly!
Use your ordering skills to reveal each emoji face on the Google Drawing.

The emojis
These are what the emojis should look like once you’ve fixed the layering.

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

Plan your image

An image for one of these:
- Book cover - “Magical Forest”
- Poster “Visit Jardil” – An area of outstanding natural beauty
- Book or poster - “Magibeasts”

Plan with a partner, thinking about:
- Which images you will use
- Background or main image
- Foreground image(s)
- How the images will go together
- Other effects and colours that you will need

Example publication

Magibeasts

What is already culturally relevant about this activity?

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