Raspberry Pi Foundation

Pedagogy Quick Read

10 areas of opportunity for making computing culturally relevant

Culturally relevant pedagogy (CRP) draws on students' cultural backgrounds, allows them to express their interests and identities, and encourages them to develop a critical consciousness of society by considering the ethical and social impacts of technology, and challenging the stereotypes, biases, and inequities that prevail[1]. Culturally responsive approaches are gaining traction in computing, to engage historically underrepresented groups of students.

Most research relating to CRP has been US-focused. Within the UK computing context, researchers have developed **10 areas of opportunity** (AOs)[2] for applying CRP. These AOs provide a framework for teachers to review their curriculum, teaching materials, and practices so that they can increase student engagement and success in the subject.

The AOs have been used to support research in culturally responsive teaching in different contexts, from primary and secondary UK settings, to non-formal, vocational provision in Kenya.

Culturally relevant areas of opportunity for K–12 computing lessons[2]

There is much that teachers can do to incorporate culturally relevant pedagogy into their classrooms. Here we introduce the **10 areas of opportunity** (AOs) — prompts that teachers can use to review, develop, and adapt computer science (CS) teaching activities to achieve this (for more details see page 3). Importantly, each area of opportunity is research-informed, with studies linked in brackets below:

1. **Learners:** Find out about learners to reveal opportunities to adapt our teaching. (Teachers should not assume that they know what their students' interests are[3].)

2. **Teachers:** Find out about ourselves as teachers to reflect on our own cultural lens. (Teachers should examine their beliefs about the computing curriculum to ensure that these don't **negatively impact on computing provision**.)

3. **Content:** Review the content of what is taught and add in culturally relevant content. (**Technical knowledge is given more attention** than moral and cultural topics in the English computing curriculum.)

4. **Context:** Review the contexts and examples used, to make teaching relevant and meaningful.

5. **Accessibility:** Make the content accessible and relevant for all learners. (In the USA, the Universal Design for Learning framework has been applied to differentiate for diversity; this **computing-focused**

guide shows how teachers can provide students with multiple means of engagement, representation, and expression to promote success for all.)

6. **Activity:** Provide opportunities for open-ended and problem-solving activities. (The US CS education programme **Exploring Computer Science** encourages enquiry-based approaches, which support disengaged students and those from underrepresented groups[4].)

7. **Collaboration:** Promote collaboration and structured group discussion. (Well-structured collaborative learning leads to positive affective and cognitive outcomes, especially for female students[3].)

8. **Student agency:** Promote student agency through student choice. (**Giving students agency and promoting student choice** increases motivation.)

9. **Materials:** Review the learning environment and learning materials to increase accessibility, a sense of belonging, and to promote respect. (Improving accessibility, reducing stereotypical depictions, and reflecting students' identities and experiences broadens participation[3].)

10. **Policy:** Review related policies, processes, and training in your school and department. (The Kapor Center's **Culturally Responsive-Sustaining CS Education Framework** includes key components for consideration.)

Engaging primary (K–5) computing teachers in CRP through professional development[5]

UK researchers have begun work to bring CRP theory and practice directly into CS classrooms in England. In one research project, they collaborated with primary teachers in a professional development workshop to address cultural bias in lesson resources. Together, the teachers and researchers investigated how units of work in photo editing and vector graphics could be culturally adapted, using the 10 AOs.

As part of the workshop, teachers viewed a **presentation** introducing CRP, used **booklets** to record how lesson material could be adapted, and completed a **reflective diary**. The workshop resources are available on the **project's website** to support schools wishing to introduce their own professional development in CRP.

Post-workshop findings showed a statistically significant increase in teacher confidence in adapting resources, and increased agreement with the following statements:

- An important part of being a computing teacher is examining one's own attitudes and beliefs about class, race, gender, disabilities, and sexual orientation

- Part of the responsibility of the computing teacher is to challenge teaching practices that maintain societal inequities

- It is important to allow student choice when designing computing activities

- Issues relating to racism, sexism, and other inequities should be openly discussed in computing classrooms

The research project's findings suggest that professional development plays an important role in developing teachers' understanding of CRP and in enabling them to apply it in their own practice.

Embedding culturally relevant pedagogy in practice: considerations for training and resource development[6]

Computing education resource developers have used the 10 AOs to reflect on how learning materials were adapted for a Kenyan refugee camp setting. These adaptations involved reworking existing resources and adding new content to create a 10-week vocational course for students aged 16–25 who have English as an additional language. Independent learning content had to be heavily adapted so that it was suitable for a direct-to-learner context, as well as ensuring it was linguistically and logistically accessible to students and course facilitators. Reflecting on the adaptations made, content relevance, availability of tools, levels of prior learning, and exposure to technology were important considerations. Curriculum developers rated the importance of each of the AOs to the adaptations, using a 0–5 scale (not at all important to very important) (see Figure 1).

The relevance of activities to learners (AO1, AO4, AO6) was very important in this context — students wanted to develop their digital skills, so learning outcomes were tailored to develop these and to relate to their work aspirations; programming content was removed and digital literacy, graphics, and web design skills were promoted. Accessibility was also a key design requirement (AO5); text-based animations in the original resources were adapted to include spoken explanations and subtitles; course content was contracted and reworked for older learners; readability of materials was adjusted.

Curriculum developers found the AOs useful as they reflected on how the course was made more culturally relevant. Course facilitator feedback reported that employing CRP yielded positive outcomes for these learners.

These are two examples of how the areas of opportunity have been used to explore the application of culturally relevant pedagogy in different settings. See page 3 for a printable table of the 10 areas of opportunity, with suggestions for how educators can implement them in their own contexts.
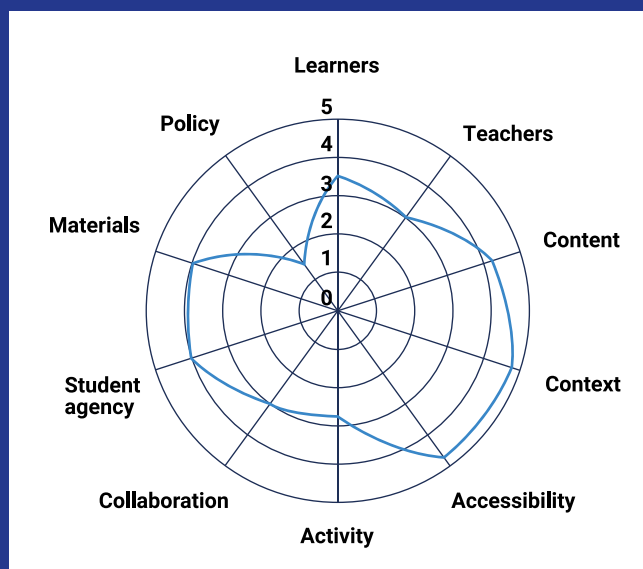

Figure 1. Importance of the AOs to the course adaptation.

Area of opportunity	Examples
1. Learners Find out about learners to reveal opportunities to adapt our teaching	Regard learners' cultural backgrounds, identities, interests, families, etc. as assets for curriculum development. Don't assume you know what their interests are.
2. Teachers Find out about ourselves as teachers to reflect on our own cultural lens	Consider how your own beliefs, identities, and unconscious biases impact on your practice.
3. Content Review the content of what is taught and add in culturally relevant content	Include topics such as data bias, user experience design, the ethics of computing, social justice, and legal issues.
4. Context Review the contexts and examples used, to make teaching relevant and meaningful	Organise extracurricular clubs, forge community links, use 'everyday life' or 'youth culture' contexts for the activities and examples you offer. Review the role models you promote, choose current topics, e.g. the environmental impacts of tech, the ethics of generative AI.
5. Accessibility Make the content accessible and relevant for all learners	Review your instructional approaches, consider the **Universal Design for Learning framework**, use **PRIMM** to teach programming, adapt language for learners with English as an additional language and to increase gender balance, locate resources to support learners with SEND.
6. Activity Provide opportunities for open-ended and problem-solving activities	Offer extended, enquiry-based projects where learners collaborate to solve real-life problems of interest to them and create meaningful outcomes, e.g. Coolest Projects, Apps for Good.
7. Collaboration Promote collaboration and structured group discussion	Encourage student interaction via peer instruction, pair programming, group projects and discussions, introduce digital leaders, etc.
8. Student agency Promote student agency through student choice	Allow students to choose contexts for tasks, the ways they work, and the formats of the outcomes they produce — but limit the options to avoid overwhelming them.
9. Materials Review the learning environment and learning materials to increase accessibility, a sense of belonging, and to promote respect	Ensure that all students are represented in the materials, resources, and displays provided.
10. Policy Review related policies, processes, and training in your school and department	Introduce culturally responsive approaches to the agenda of all meetings.

References

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