

Motivation

Efforts to make computing education more inclusive have been ongoing for a number of years, but underrepresentation in the IT industry persists, e.g. only 22% of UK IT specialists are female as of 2022 [1].

Culturally relevant strategies in computing education can help broaden participation and tackle systemic educational inequity [2]. However, there is limited data on K–5 pupils' responses to such activities.

This study aims to fill this gap by using a toolkit called the **Integrated Interest Development for Computing Education Framework (IIDfCEF)** [3] to examine K–5 pupils' responses to culturally responsive computing lessons and answer the following research question:

What is the effect of engaging with culturally responsive computing resources on K–5 pupils in England?

The IIDfCEF

This framework is a toolkit [3] for researchers and resource developers in computing education. It is organised around three dimensions of interest in computing (see Figure 1):

- Knowledge
- Belonging
- Value

Each dimension has key factors that connect to strategies that can be employed in computing education contexts to help develop student interest.

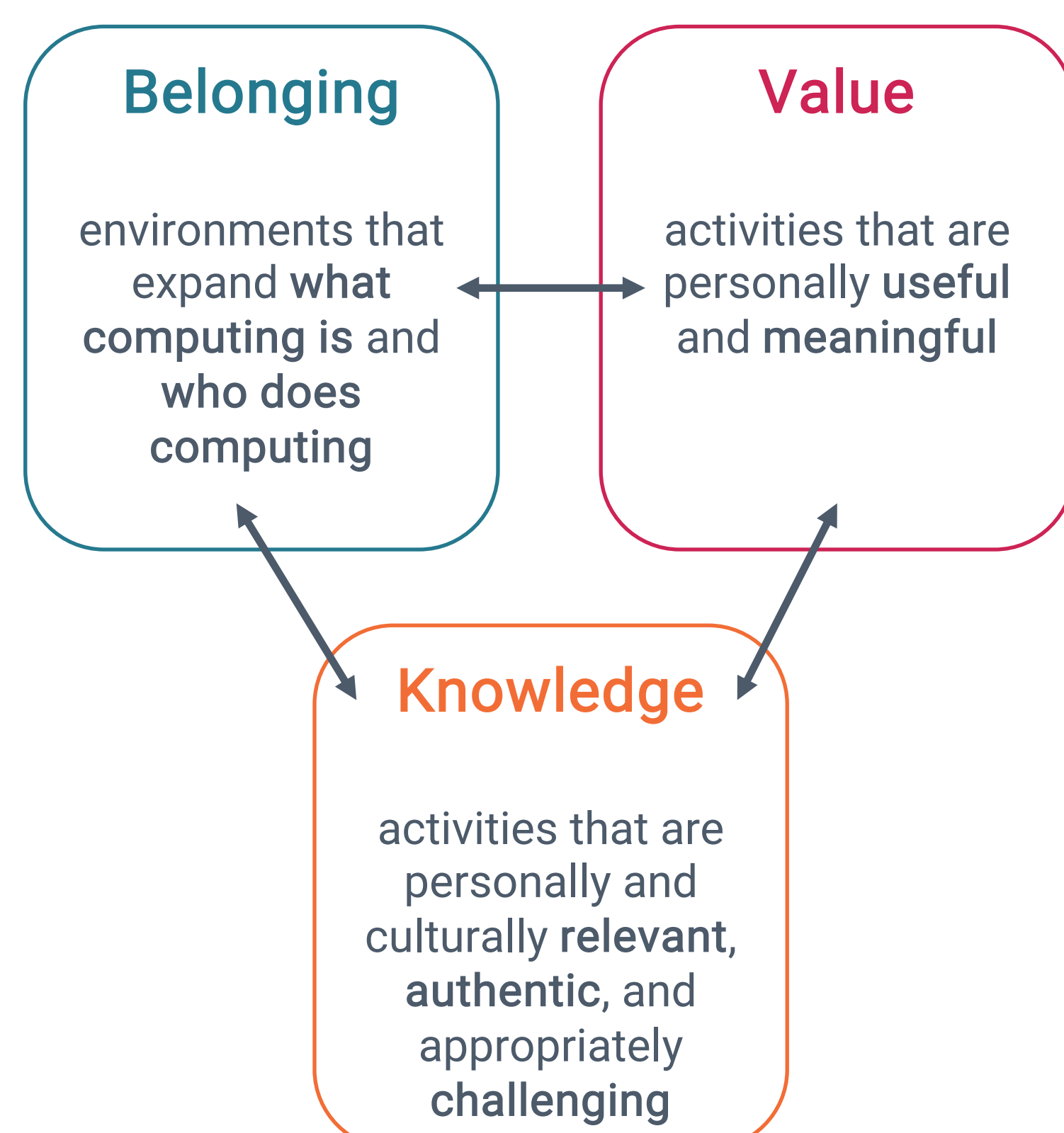


Figure 1: Integrated Interest Development for Computing Education Framework (IIDfCEF). Adapted from [3].

Methodology

- Three focus groups with twelve students aged 8–10 years old, in primary (K–5) schools in London and the South of England.
- Students had taken part in a unit of computing lessons about image editing or vector graphics which had been adapted to be culturally relevant [4] (see Figure 2).

Example focus group questions

Belonging: Who do you think can be good at computing?

Value: How could you use what you have learned in a job when you are older?

Knowledge: What did you learn in these lessons?

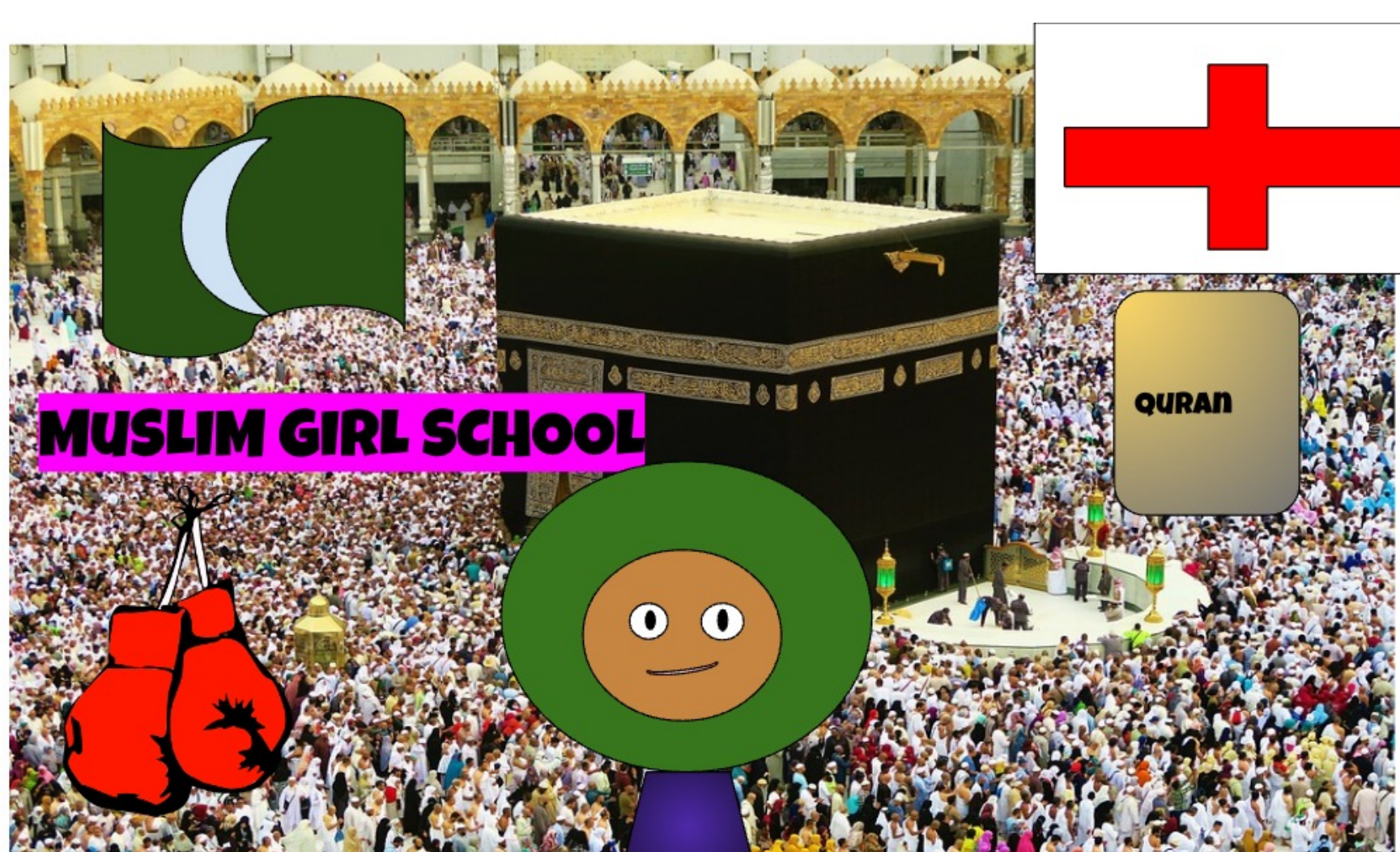


Figure 2: Example student identity artefact created in culturally responsive lessons.

Findings

Knowledge

Students felt the lessons enabled them to incorporate relevant ideas that related to their own lives such as their interests (n=6) and cultural background (n=3).

"It was nice to do something that actually represented you in many different ways like your culture and your background".
(Student 301-2)

Belonging

When asked about what computing is, the participants most frequently (n=18) referenced manipulation of graphics and fewer (n=11) made references to programming and algorithms.

"We've been learning the skill about vector graphics and how to order and layer."
(Student 301-3)

"I've learnt that you need to be a bit patient, and sometimes you need to set out a plan before you just do something".
(Student 102-2)

Participants responded to questions about who does computing by mentioning the importance of someone who kept trying, who didn't give up, or who was resilient (n=9).

Some students referred to the fact that computing was for everyone (n=4).

"Anyone can be good at computing if they have the passion to do it".
(Student 301-4)

Value

The value dimension was less discussed, suggesting the activities didn't feel as personally useful or meaningful to students. This may be due to the focus on a single topic from the whole curriculum.

Conclusion

- Engaging with culturally responsive resources help K–5 learners feel a sense of belonging and representation in computing lessons.
- The adapted unit led learners to feel that their interests were recognised as well as, to a lesser extent, their cultural background.
- Our findings validate the assertion in the IIDfCEF framework that introducing culturally relevant pedagogy into computing lessons triggers students' interest in computing, because they make connections between the content and their own lives.

References and acknowledgements

[1] BCS. 2022. BCS diversity report 2022: Women in IT. <https://www.bcs.org/policy-and-influence/diversity-and-inclusion/bcs-diversity-report-2022-women-in-it/>

[2] Tia C Madkins, Nicol R Howard, and Natalie Freed. 2020. Engaging equity pedagogies in computer science learning environments. *Journal of Computer Science Integration Vol. 3, Issue 2*. [2] Tia C Madkins, Nicol R Howard, and Natalie Freed. 2020. Engaging equity pedagogies in computer science learning environments. *Journal of Computer Science Integration Vol. 3, Issue 2*. <https://doi.org/10.26716/jcsi.2020.03.2.1>

[3] Joseph E. Michaelis and David Weintrop. 2022. Interest Development Theory in Computing Education: A Framework and Toolkit for Researchers and Designers. *ACM TOCE, Vol. 22, Issue 4, pp. 1 – 27*. <https://doi.org/10.1145/3487054>

[4] Katharine Childs and Jane Waite. 2024. Funds of identity and culturally responsive computing: K-5 teachers' adaptations to computing resources. *In The 19th WIPSCCE Conference on Primary and Secondary Computing Education Research (WIPSCCE '24)*.