CAMBRIDGE Mathematics

Draft guidelines for assessment and resource design in mathematics education

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These guidelines reflect our current understanding of identities and mathematics education design, but of course are not exhaustive and to that end will remain in some sense 'draft'. We recognise that we can and should return to them iteratively as new research and new understandings in this area arise. We also recognise the limitations of our own expertise and lived experience in many areas of Equity, Diversity, Inclusion and Belonging (EDIB) and therefore recommend ensuring explicit provision in budgets and timelines for engaging a professional sensitivity consultant to support both the quality of the design output and the long-term development of designers in this area.

1. General design principles

Mathematics (and mathematics education) is not neutral, apolitical, or value-free; all design decisions have inbuilt assumptions, implications and consequences which affect how people see the practice of mathematics, who is allowed to access it, and what kind of behaviour the mathematical community values.

Different communities have been marginalised with respect to their position in the world and specifically through and in mathematics learning, and decisions made around mathematics education resource design can perpetuate this or challenge it.

Identities (personal and social ideas of who a person is or is constructed to be) are intersectional, and marginalisation in particular can affect people in intersectional ways.

Generally, questions, items and tasks with human contexts will have space for inferred ideas about identities, cultures and relationships and decisions related to these contexts are consequential. Be aware of and account for a bias towards perceiving White cis heteronormativity as neutral. Aim to design identity markers mindfully and as background, not the focus – i.e., there is no need to alter the course of the question, item or task significantly to make it 'about' the inclusive context. Aim not to perform inclusivity, but to consider how those reading and using the material may feel seen, included and represented – quietly and without fanfare.

The intention is not that EDIB concerns obscure or overwhelm the mathematical intent but that the micro-decisions related to the chosen context are taken with attention to EDIB consequences.

Images, language, and use of data are all important elements of design; they therefore should all be considered carefully as communicating the values and assumptions underlying the design output.

2. Images

- Be intentional about designing images – for example, not just haphazard choice of clip art or 'looks fine' – considering the assumptions inherent in visual identity markers that people might associate with gender, 'race', age, sexuality, etc., and what stereotypes this might perpetuate.
- Avoid unnecessary exaggerations, one-note depictions, stereotypes, caricatures and cultural clumsiness – for example, big pink bows or eyelashes to denote femininity; use of a walking stick to denote age; only denoting disability with the use of a wheelchair.
- Take opportunities to problematise and ask questions of stereotypes of femininity and masculinity, and represent nonbinary identities (those which are outside of the idea of a simple male-female binary).
- Consider not just diversity of representation, but what actions or attitudes those represented are enacting; for example, whether the figures are passive or active, explaining or being explained to.
- Avoid tokenism – just placing a single image of a member of a marginalised identity group somewhere is insufficient.
- Be aware that real identities overlap; equally, placing one image with 'all' minoritised identity markers combined in order to 'do' diversity is not sufficient.
- It is not just entire human figures that may be read as particular identities – use opportunities to make design decisions when human-type characteristics are used on non-human entities (e.g., animals, aliens, etc.) and where individual body parts are used (e.g., hands may have rings, nail polish, etc.).

3. Language

- Avoid unnecessary exaggerations, stereotypes, caricatures and cultural clumsiness when using language, in particular when describing people or using adjectives; if a word is only ever used for one group of people, don't use it.
- Don't always align an assumed gender with an image – use the singular 'they' unless you are sure or intend a figure to have a particular gender.
- Don't assume or exclusively stick to heteronormative relationships/families but keep these relationships in the background unless there is a good reason not to; for example, a question with a family in it could allude to the family setup having two female parents and an adopted child.
- When writing about other people's thinking in order to critique it, be particularly careful about who is 'incorrect' in their thinking in relation to stereotype threats in mathematics.
- Actively identify opportunities to design questions to focus on EDIB issues – for example, wage gaps.
- Be particularly careful when using analogies, metaphors, and role models in various historical contexts; for example, the use of slavery as a metaphor or the role of eugenics in the careers of statisticians such as Galton.

- When giving names of mathematical objects, theorems, or ideas, try to give multiple names, not just those which privilege White Western mathematical viewpoints (for example, Yang Hui's triangle, or the Khayyam triangle, or Pascal's triangle).

4. Data

- EDIB issues apply to both the use of data within assessment or tasks and the generation of data in terms of questions asked and information collected about individuals and groups.
- Be aware that data are a product of many biases at many stages and be aware of 'mathwashing': the tendency to ascribe neutrality or legitimacy to data, forgetting that they have been collected, collated, analysed and reported by humans.
- Be careful not to reinforce a particular narrative by focusing on the counternarrative; for example, focusing on crime rates among young Black boys.
- Be particularly attentive to what questions are you asking, what you are 'measuring' and the inherent assumptions in the model/s used.
- Don't design questions based on the mutual exclusivity of binary gender.
- Use a standard introduction for dealing with real-life data sets encoding complex characteristics through narrow categories; for example, binary notions of gender as a sex variable could be introduced by 'Research suggests gender is not binary and the categorisation of it in this data set may erase or minimise gender identities.'
- Explicitly encourage students to critique the binary categorisation of sex as a unit of analysis.
- Don't categorise any data by sex unless there is a good reason to do so.
- Don't always default to comparison between two categories, and in particular male vs female – not only is this reliant on notions of binary gender but also realistic data commonly compares across multiple categories.
- Explicitly encourage students to critique false dichotomies/mutual exclusivities.
- Design questions explicitly to critique grouping and categorisation that erases individuality and suggests homogeneity; for example, use of 'BIPOC' or 'BAME' data.
- Avoid questions with harmful superficial associations, in particular where the meaningful statistical work needed to investigate the deeper issues may be beyond students' current capabilities, or insufficient time is given to exploring the issues in detail; for example, 'associations' between IQ and 'race'.

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