ADDRESSING GENDER DIFFERENCES ON PHYSICS ASSESSMENT TASKS

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THE PROBLEM

The participation of women in the workforce and education has risen dramatically over the last several decades. However, women are still under-represented in STEM fields, and particularly in physics. So, why is this the case and what can we do about it? Many reasons have been postulated: school, family and broader societal culture are all believed to be important (see for example Hazari et al., 2007). These external factors influence internal factors such as interest, self-efficacy and motivation. These factors can influence not only a student's desire to take a subject, but also their ability to succeed in it (Kalendar et al., 2020).

Assessment practices in physics can also contribute to the gender gap in participation. There are two mechanisms by which this can occur. First, there can be a direct impact by the exclusion of girls and women based on assessment results. This is most likely on competitive exams for limited places. This has been observed on university placement exams (among others, Singh & Pathak, 2010), and international and national competitions (Wilson et al., 2016). Second, feedback from assessment tasks in which girls underperform compared to their male peers, can result in reduced self-efficacy and reduced motivation to continue in those subjects.

WHAT CAN BE DONE?

We have explored the reasons for gender gaps in physics exams, particularly in competitive examinations. What we have found is that often it is the question structure or even the question wording that is causing the gender gap. We recommend that anyone running assessment tasks in physics look at the results of their assessment to see whether there is a gender gap in performance (or indeed gaps with any other demographic factors). This needs to be done not just at whole-task level, but question by question. We have observed that when there is a small overall gap, it is often due to large gaps in a relatively small number of questions. Investigating these questions can then provide valuable information. It may be that the question itself is the problem – something about the question structure or wording may be causing the gap. In this case, the question can be revised to reduce or eliminate the gap.

We have also observed that some marking schemes, in particular "negative marking" on multiple choice exams, disproportionately penalizes girls. In some instances, it may not be the structure or wording of the question, or the marking scheme, but the content – the gap in performance may be indicating a genuine gap in knowledge or understanding. In this case, where possible, the gap should be addressed through modified teaching and learning practices. We have found that interactive learning activities in which students create multiple representations in different modes support learning for all students and help close gender gaps.

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