Active learning in an inequitable learning environment can increase the gender performance gap: The negative impact of stereotype threat and interventions to help mitigate it[1]

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Evidence-based active engagement (EBAE) instructional strategies are being used with increasing frequency. However, they may not help all student demographics equally if the learning environment is not equitable because stereotype threats can be higher for women and other underrepresented groups in a collaborative situation and students from these groups may not have the opportunity to contribute meaningfully to the group work if equity is not kept at the center of the learning environment. Here we summarize the findings of two research studies related to these issues that have important implications for physics teaching. In the first study we find that in calculus-based introductory physics 2, the gender gap on the Conceptual Survey of Electricity and Magnetism increased in EBAE courses, but remained relatively constant in traditional Lecture Based (LB) courses. In particular, EBAE instruction provided disproportionate benefit to male students and increased the gender gap even though all students performed better on average in EBAE courses compared to LB courses. A subsequent investigation suggests that stereotype threat may be larger for female students who agree with a gender stereotype about physics learning, and can have an added detrimental effect on their physics learning compared to the other female students who disagree with the stereotype. The findings suggest that in order to improve learning of all students, it is important for physics instructors to create equitable physics learning environments in which all students feel valued and respected and internalize that intelligence is malleable and can grow with hard work because such environments can encourage productive struggle with challenging physics problems without anxiety. Examples of promising interventions to reduce the gender gap along with data supporting their effectiveness will also be discussed.