Reducing gender differences in performance in introductory college physics through values affirmation

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Despite males and females being equally represented at the college level in several STEM disciplines (including biology, chemistry and mathematics), females continue to be under-represented in physics. Our research documents and addresses this participation gender gap in the introductory, calculus-based physics courses at the University of Colorado. We characterize gender differences in performance, psychological factors (including attitudes and beliefs) and retention that exist in Physics 1 and 2 [L. E. Kost, et al., Phys. Rev. ST Phys. Educ. Res. 5, 010101 (2009); L. E. Kost-Smith, et al., Phys. Rev. ST Phys. Educ. Res. 6, 020112 (2010)]. We find that the gender differences in performance can largely be accounted for by measurable differences in the physics and mathematics backgrounds and incoming attitudes and beliefs of males and females. But these background factors do not completely account for the gender gaps. We hypothesize, based on gender differences in responses to survey questions about students' sense of physics identity and confidence levels, that identity threat (the fear of confirming a negative characterization about one's identity) is playing a role in our courses. Working with researchers in psychology, we implemented an intervention where students either wrote about their most important values or not, twice at the beginning of the course [A. Miyake, et al., Science, 330, 1234 (2010)]. This "values affirmation" activity reduced the male-female performance difference substantially and elevated women's modal grades from the C to B range. Benefits were strongest for women who tended to endorse the stereotype that men do better than women in physics. This brief psychological intervention may be a promising way to address the gender gap in science performance.