

CP02 10:15a.m. Initial Understanding of Vector Concepts Among Students in Introductory Physics Courses

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A two-semester investigation of students' basic vector competence was conducted at a large state university. More than 2000 introductory physics students took a seven-item free-response diagnostic including questions on magnitude, direction, addition, and subtraction of vectors. Among students beginning their second-semester courses, 55% in the algebra-based course and 27% in the calculus-based course could not perform non-colinear addition of two vectors graphically represented on a two-dimensional grid. In addition, 13% of the beginning second-semester calculus-based students could not operationally identify magnitude, and 23% could not operationally distinguish direction among similarly oriented vector representations. The errors of first semester students were even more pronounced. (These results are consistent with previous findings reported by Knight.¹) The data suggest that students' vector competence does improve after one semester of physics in either the algebra-based or calculus-based sequence. However, many students might benefit from further instruction dedicated specifically to vectors.

1. Randall D. Knight, "The vector knowledge of beginning physics students," *Phys. Teach.* **33**, 74-78 (1995).