

# **Using Factor Analysis to Explore the Structure of a Vector Assessment**

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Vectors are tools that all physics students use, and the ability to perform vector operations is essential to student success. Students frequently struggle with the simplest of operations – vector addition and subtraction. This summer I worked with a research group at North Dakota State University that is investigating student difficulties with these skills. They are developing a vector skills assessment to quantify the type, frequency, and relationships among student mistakes when graphically adding vectors. My work focused on a factor analysis conducted on a preliminary version of the instrument. We used prior results from the literature to propose factor structures that depend on the vector operation and orientation. Using both exploratory and confirmatory factor analysis, we found a factor structure that begins to justify our assessment's ability to capture a student's comprehension of vector addition and subtraction. As we continue this research, we also intend to publish this assessment as a resource for physics educators to assess students' skills in graphical vector addition and subtraction.