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Analysis of Students' Conceptions in Vectors with Mechanics Context

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A group of physicists from Mexico developed a standard test in vector conceptions without any physics related context called "Test of Understanding of Vectors (TUV)". This test was first conducted as open-ended questions which later on was re-designed as a 20-item multiple-choice test. Since physics is a subject that involves quantities like vectors, and students' understanding of concepts in vector may cause difficulty in solving problems. In this study, we first modified the TUV by adding the physics context –Mechanics –in the test. Then 136 undergraduate students registered in the General Physics 1 class at Chulalongkorn University in 2017 were tested using our modified-TUV and original-TUV tests prior learning the vector concept in the first week of their class. The results have been evaluated using the item analysis, and the efficiency and reliability are compared between those tests. We found that there are similar tendencies of statistical indices for both tests, which are within the acceptable values. Thus our modified-TUV test is reliable to test students' conceptions in vectors with mechanics context.

We have also emphasized on the dot products in both TUV tests. The results show that students have more difficulty in understanding the definition of dot products than they do in the dot product operations. Furthermore, they did better in modified-TUV with physics context than original-TUV with only mathematics context.

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