Disentangling the Force Concept Inventory Using Latent Class Analysis IVAN IVANOV, HELENA DEDIC, STEVEN ROSENFIELD, Vanier College — This study probes dimensionality of the Force Concept Inventory (FCI) using a latent class factor analysis of data collected at three universities (6621 records). The best fitting 5-factor model closely matches theoretical groupings of items envisioned by the FCI authors. Although this model accounts for more than 95% of bivariate associations present in the data, and the p-value indicates the model is acceptable, there remain some unexplained pair-wise associations between items. This result shows that the FCI measures several abilities rather than just one. Thus, assigning separate scores to each factor may be more appropriate than the total score of correct answers. This is especially important for physics educational researchers who use the FCI to assess the effectiveness of particular pedagogies. When the scores are reported for individual records, the changes in each of the latent abilities with instruction may be rigorously measured. We have found that the pre-instruction and post-instruction scores for all three universities showed significant gains for three of the factors (understanding of Newton's 3rd Law, Cancelling forces/Constant forces and Gravitation). The gains in the other two factors were not statistically significant because they were below the classification error.

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