Results and Discussion of the Laboratory Survey

This laboratory questionnaire was intended to solicit thoughtful feedback from the students to improve the laboratories’ design and only secondarily to gauge student opinion. In the form distributed to the students, it asked for feedback on all 10 of the laboratory exercises, but in this version we have included only the 4 laboratories described in the accompanying paper. Many students abbreviate or omit written comments when asked to provide both a response on a Likert scale and also to provide written comments. Since we expected the written comments to be most helpful in continuing to improve the design of the laboratories, we chose to omit the Likert scale on our survey. To try to summarize the attitudes of the students to each of the experiments, we scored each of the student comments on an abbreviated Likert scale. Negative attitudes were scored as 1, neutral attitudes (or mixed positive and negative responses) were scored as 2, and positive attitudes to a laboratory exercise were scored as 3. Modes, means, and standard deviations (sd) from this abbreviated Likert scale were calculated for each laboratory and for all of the laboratories taken as a whole (Table S1). Means of greater than 2 for all of the laboratories suggest an overall positive student response to these exercises. It is noteworthy that the most positive response from the students was associated with the final laboratory in the series, suggesting that the students gained additional satisfaction from completing the entire series of experiments. Representative student quotations are included in the results section of the accompanying paper. To date, 496 students have completed these laboratory exercises.