Small changes, big gains: a curriculum-wide study of teaching practices and student learning in undergraduate biology

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Supplementary methods

Diagnostic test analysis

Discrimination index values were calculated for each question using post-test scores, using the following formula:

\[
\frac{\text{(number of students correct within upper group)} - \text{(number of students correct within lower group)}}{\text{(number of students per group)}}
\]

Upper and lower groups were the top and bottom 27% of the section population [1], based on their entire post-test score. For each test administered, a mean discrimination index was calculated from the discrimination indexes of each question. A discrimination index value can range from -1 to +1, with values higher than +0.2 considered fair to good [2]. The mean discrimination index of all tests ranged from 0.32 to 0.55 (overall mean for all tests 0.42 ± 0.22 (SD), median 0.41). Discrimination index summary and analysis results can be found in Table S1 and Fig S1.

Effect size calculations

The effect size of the difference between pre- and post-test scores within each class section was calculated using the standardized mean gain according to Lipsey and Wilson [3]. The equation for this effect size (ES) metric is:

\[
ES = \frac{\bar{G}}{s_g \sqrt{2(1-r)}}
\]

where \(\bar{G}\) is the mean post-test minus pre-test gain score within a given section, \(s_g\) is the standard deviation of the gain scores, and \(r\) is the correlation between pre-test and post-test scores.
References

