Understanding the Curve: Implications of Norm-Referenced Grading in Large Introductory Science Courses

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Introductions

Curving grades in introductory science courses is a common practice, with approximately half of chemistry and physics professors and one-quarter of biology professors reporting that they grade on a curve (Goubeaud, 2010). Proponents argue curving accounts for changes in the difficulty of exams, guards against grade inflation, and is a tool for ranking students and of chemistry and physics professors and one-quarter of biology professors reporting that they grade on a curve (Goubeaud, 2010). Critics argue that curving grades does not provide a valid measure of the degree of content mastery (Goubeaud, 2010). Despite the contentious debate over whether curving student grades is a valid assessment method, little empirical research has examined this practice.

Methods

Research Questions
1. Are there differences in the prior achievement and characteristics of students who take Chemistry 2A on- and off-sequence?
2. Is taking Chemistry 2A off-sequence associated with a higher course grade?
3. If taking Chemistry off-sequence is associated with a higher grade, is this a result of the composition of the students in the class? In other words, is it an effect of the curve?

Statistical Analysis
Hierarchical linear modeling (HLM) was used to examine the effects of class characteristics on student grades. HLM accounts for the nested structure of the data (students nested within classes) and models the effects of individual student characteristics, as well as the effects of class-level characteristics on student grades. A two-level random intercept model was used. At level 1, individual students' Chemistry 2A course grades were modeled as a function of student-level covariates, with all students who were in the same class as higher performing students and artificially deflated the grades of lower performing students and artificially deflated the grades of lower performing students and artificially deflated the grades of lower performing students and artificially deflated the grades of lower performing students and artificially deflated the grades of lower performing students and artificially deflated the grades of lower performing students and artificially deflated the grades of lower performing students and artificially deflated the grades of lower performing students and artificially deflated the grades of lower performing students and artificially deflated the grades of lower performing students and artificially deflated the grades of lower performing students and artificially deflated the grades of lower performing students and artificially 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