The Innovative Instructor

Center for Educational Resources

Best Practice Forum

April 2013

To Curve or Not to Curve

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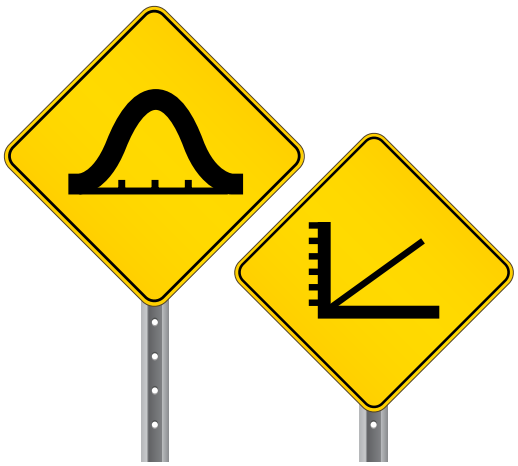
What it is

Instructors choose grading schemes for a variety of reasons. Some may select a method that reflects the way they were assessed as students; others may follow the lead of a mentor or senior faculty member in their department. To curve or not to curve is a big question. Understanding the motivations behind and reasons for curving or not curving grades can help instructors select the most appropriate grading schemes for their courses.



Curving defines grades according to the distribution of student scores. Grades are determined after all student scores for the assignment or test are assigned. Often called norm-referenced grading, curving assigns grades to students based on their performance relative to the class as a whole. Criterion-referenced grading (i.e., not curving) assigns grades without this reference. The instructor determines the threshold for grades before the assignment is submitted or the test is taken. For example, a 92 could be defined as the base threshold for an A, regardless of how many students score above or below the threshold.

Why does it matter

Choosing to curve grades or use a criterion-referenced grading system can affect the culture of competition and/or the students' sense of faculty fairness in a class. Curving grades provides a way to standardize grades. If a department rotates faculty responsibility for teaching a course (such as a large introductory science course), norm-referenced grading can ensure that the distribution of grades is comparable from year-to-year. A course with multiple graders, such as a science lab that uses a fleet of graduate students in the grading, may also employ a norm-referencing technique to standardize grades across sections. In this case, standardization across multiple graders should begin with training the graders. Curving grades should not be a substitute for instructing multiple graders how to assign grades based on a pre-defined rubric (see link below to related *Innovative Instructor* article on rubrics).

In addition to standardizing grades, norm-referenced grading can enable faculty to design more challenging assignments that differentiate top performers who score significantly above the mean. More challenging assignments can skew the grade distribution; norm-referenced grading can then minimize the impact on the majority of students whose scores will likely be lower.

A critique of curving grades is that some students, no matter how well they perform, will be assigned a lower grade than they feel they deserve. Shouldn't all students have an equal chance to earn an A? For this reason, some instructors do not pre-determine the distribution of grades. The benefit of using a criterion-referenced grading scheme is that it minimizes the sense of competition among students because they are not competing for a limited number of A's or B's. Their absolute score, not relative performance, determines their grade.

The Innovative Instructor: "Calibrating Multiple Graders"
http://www.cer.jhu.edu/ii/InnovInstruct-BP_CalibratingGraders.pdf

What this is

The Innovative Instructor is a forum of published articles (www.cer.jhu.edu/ii) and a blog (ii.library.jhu.edu) related to teaching excellence at Johns Hopkins

About the CER

The Center for Educational Resources partners with faculty and graduate students to extend instructional impact by connecting innovative teaching strategies and instructional technologies

For information on how to contribute to *The Innovative Instructor* or to read archived articles please visit

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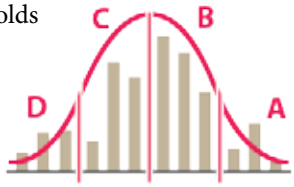
How to do it

There are multiple ways to curve grades.

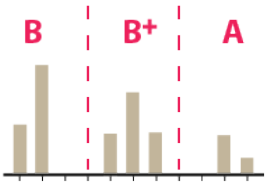
I. The Bell Curve

Normalizes scores using a statistical technique to reshape the distribution into a bell curve. An instructor then assigns a grade (e.g., C+) to the middle (median) score and determines grade thresholds based on the distance of scores from this reference point. A spreadsheet application like Excel can be used to normalize scores. CER staff can assist instructors in normalizing scores.



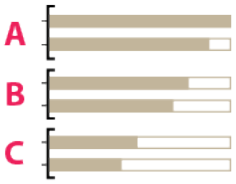
II. Clumping

The instructor creates a distribution of the scores and identifies clusters of scores separated by breaks in the distribution, then uses these gaps as a threshold for assigning grades.



III. Quota Systems

Often used in law schools, the instructor pre-determines the number of students who can earn each grade. The instructor applies these quotas after rank ordering student scores.



IV. Criterion-reference grading

Using a pre-determined scale, assessments are based on clearly defined learning objectives and grading rubrics so students know the instructor's expectations for an A, B, C, etc.

100% - 91% = A
90% - 81% = B
80% - 71% = C
70% - 61% = D

Other thoughts

During the 2011 Robert Resnick Lecture at Johns Hopkins, Carl Wieman, Nobel Laureate and Associate Director for Science at the President's Office of Science and Technology, argued that most instructors are not trained to create valid assessments of student learning. Curving can be used as a tool to adjust grades on a poorly designed test, but consistent use of curving should not be a substitute for designing assessments that accurately assess what the instructor wants students to learn by the end of the course. CER staff are happy to talk to faculty about defining learning objectives and/or strategies for designing challenging and accurate student assessment instruments.

"We have tried to standardize grading with rubrics and TA training, but we still see large differences from TA to TA. We know that this is the case because the grade distributions for given TAs who have taught multiple sections over multiple years are remarkably consistent and stable. The only fair and practical solution is distribution based grading."

– Morris Swartz, professor of Physics

"Curving grades ranks students relative to each other but tells me little about whether they have mastered the course material—it's entirely possible for a student to get an A yet not understand the material at all. Using criterion-based grading with specific learning objectives allows me to assess whether or not the students grasped what I am trying to teach. If everyone in the class has thoroughly mastered the material, why shouldn't they all get A's?"

– Todd Hufnagel, professor of Materials Science and Engineering

Additional Resources

- Campbell, C. (2012). Learning-centered grading practices. *Leadership*. 41(5), 30-33
- Jacobson, N. (2001). A method for normalizing students' scores when employing multiple graders. *ACM SIGCSE Bulletin*. 33(4), 35-38.
- Joe Champion's Grading Transformation Spreadsheet. This spreadsheet automatically curves students' scores after the instructor copies the scores into the spreadsheet and sets a variable defining the amount of curve. http://faculty.tamucc.edu/jchampion/grade-transform-excel

Author's Background

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