

Will there be a curve?

Statisticians have found that data (for example grades) for large sample sizes (large classes) generally mimics a nice bell curve, with a certain percentage of the data points falling quite close to the average. These curves have a lot of desirable properties, and so for a while in education it was popular to "curve" a class to fit this model. My high school chemistry teacher tells me of an extreme example of this, where his professor announced to his students at the beginning of the term that the course would be graded on a bell curve. At the end of the term, my chemistry teacher had a 96% in the class and received a C. His friend had a 93% and received an F. After all, the bell curve said that 3 students should receive F's, and the friend with the 93% was the third lowest score, so that's how the curve was set.

When students ask me if there will be a curve, I don't think this is exactly what they have in mind. After all, my syllabus has already explained exactly how the weighted average for my class is computed, and it has promised that an average of 70% will correspond at least to a C- and a 90% at least to an A-. I've already committed that grades will not go down. What I'm really being asked, is if I will fudge the numbers a little: either taking that 78% a student got on a midterm and changing it to an 80%, or taking that weighted 70% a student ended up with and calling it a C+ or... some other magic; when curves are applied, my experience has been that they are done in a secretive and unclear manner that leaves students to guess why their grade ended up as it did, or to just be grateful and try not to ask too many questions.

So should a course, and in particular my course, be graded on a curve? Let me summarize what I see as some of the major advantages and disadvantages of curving that ought to influence this decision.

Advantages:

1. **Wiggle room**- It's surprisingly difficult to know ahead of time the exact difficulty of a test. An instructor might ask fair questions, but underestimate how long students will need in order to answer them, and so have a test that many struggle to complete in time. Or an instructor might ask too many questions that students find hard (or too many that they find easy). This problem is naturally worse for instructors that have less overall experience teaching, and less experience teaching the specific course they're writing a test for, but it's something everyone struggles with.
2. **Popularity**- At the end of the course, students get to evaluate their instructor, and it's no secret that good grades make students happier than bad grades do. Even more powerful, **curving** a course is an easy way to convince students that an instructor really is the "good guy" and "on their side." Imagine that the work a student does earns them a F according to the grading system established for the course. The instructor then gets to step in as an all powerful entity that's above the rules and grant the student amnesty, bestowing upon them the gift of a higher grade. That's pretty great. I wish I were as cool and powerful as that instructor.
3. **Evaluation as learning**- I've heard professors say that if any student gets above 50% on their test, then 50% of the test was wasted. They have a different mindset about the purpose of an exam. While some instructors think that exams should evaluate learning that has already taken place, these instructors think that exams are additional opportunities for students to struggle and learn. If they give a problem students have already seen and learned how to solve, then the time is wasted. If they provide a brand new problem that the student has to think through, then the student will learn something (they might even get the correct final answer, but it can't be expected that this will happen for everyone). Curving a course allows instructors to give these kinds of exams, since a 50% on a test of this type should be an exceptionally high score rather than a failing grade. Of course, testing approach is more of a spectrum than a dichotomy.

Many instructors think that tests should have problems that students have seen before, but that truly exceptional students should also be able to solve more challenging problems or problems they haven't seen previously. Other instructors intentionally make the test a little difficult to give them some flexibility in assigning grades. They don't want to curve scores in a way that hurts students, because that's quite unpopular, but they also don't want to be forced into a situation where everyone gets an A just because they wrote a test that was too easy.

### Disadvantages

- 1. Competition-** It's easy for a student in a curved class to feel that there are a finite number of passing slots and thus that the success of a peer comes at the expense of their own success. (This is not generally how curves work out in reality, but for the sake of brevity I won't get into the technical details here.) I had a student in a my precalculus class that emailed me a link she had found helpful when reviewing for the final. She wrote "I know that sharing this link could screw me out of doing better on a curve," but she went on to ask me to share it anyway. I was mortified. Research has shown that students who cooperate and form study groups often perform much better in a course, so any policy that punishes or is perceived as punishing cooperation is a policy that works against students.
- 2. Race to the bottom-** In my department, where favorable curves are somewhat common, a major concern is that they create the mentality that a student doesn't have to do well, as long as they do better than the person next to them. Besides creating competition, this discourages students from trying as hard as they might otherwise do. My peers and I have overwhelming, if anecdotal, evidence which suggests that even the possibility of a curve lowers the average achievement of a class significantly and is detrimental to learning.
- 3. Ambiguity-** There's a difference between mastering material, learning it well enough, and learning it insufficiently well (and also a difference between learning it insufficiently well and not learning it at all, although the grade given for those two outcomes is the same). Students have a right to know where they stand on that spectrum so they can make educated decisions about how much time they should invest in a course and whether they need to seek additional help. If the course will or even may eventually be curved, then the scores students are receiving on assignments and exams, the scores intended to provide students with the information they need in order to make those informed decisions, are no longer reliable or informative. Some curve may in some way be applied at some later point, but in the meantime students are left playing a guessing game over whether their grade will be raised to where they need or expect it to be.

So in order to vocalize my decision making process on whether my course should be curved, let me address those advantages point by point in reverse order. (Spoiler alert: I'm going to side against using a curve.)

(3.) I'm attracted to the school of thought that sees tests as an opportunity to push students to learn and grow, but it's not a good fit for me as an instructor, especially one teaching a calculus class that most students take because it's required for the major they're actually interested in. Students should have a clear understanding of what I expect them to know and should have an opportunity (mostly through homework) to evaluate whether or not they have met those expectations before their performance is evaluated on an exam. Of course this doesn't mean that a test will never ask students to do something they haven't already seen and memorized an algorithm for, but it does mean that tests should be limited to asking questions that someone that fully understands the material would be able to solve.

(2.) Evaluations matter more than most of us would like to admit. They influence hiring and

promotion. I care a lot about teaching and that forces me to care a lot about what my students think of me. But at the end of the day, I'd rather do what I think is in my students' best interests than what I hope will appear to be in their interests and boost my ratings. And students are smart. They respond better to fair, honest, transparent assessment than they do to the omnipotent being that seemingly grants random grades according to their whims or passing mood.

So that just leaves the first point, and the advantages of having some wiggle room aren't enough to outweigh the serious disadvantages that curving a class presents. As an instructor, it's my job to form fair expectations for my students, clearly communicate to students what those expectations are, teach in a manner that provides students with the tools necessary to meet those expectations, provide access to assignments that encourage further development of those tools and allow students to evaluate their progress, and then accurately assess whether students have met those expectations via carefully written tests. There are unique challenges in each of those steps, but this quarter I have the good fortune to have the guidance of several experts on mathematics and education that will help me every step of the way. I value transparency. I think students ought to know what is expected of them, be encouraged to work independently and with peers to meet those expectations, and know how well they have done in meeting those expectations and what grade they have earned as a result. To facilitate this, I choose not to curve my class.