

Why Signed Letter Grades Are Mostly Used for Graduate Classes

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1. Letter grades and signed letter grades: a brief reminder

- In the US education system, the overall grade for a class – usually, from 0 to 100 – is formed by grades for several assignments and tests.
- Based on this numerical grade, the student gets a letter grade.
- This letter grade is the only thing that is recorded in the student’s transcript.
- There are 5 letter grades.
- A (“excellent”) usually corresponds to numerical grades between 90 and 100.
- B (“good”) usually corresponds to numerical grades between 80 and 89.
- C (“satisfactory”) usually corresponds to numerical grades between 70 and 79.
- D (“below satisfactory”, passing grade for some classes) that usually corresponds to numerical grades between 60 and 69.

2. Letter grades and signed letter grades: a brief reminder (cont-d)

- F (“failing”) usually corresponds to numerical grades below 60.
- This leads to the following ordering of grades, from the worst to the best:

$$F < D < C < B < A.$$

- In addition, some universities also use *signed letter grades*, i.e., letters grades with added plus or minus signs.
- In this arrangement, the range corresponding to a letter grade is divided into three parts:
 - the upper part – describing slightly better knowledge level – corresponds to the plus grade,
 - the middle part is reserved for original unsigned grade, and
 - the lower part – describing slightly worse knowledge level – corresponds to the minus grade.

3. Letter grades and signed letter grades: a brief reminder (cont-d)

- For example, among students whose knowledge corresponds to the A level:
 - the grade A+ is the best option,
 - unsigned A is next best, and
 - the grade A− is the worst of the three A-level options:

$$A- < A < A+.$$

- In general, if we add signed versions of all letter grades, we get the following ordering of possible signed letter grades:

$$F- < F < F+ < D- < D < D+ < C- < C < C+ < \\ B- < B < B+ < A- < A < A+.$$

- Usually, not all possible signed letter grades are used: e.g., a failure is a failure, so F+ makes not much sense.

4. Comments

- US is not the only country that uses signed grades.
- For example, in Russia, where OK and VK are from, we had a similar (but not exactly) system of grades that went into a transcript:
 - the grade 5 meaning “excellent”,
 - the grade 4 meaning “good”,
 - the grade 3 meaning “satisfactory”,
 - the grade 2 meaning “failing”, and
 - the grade 1 meaning “really bad”.
- In addition, professors could add signs whenever they wanted.
- Some professors did this sometimes, some never.

5. Comments (cont-d)

- There was even a possibility to give two signs; for example:
 - the grade 5++ means exceptionally excellent, while
 - the grade 3-- means the very low level of satisfactory: one more minor mistake and it would be failing.
- Not all signed grades were used:
 - e.g., some professors would add minus or minuses to a failing grade (1 or 2),
 - but it made no sense to add plus signs to the failing grade.

6. How this is all related to fuzzy

- Grades are always strongly subjective.
- How many points to give to a partially correct problem?
- Do we consider a small mistake a typo – when a student shows, in other cases, that he/she knows this material?
- Or do we count it as a true mistake?
- All this has a lot of built-in subjectivity.
- As a result, these grades are not so much an objective measurement results, but, to a large extent, an expert estimate.
- In terms of fuzzy techniques, a grade is largely a fuzzy degree.

7. Related problem: shall we use signed grades or not?

- Two of us (OK and VK) work at the University of Texas at El Paso (UTEP), while Christian Servin got his PhD there.
- At UTEP, we normally do not use signed letter grades.
- Several faculty members – mostly those who graduated from schools that use letter grades – proposed to introduce letter grades.
- At that time, we had two different elected faculty bodies that decided on academic policies.
- The Faculty Senate decided on academic policies related to undergraduate education.
- The Graduate Council decided on academic policies related to graduate programs.
- Each of these two bodies had a discussion and a vote about the issue of signed letter grades.

8. Related problem: shall we use signed grades or not (cont-d)

- The resulting vote was split:
- In the Faculty Senate, most elected representatives voted against using signed letter grades in undergraduate classes/
- In the Graduate Council, most elected representatives voted for using signed letter grades in graduate classes.
- It turned out later on that this was not a peculiar feature of our university.
- Many more schools use signed letter grade in graduate classes than in undergraduate classes.
- A natural question is: why?
- In this talk, we provide a possible explanation for this phenomenon.

9. What is the purpose of the letter grades?

- In order to provide an explanation, let us recall what is the purpose of the grades in the first place.
- This question is easy to answer for numerical grades.
- The numerical grade, in spite of all its level of subjectivity, reflects the level of student knowledge.
- After receiving this grade – and these grades are officially announced to students – each student knows where he/she stands.
- This does not change whether we use unsigned or signed letter grades.
- In the US system, these numerical grades are only shown to the student.
- They are *not* shared with anyone, they are not kept as records anywhere.
- Sharing these numerical grades with someone different from this particular student is prohibited by law.

10. What is the purpose of the letter grades (cont-d)

- The only thing that becomes different when signed letter grades are introduced is what goes into the transcript.
- The transcript is used when a student applies for a job, when the student applies for further studies, etc.
- From this viewpoint:
 - the only objective of introducing letter grades is
 - to provide future employers a better understanding of the student's level of knowledge in this class.
- This, in turn, encourages students to study better.
- If a student is currently at a lower B level, with expected 80 points out of 100, then this student needs a lot of effort to make it an A.
- So if he/she does not have time for such a big effort, this student will stay at the same B level.

11. What is the purpose of the letter grades (cont-d)

- On the other hand, if we have a signed letter grade system:
 - a student with expected 80 points (that correspond to B–)
 - has a chance to get a better grade (e.g., unsigned B) – with a much more reasonable effort.
- So more students will select to study more – and thus, the average level of knowledge will increase.
- Adding signed letter grades provides a higher level of granularity.
- So, the question of whether to use signed letter grades or not become a question of how much granularity is needed.
- If we decide to use too few levels, we will not give a good picture.
- However, if we provide too many details, too many levels, they may not be noticeable neither by a student, so why add them?
- Thus, to proceed further, we need to analyze which level of granulation should we use.

12. Which level of granularity should we use?

- According to the well-known seven-plus-minus-two law, a person meaningfully distinguishes between from 5 to 9 levels.
- For most people, it is 7 levels.
- Thus:
 - to be as detailed as possible – and at the same time to make all these levels clearly distinguishable for the majority,
 - it makes sense to provide 7 levels of granularity.

13. Let us apply all this to the question about letter grades

- In the undergraduate level, if we only use letter grades, we have 5 options: A, B, C, D, and F.
- This is within the range of optimality.
- This number has an additional advantage:
 - it leads to distinguishable grades for *all* the students,
 - even for those who usually consider 5 levels.
- If we add all possible signed grades, we will get too many levels.
- This will make the difference between the neighboring levels indistinguishable both for the students and the employers.
- This would defeat the purpose of assigning letter grades.
- This explains why signed letter grades are rarely used for undergraduate classes.
- What is different in the graduate school is that for a graduate class, already C is a failing grade.

14. Let us apply all this to the question about letter grades (cont-d)

- By definition, graduate students should have good, above-average knowledge.
- From this viewpoint, it does not make sense to consider signed versions of the C grade.
- It also probably does not even makes sense to consider yet other failing grades D and F.
- So, if we only use unsigned letter grades, we get only three levels: A, B, and C.
- Clearly, we can provide a more detailed granulation that will still make all the levels distinguishable.
- If we add signs for positive grades A and B, we will have exactly 7 grades:

$$C < B- < B < B+ < A- < A < A+.$$

15. Let us apply all this to the question about letter grades (cont-d)

- This way, we will get the optimal number of grades.
- This explains why signed letter grades are often used for graduate classes.

16. Comment

- These two conclusions do not mean that signed letter grades should never be used in undergraduate classes.
- For example, in highly selective prestigious schools, students are expected to have only As and Bs.
- For such schools, C for a class is a shame – practically a failure.
- In this case, it also makes sense to add signed letter grades to supplement the three real grades A, B, and C.

17. Acknowledgments

This work was supported by:

- the AT&T Fellowship in Information Technology,
- the Institute for Risk and Reliability, Leibniz Universitaet Hannover, Germany,
- the Deutsche Forschungsgemeinschaft (DFG, German Research Foundation) Focus Program SPP 100+ 2388, Grant Nr. 501624329,
- the European Union under the project ROBOPROX (No. CZ.02.01.01/00/22 008/0004590),
- the Center of Excellence in Econometrics, Faculty of Economics, Chiang Mai University, Thailand,
- the Ho Chi Minh City University of Banking, Vietnam, and
- Thang Long University, Hanoi, Vietnam.