

Grade  
Forecasting As  
a Student  
Motivator

Daniel  
Swenson

What is Grade  
Forecasting?

A Case Study:  
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# Grade Forecasting As a Student Motivator

Daniel Swenson

University of California, Merced

Spring 2015

# What is Grade Forecasting?

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**Grade forecasting** is the prediction of someone's end-of-the-semester grade based on their current assignment grades. So, grade forecasting is a form of feedback that informs the student whether their progress in the course so far is adequate, based on the grade that they wish to receive in the course.

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The grade forecasting tool is based on the end-of-the-semester grades and assignment grades of students who have previously taken the course. When this type of tool is used, the hope is that it will be a better calibrated (i.e., more accurate) predictor of a student's end-of-the-semester grade than their current grade.

# A Case Study: Dr. Armstrong's Use of Grade Forecasting

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Dr. Armstrong is a business professor at Brock University in Canada who has used grade forecasting in many of his courses.

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What follows is taken from Dr. Armstrong's article "A Grade Forecasting Strategy for Students", which is available on UC Merced's CRTE website at

`crte.ucmerced.edu/content/grade-forecasting-strategy-students`

The article was published in 2013.

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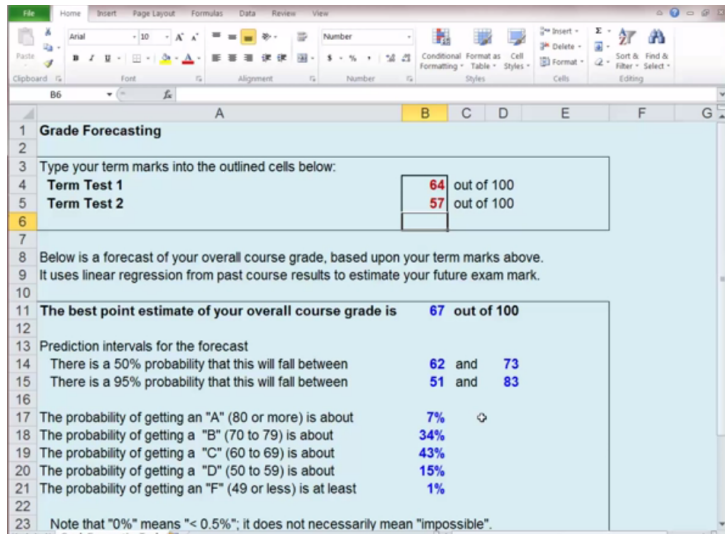


Figure: Dr. Armstrong's grade forecasting spreadsheet.

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- Of 465 students enrolled in the course during 2010-2012, 282 completed the survey.
- Of those, 144 (51 percent) said they had tried the forecasting spreadsheet.

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- The rate of trial varied with academic performance. “A” students were 7.6 times more likely than “D” students to report trying the spreadsheet.
- Of those who did participate, 29 percent of them said the forecast grades were lower than they had expected, while only 6 percent said they were higher. Armstrong notes that “This imbalance indicates the degree to which students are overly optimistic about their course grade.”



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- 31 percent of the respondents said the forecasting experience made them feel more positive or confident about their course progress, while 35 percent said they felt more negative or worried.
- Fifty-six percent said their motivation had increased, while 7 percent said it had decreased.
- Forty-seven percent said they were subsequently studying more than they had previously planned, while 3 percent said they were studying less.
- And 74 percent recommended that grade forecasting continue to be offered in the course, while 6 percent recommended against it.

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Dr. Armstrong concludes “These results suggest that grade forecasting can be a useful addition to a course but that its effects on student motivation and effort are largely indirect. I am currently working with one of my colleagues on a follow-up study to better understand this relationship.”

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This semester, after mid-semester grades were submitted for the Math 32 course at UC Merced (a course in probability and statistics), a grade forecasting app was made available to the Math 32 students.

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In the Math 32 grade predictor, the students' end-of-the-semester grade is predicted using their first two homework grades and their first exam grade. A percentage is forecasted for the current student based on the assignment grades that they entered.

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In addition to the semester grade, a visualization tool is available. Colored points represent 184 students from a previous semester's Math 32 course, which a black point represents the assignment grades of the person currently taking Math 32. This visualization aspect allows the student to see whether their assignment grades are most similar to those of students who received high or low semester grades in the previous Math 32 course.

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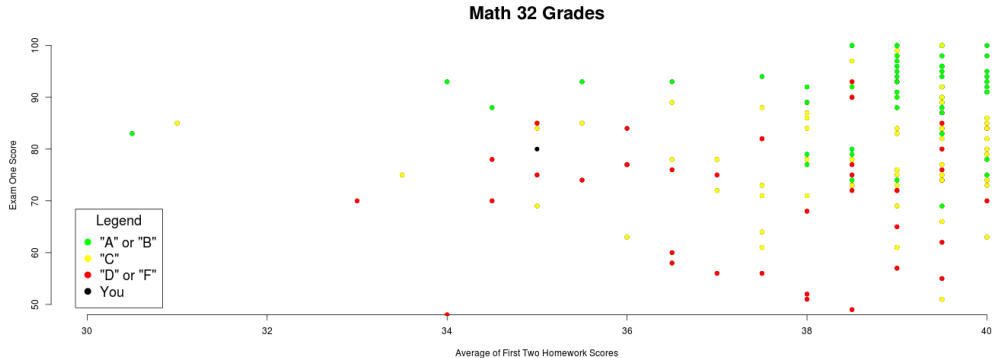
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Average of Your Two Homework Scores

35

Your Exam One Score

80



You are on track to receive a grade of approximately 72 % in this course.

Figure: The Math 32 grade predictor.

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The predicted grade is simply the average of the seven students from the previous Math 32 course with the grades that were most similar to the current student's assignment grades. The number seven was chosen because it yielded the most accurate results when used on the previous semester's end-of-the-semester grades.

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The students were also offered a survey to take regarding the grade forecasting tool. 46 students responded to the survey questions.



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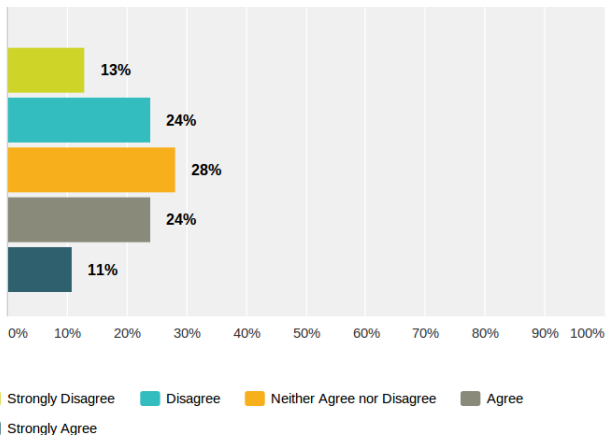
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**Figure:** Survey results for the question “My forecasted semester grade is higher than I expected it to be.” The mean response was 2.48 (interpreting the responses on a 1-to-5 scale).

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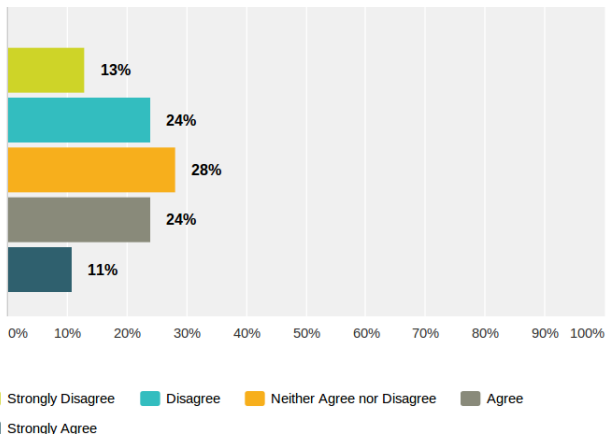
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**Figure:** Survey results for the question “The forecasting experience has made me feel more positive or confident about my course progress.” The mean response was 2.96.

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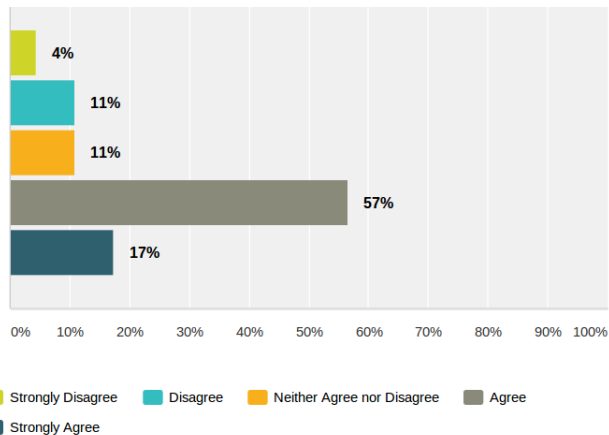
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**Figure:** Survey results for the question “As a result of the grade forecasting experience, I plan to study more than I had previously planned.” The mean response was 3.72.

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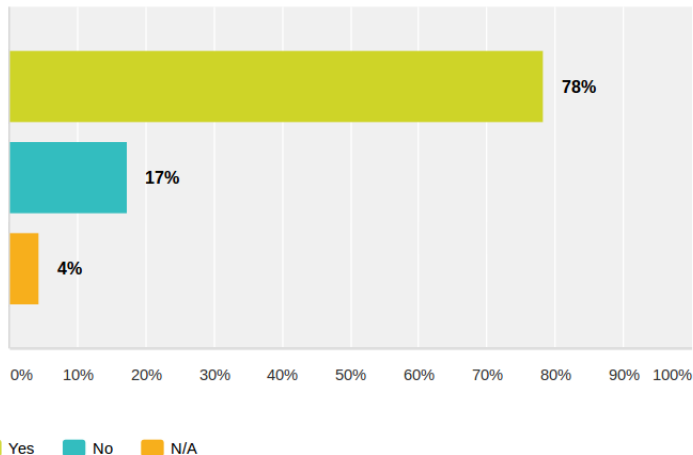


Figure: Survey results for the question “Do you believe that grade forecasting should be offered in future Math 32 courses?”

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Interestingly (and counterintuitively), a correlation coefficient of approximately zero ( $-0.0027$ ) was observed between the responses to the questions regarding “studying more” and the forecasted grade being “higher than expected”.

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In summary, the students' expectations regarding their end-of-the-semester grades seem to be, on the whole, overly optimistic. Moreover, grade forecasting encouraged the Math 32 students to study more, regardless of whether or not the forecasted grade was higher than they expected it to be.

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The type of grade forecasting tool used here can also be adapted to display estimates of the probability of getting a particular end-of-the-semester grade, as Dr. Armstrong's tool does. (However, the students did not complete a survey regarding this version of the grade forecasting tool.)

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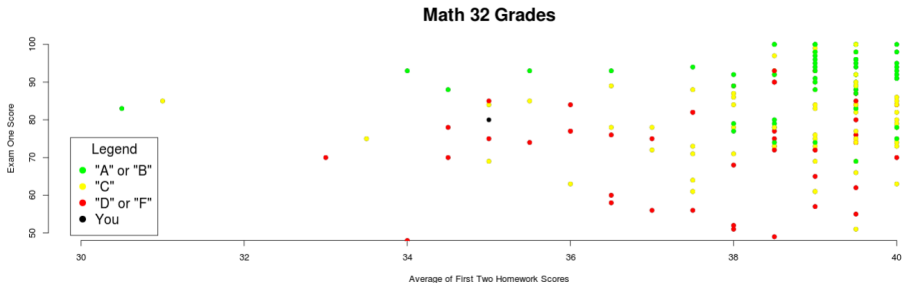
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Average of Your Two Homework Scores

35

Your Exam One Score

80



You are on track to receive a grade of approximately 72% in this course.

The probability that you will receive an "A" in Math 32 is 1%.

The probability that you will receive a "B" in Math 32 is 13%.

The probability that you will receive a "C" in Math 32 is 45%.

The probability that you will receive a "D" in Math 32 is 35%.

The probability that you will receive an "F" in Math 32 is 6%.

(A probability of "0%" should be understood as meaning "less than 0.5%", not "impossible".)

Figure: The updated Math 32 grade predictor.



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After the second Math 32 exam, a spreadsheet-based grade predictor that uses linear regression (as Armstrong's predictor does) was distributed to the students.

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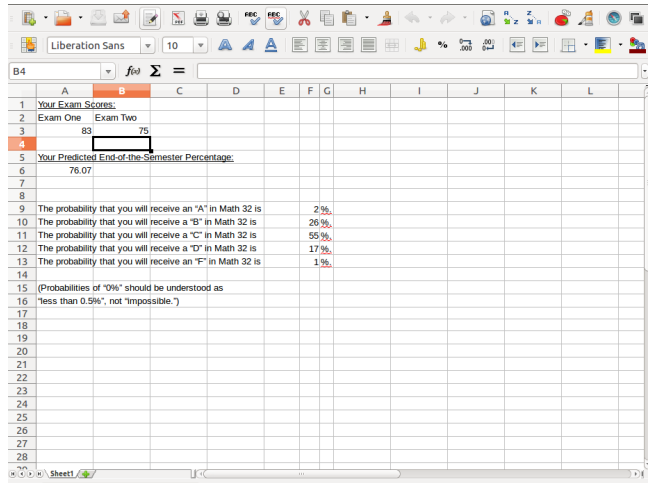


Figure: The spreadsheet-based grade predictor for Math 32.

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Although no survey data were collected regarding this version of the grade predictor, student response seemed generally favorable, although some students desired the addition of the other assignment grades (quizzes and homework assignments) to the grade predictor, as they believed that this would make the predictor more accurate.

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In summary, from the limited data available thus far (from Dr. Armstrong's results and from Math 32), it appears that grade forecasting is a tool that motivates students to study more, regardless of whether or not the forecasted grade is lower than they expect it to be. Grade forecasting can be implemented in a spreadsheet (including estimates of the probability of getting a particular grade, such as an "A", "B", and so forth) which can be distributed to students electronically, allowing them to engage in grade forecasting anonymously.

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Proposed future work includes investigating whether grade forecasting is better calibrated than students' current grades (say, at the mid-semester point) as an estimator of the students' end-of-the-semester grades in other courses at UC Merced, such as CORE 001. Courses such as CORE 001 would be ideal candidates for such a predictor due to the large amount of data that could serve as the input to the predictor and due to the fact that CORE 001 is presumably implemented in a very consistent way from semester to semester.