



Report on Grading in Interdepartmental Biology Courses

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Recently, several questions came up about grading in interdepartmental biology courses. Three questions in particular are:

1. Is it better to take Biology 151/2 rather than Biocore in order to get a better GPA?
2. What is a reasonable average grade in Biology 151/2?
3. Are we contributing to grade inflation if this class is given a higher average grade than a previous class?

The University of Wisconsin-Madison is fortunate to have very highly qualified students. The average ACT score of the entering class has steadily increased for at least the past 10 years. While no measure adequately captures student preparation, ACT score is the most easily accessible quantification available. Grades as a function of ACT scores were examined in 1999 by Bruce Beck (Office of Budget, Planning & Analysis). In 1999 students who entered with an ACT score of 26 obtained an average semester GPA of 3.10 while those who entered with an ACT score of 30 got a 3.29. How do grades given in interdepartmental biology courses compare?

Trends in grades

This analysis covers 10 years from 1996 through 2005. ACT scores are for 1996 to 1999, 2003, and 2005. In Biology 152 both GPA and ACT scores showed a trend upwards but the slopes were not statistically significant (Fig. 1). These data show that there are large differences from class to class in ACT scores, and so presumably, in preparation for the course. How well do grades reflect these differences?

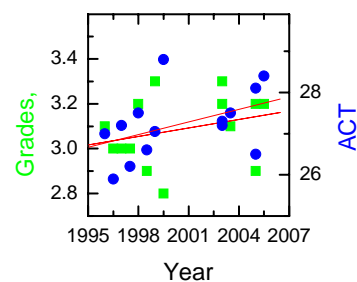


Figure 1. Trend of grades and ACT scores for students finishing Biology 152 in the indicated year (Fall semester plotted as 0.5.)

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Figure 2 shows grades as a function of average ACT score of a given class and Biology 152 data are compared with Biocore data. To simplify, data for Biology 152 is compared with data for Biocore 303. These are the second courses in each sequence.

Average grades are plotted as a function of student ACT score for Spring 152 (cyan circle), Fall 152 (blue square), and Biocore (orange triangle). The 1999 university-wide data are shown in gray.

Biocore students generally have higher ACT scores and get better grades than do students in Biology 152. The slope of the relationship for university data is 0.05 GPA points per ACT point while for biology grades the slope is 0.08 ($r^2=0.46$). These data show that Biocore students are generally better prepared and generally get better grades than do students in 152. Thus, there is no evidence for a GPA penalty for taking Biocore. In addition 46% of the variation in course grades is accounted for by the difference in preparation of the students (as predicted by ACT score).

Comparison of grades with graduating GPA

The grades given in the biology courses can be compared to the graduation GPA achieved by students in the biology courses. These data are limited to 1996 through 2003, since more recent students have generally not yet graduated. The slope of graduation GPA versus ACT score is even greater than between biology grades and ACT score (0.112 versus 0.085) (Figs. 2 and 3). The r^2 is also greater (0.62) indicating that graduating GPAs better reflect student variation (ACT score) than do the grades in the interdepartmental biology courses. Students generally score between 0.1 and 0.2 grade points less in biology courses than they achieve for an overall GPA. The average for Biocore is 0.17 while for Spring 152 it is 0.16 and for Fall 152, 0.13. The variation in average grade between lecture sections within Biology 152 (range 2.9 to 3.4) is greater than the difference between average grades in Biology 152 and Biocore (3.12 versus 3.39).

GPA in the large biological science majors

Finally, data are available to address the question of what do students majoring in the biological sciences achieve for GPAs. Surprisingly, the answer depends upon which semester is taken. More students graduate in the Spring semester and they average almost 0.2 grade points higher in overall GPA (averaged over the 6 majors but not weighted for numbers of students).

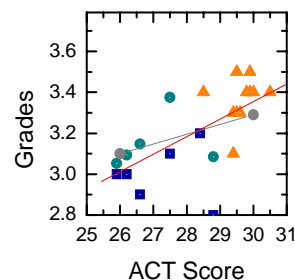


Fig. 2. Grades as a function of ACT score. The slope is highly significant and is 0.085. The gray data are for university-wide grades from 1998.

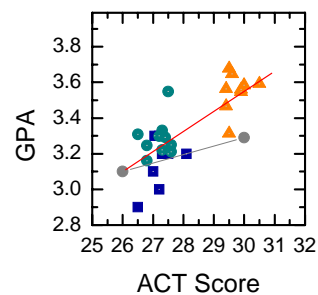


Fig. 3. GPA at graduation as a function of ACT score upon entering. The slope is highly significant and is 0.1124. The gray data are for university wide semester GPAs as a function of ACT score in 1998.

	Bacteriology	Biochemistry	Biology	Genetics	MolBio	Zoology
Spring GPA	3.17	3.43	3.39	3.28	3.46	3.28
Fall GPA	2.98	3.15	3.25	3.02	3.34	3.14

Table 1. GPAs upon graduation for students graduating between 1994 and 2003. The data for Biology covers 2001 to 2003 because the major came into existence in 1999.

Conclusions

1. Taking Biocore will not hurt a student's GPA. While Biocore students are generally better prepared, this is reflected in higher average grades and it appears that the difference in cohort preparation is appropriately reflected in differences in grades, at least in Biocore 303.
2. The overall average given in Biology 152 is 3.12. This is a little bit below the GPA attained by Biology 152 students upon graduation and a little bit below the average graduating GPAs of students in the large biological science majors. Allowing for students typically doing better in upper level classes, 3.12 may be about right. However, there is significant variation in the preparation of students from one class to the next and even between simultaneous lecture sections. Thus, it would be inappropriate to suggest that the average grade should always be 3.12. Instructors need to develop a sense of what students can be expected to achieve and adjust grading to make grading across the different sections and years fair. When assigning grades instructors ought to consider what average grade is being given for a given lecture section. It is, of course, not correct to say that if 80% and above is a B and a B is worth three grade points, then a class average of 82% equates to just over a 3.0 grade point average for the course.
3. There has been a slight trend upward in ACT scores of entering students over the past decade and this has been matched by a similar slight trend upward in assigned grades.