

Factors Affecting Student Performance in Principles of Macroeconomics Courses

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The ability to attain high scores on standardized entrance exams does not guarantee high student performance in all areas of academics. Economics courses are examples of this phenomenon. Student performance in Principles of Macroeconomics classes is dependent on many factors. Natural ability needs to be supplemented with motivation and effort. Recent studies have tried to determine the factors that are attributed to high performance. A study by M. Borg and S. Shapiro tried to predict the student's performance based on the personality type of the instructor. The results found that a student would do better in the class if the student and professor had similar learning styles.

Other studies (R. Tay 1994, M. Lage 1996, and K. Dynan 1997) looked at more general aspects of success. G. Anderson et al. concentrated on how well the student scored in high school on mathematics, English, and economics, as well as gender, student age, and level of college attainment. According to their study, students who received better scores in high school also performed better in college. Another aspect discovered was that men had better grades than women and chose to drop the class less often.

I. THE PROBLEM

This study was conducted in an attempt to determine to what degree absences and seating arrangements affect student performance. Also included was gender, class level performance on the first quiz, the percentage change from the first test to the last, and percentage of quizzes and homework accomplished as it relates to the score on the departmental final in the course. The model to be used is:

$$(1) \quad \text{GRADE} = f(\text{Motivation, Ability, Gender, Effort})$$

The sample size of 142 original students was taken from a principles of macroeconomics class at a midwestern university during the fall of 1997 with ninety-six in the final results. The students take four (100 point) exams, a departmental final (176 points). Four quizzes (of varying points possible), and occasional homework and bonus opportunities. The lowest test score of the four is dropped from the total points.

Each area of the model is explored. Absences and seating arrangements were included as a measure of effort. It was expected that high absences (ABS) and sitting in the back of the room (BACK) would have a negative effect on the student's grade and sitting in the front of the room (FRONT) would increase the points accumulated.

Research shows that absences lower the student's grasp of the material (E. Topping, 1994). In the classroom, each of the ten rows contained fifteen seats. Sitting in the back of the room (last three rows) was believed to have a negative effect because the students are more likely not to pay attention and the instructor would not notice. Sitting in the front (first three rows) was expected to have a positive effect because the instructor can hear the student responses and communicate more easily with the students in the front and notice more quickly if there is a problem.

Personal attributes are also considered as a part of motivation. The determination to graduate was considered to be more important to seniors than freshmen, because graduation might be postponed if a class is failed. Being a senior (SR) would have a positive effect on the student's grade whereas being a freshman (FROSH) was expected to have a negative effect. Gender (MALES) was included to test the findings from Anderson et al. Being male demonstrates positive effect on performance in economics courses.

The points received on the first quiz (Q1) were included as a measure of the natural ability of the student for the subject and was expected to have a positive effect on the final. The opportunities (OP) that were available included four quizzes and seven homework assignments throughout the semester. For every opportunity the student participated in it was predicted that there would be a positive effect on the departmental final and was measured by the percentage finished regardless of the score received. It was hoped that effort could be measured by the sustained use of this reinforcement of the course material.

The final variable included was the percentage change between test one and test four (TESTP). The students had the option of dropping the lowest test score of the four taken and a test score of zero would automatically be the one dropped. If a student did not take test four, the average of the first three tests was used to assign a score before the percentage change was calculated. Six students chose to drop test four by not taking it and needed this adjustment. This was also a measure of effort. If the student continued to work at the same level throughout the semester, the percentage change would be minimal. A marked increase or decrease would demonstrate a difference in effort since the natural ability level as measured by quiz one.

Table 1: Means and Standard Deviations

Variable	Mean	Standard Deviation
Quiz One (Q1)	5.452	2.526
Absences (ABS)	6.216	5.363
Assignment Opportunities (OP)	0.752	0.195
Test Percentage Change (TESTP)	-0.096	0.321
Departmental Final (FINAL)	108.226	24.92

The original 142 students included 36 students who dropped the course and 10 students who failed to take the final. The scores on the departmental final varied from sixty to one hundred and seventy-six with a mean of 108.22 and a standard deviation of 24.92 having a wide distribution. The first quiz had a maximum score of twelve, a minimum of zero, and a mean of 5.45. The number of absences recorded ranged from zero to twenty-six for a sixteen week semester with three classes per week and a mean of 6.22 days missed.

Eleven opportunities were available for the students to take quizzes or turn in assignments to determine if the students understand the material. Every student participated in at least one of these opportunities, some participated in all eleven. Also, the percentage change from test one to test four was calculated and found to have a minimum of -83.5% and a maximum of 68.8% giving a mean of -0.05 and a standard deviation of 0.24. The majority of students was consistent throughout the semester and had very little variation in their test scores. 92% of the students experienced a percentage change of less than forty percent above or below the test one score.

The author assisted the course instructor and was responsible for recording scores and absences. Absences were recorded based on attendance ten minutes after the class began. Students who were tardy may have heard the majority of information and not have been counted as present. However, no information is available to indicate how much time each student spent studying the material or the attitude each person had concerning the subject of economics before the class began.

II. THE RESULTS

$$\begin{aligned}
 FINAL = & 92.931 + 11.188FRONT + 7.450 BACK - 6.991FROSH + 3.237SOPH \\
 & (5.895)^* (2.031)^* (1.319) (-1.011) (0.422) \\
 & + 2.651SR + 4.595MALES + 2.328Q1 + 26.724TESTP + 6.871OP - 0.749ABS \\
 & (0.251) (1.050) (2.555)^* (2.939)^* (0.421) (-1.327)
 \end{aligned}$$

Adjusted R-Square = 0.2613 F = 4.174* n = 106 (t scores)

The model used a significance level of 1% for all tests. The variables FRONT, Q1, and TESTP were statistically significant. Each of the independent variables exhibited the anticipated signs except BACK. The positive effect from sitting in the back may be explained by the 36 students who dropped the course. Fifteen of the thirty-six students sat in the back. It could be argued that the students who completed the course were determined to succeed regardless of the seating arrangements. Of the students who dropped 22% were undecided about their major and may have decided to postpone classes that might not be required when their major is declared.

Senior status was worth an additional two points and being a freshman subtracted seven points. The study skills of seniors may have been better honed through practice than freshmen have attained. The sign for gender was correct according to other studies that have been performed, but was not statistically significant in this model. Males accounted for 53% of the

original students. Contrary to Anderson et al. Males had a higher drop rate than females in this class.

Each variable has an inelastic effect on the final score with quiz one (0.1173) being the most elastic and absences (-0.0430) the most inelastic.¹ If quiz one increases by one percent then final will increase by 0.1173%. Similarly, final will increase by 0.0477 if the opportunities taken increases by 1%. On the other hand, an increase of one percent in absences will reduce the score of the final by 0.0430%. Finally, as the change in the test percentage increases by one percent then final will decrease by only 0.0123%. In other words, it would have taken a substantially higher level of effort to receive a modest change to the course final.

The model had some multicollinearity as indicated by the condition indexes, but it was not considered severe. The two variables involved are absences and opportunities taken. This is to be expected since the opportunities are only available when the students attend class. Amemiya's Prediction Criterion Test was performed to see if the model would improve if one of these two variables were removed. The results stated that both items were valid variables. According to Ramsey's Regression Specification Error Test, the model was not misspecified. The model does not have heteroskedasticity as indicated by the Park Test or the plot of the residuals, and the model is statistically significant at $F = 4.174$.

III. CONCLUSION

The ability of students to perform well in Principles of Macroeconomics courses can be predicted to some degree by applying the student's scores on the first quiz, the percentage change from the first test to the fourth test, and where the student sits in the classroom. Students in principles of economics courses must determine the costs and benefits related to

studying the material and attending class. Studying for other subjects, sleeping late, attending social activities, and hanging out with friends are just a few of the options that take student's time. Many things can interfere with their study efforts.

Students sometimes enter a class with a preconceived opinion about the class that can elicit a response based on the original attitude. If the student starts a course with a negative attitude, it would be supposed that the effort would not be as great as for an anticipated class. Because of this, future studies might concentrate on better ways to measure effort and motivation. Time spent actively studying economics would be an excellent method for measuring effort if the self-reporting is accurate. To measure motivation, student age may also be a consideration. A non-traditional freshman may have different goals and time schedules toward graduation than a traditional freshman. The information from this study might be used to encourage students to participate in class and to complete assignments and tasks for a better grade in the course.

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¹ Elasticities represent the responsiveness of the course final to the percentage change in the variables. For example, when there is a relatively large effect marginally to an additional point earned on the first quiz, a one percent change in that score creates very little change in the course final. The elasticities were calculated at the means of the variables using the equation: $\text{elasticity} = \text{coefficient} * (\text{mean of independent} / \text{mean of dependent})$.