



LINKING RESEARCH, POLICY AND PRACTICE



## Course Learning Strategies for Efficient Student Performance

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## ***Abstract***

### **Course Learning Strategies for Efficient Student Performance**

The study analyzes statistically how course performance is influenced by study activity and individual background factors. Some students attend external exam training courses, and it is analyzed how participation in such courses influences grading. The analysis shows some unexpected results, which may serve as student recommendations in terms of choosing personal learning strategy, depending on one's individual background.

Not surprisingly, strong entrance qualifications and class participation and preparation have a strong positive effect on grading performance. More surprisingly, student satisfaction with course and teacher has no significant influence on grades, and participation in exam training courses seems to have a directly negative impact on exam performance.

## **Presentation**

### **Course Learning Strategies for Efficient Student Performance**

#### **Introduction**

Higher education not only involves design and delivery of courses, but is to a high extent a joint effort between teachers and students, where students contribute actively to their own learning, while teachers serve as enablers to support learning. In today's mass education it is more important than ever to be able to assess which factors enable the learning process in order to improve program quality, and to be able to give sound advice to students on how to optimize their benefit from teaching in order to finalize their study in time and with a positive result. The data presented in this paper analyze the interaction between several factors that are assumed to influence student learning, and significant factors are identified that offer basis for sound advice to students on how to plan their study activity in order to gain the most from teaching courses.

The analysis is part of the regular student survey system applied at Copenhagen Business School, including the following components:

1. All courses are evaluated by a standard questionnaire at the end of the course.
2. All teachers with more than 2 lectures in the course are evaluated individually.
3. At the end of each study year the portfolio of learning activities (courses, seminars, assignments, etc.) are evaluated for coherence, alignment and progression.

In addition to these 3 compulsory elements a Study Board, a Course Coordinator, a Teacher, or a Head of Department may conduct additional ad hoc evaluations if needed.

This system generates student survey data for all courses, and in addition to measuring student satisfaction, the survey includes self-reported data on study behavior, such as class participation, class preparation, attendance of external exam training courses, assessment of curriculum in terms of relevance and workload. In addition, CBS holds information on student performance at the final exam in terms of grading data, failure rate, and time to complete the program. Finally, background data of individual students in terms of gender, age, nationality, and type of entry qualifications are available, including grade point average (GPA) from the entry exam. Annually, the CBS evaluation unit conducts more than 2000 surveys with a response rate between 30 and 60, depending on program, level of study, and discipline.

#### **Purpose and Methodology**

Data used for the current analysis are composed of individual grading results from 553 students, attending identical courses in macroeconomics at bachelor level. As potential explanatory variables are used individual background data (gender, age, entry qualifications in terms of grade point average and type of entry exam). Of the 553 students, 287 (51.9 percent) responded to a survey including questions on study behavior, level of class participation, class preparation, and – which was of particular interest for this study – attendance at external exam training courses. The survey also included data on student satisfaction with the course and the teacher. In addition to summary statistics describing the data set, a statistical analysis based on regression and variance analysis is conducted in order to identify significant explanatory variables that affect final exam grading. Our data set has been analyzed by Lisbeth La Cour and Anders Milhøj (2011) who used various statistical models (linear regression, logistical regression, and log-linear models for categorical variables). Their analysis had a stronger statistical focus, including a detailed discussion

of validity and representativeness of the survey data, but reached the same main conclusions as the ones presented in this paper.

This analysis represents an ad hoc analysis, based on the regular student survey system applied to all courses offered at Copenhagen Business School. Student satisfaction is reported semi-annually, but normally without link to grading results and student background variables. A number of earlier studies confirm some of the results, but it is the first time such a comprehensive study is conducted at CBS. The study relates further to a current ad hoc study of individual drop-out, conducted as a time series analysis of students' exam behavior. The drop-out study aims at identifying factors that may be able to predict drop-out in order to be able to identify students with high drop-out risk, and thus develop a more targeted student counseling in order to reduce drop-out.

### Survey Response, Teacher Evaluation, and Actual Study Behavior

A well known survey sampling problem is bias due to non-response, in particular in cases like this, where the non-response was 48 percent (which is not uncommon in student surveys). Therefore, our first concern was to find out, if there is systematic sampling bias in our data. Since we hold population data for a number of variables, it is possible to identify the level of bias for a number of relevant dimensions. Initial analyses of the data material provide interesting profile information of the students who respond to the survey and correlation between survey responses and actual study behavior.

All surveys are conducted prior to the exam in order to avoid bias caused by exam outcome. Still, there are several interactions between students' response rates, exam performance and evaluation of teachers. These findings from the current study are confirmed by similar data sets from other student cohorts and from different disciplines; thus they seem to be general patterns.

- Students with high exam performance have *higher response rates* than poor performing students

	All students	Students passing exam (above 2)	Students graded above 7 (medium)
Response rate	51,9 %	54,4 %	57,7 %

- The *average score* on teacher satisfaction is *unaffected* by student exam grading
- However, students with high exam performance *have higher variance* in their teacher score (i.e. either they give high or low score on teacher satisfaction), whereas poor performing student tend to be more indifferent
- In general, there is *no correlation* between average teacher satisfaction and average grading at class level. This surprising result is sometimes explained by stating that teacher evaluation is just a popularity measure which tells nothing about the teachers ability to teach
- However, the data show *positive correlation between teacher evaluation, class attendance, and study activity outside class*, both factors that have strong influence on exam performance

### Significant predictors of high exam score

Next, we analyzed which factors had the highest influence on the final exam score. The students in this study had various backgrounds in mathematics from high school, depending on the depth of

study their background is either A-level, B-level or (in rare cases), C-level. In the analysis we merged students with B and C level, as no significant difference was detected on grading score. In addition to the level (A or B/C) the high school grade point average (GPA) was included in the survey.

The following statements summarize our results of this part of the study.

- Overall, *students with A-level in mathematics score significantly higher* in macroeconomics than students with B/C level – even though they spend less time to prepare for the classes
- In addition to their level in mathematics, the *grade point average (GPA) from high-school has a strong influence on students' exam score* in macroeconomics
- Independent of their entrance level *all students get a significantly positive grading effect from class preparation*
- Independent of their entrance level *all students get a significantly positive grading effect from class attendance*

### External Exam Training Courses and Exam Performance

The current study is conducted for a part-time graduate diploma program aimed at young professionals who want to boost their career while attending a full-time job. Thus, this particular group of students is challenged in terms of time management, since they combine their study with both work and family life. Not surprisingly, they are looking for shortcuts to save time while still passing their exams. Hence, over the last 5 years, between 45% and 65% of all students attend short exam training courses offered by private suppliers, promising 'easy ways' to pass exams without too much work during the semester. Here are the results.

- *Students taking training courses have significantly lower GPA and lower levels in mathematics* from high-school
- Students taking training course in macroeconomics also tend to take training courses in other disciplines, such as finance, thus *they seem to have adopted a general study strategy with training courses as a fixed element*
- *Students who attend exam training evaluate their teachers poorer* than students not attending exam training courses (or vice versa)
- *Students who attend exam training prepare less for classes and attend fewer classes* than students not attending exam training courses
- Over the last 5 years, *every cohort who attended training courses in macroeconomics experienced lower exam grading scores* than those who didn't attend such courses – in some cases significantly lower. This is to be expected since takers of exam training have lower prerequisites in mathematics and lower GPA from high-school, which *is not compensated by the training course*.

	<i>Entrance prerequisites</i>		
	<i>Weak (C-level)</i>	<i>Middle (B-level)</i>	<i>Strong (A-level)</i>
<i>Training Course Effect on Exam Grading</i>	Weak Positive – Insignificant	Strong Negative – Significant	No Effect

- More surprising; the *same picture is found when we adjust both for students' prerequisites and study activity*. In almost all cases the *training course had no or even a slightly negative effect* on exam performance.

Training Course Effect on Exam Grading	Entrance prerequisites		
	Weak (C-level)	Middle (B-level)	Strong (A-level)
Less Studious ( <i>&lt; 2 hours/class</i> ) Negative – significant ( <i>p=0.039</i> )	Weakly negative – insignificant ( <i>p=0.460</i> )	Negative – insignificant ( <i>p=0.161</i> )	Weakly negative – insignificant ( <i>p=0.445</i> )
More Studious ( <i>2+ hours/class</i> ) Negative – insignificant ( <i>p=0.305</i> )	Positive – insignificant ( <i>p=0.067</i> )	Negative – significant ( <i>p=0.012</i> )	Positive – insignificant ( <i>p=0.101</i> )

- Students with *strong (A-level) prerequisites, who prepare systematically, seem to get benefit from the exam prep. courses.* The effect is, however, not significant (*p=0.101*)
- Students with *weak (C-level) prerequisites, who prepare systematically, seem to get benefit from the exam prep. courses.* The effect is, however, not significant (*p=0.067*)
- Students with *middle (B-level) prerequisites apparently face a significantly negative effect of taking exam training courses*
- Students who *substitute regular teaching with training courses get significantly poorer exam results* than students, who don't attend these courses.
- The study by La Cour et.al. (2011) not only examined the exam grading result, but also the probability of passing the exam. The above listed *conclusions about the effect of exam training courses hold also for the pass probability*

### Effect of Exam Training on Different Student Segments

In the preceding sections we have presented several statistical results from a study of student background, teacher evaluation, study behavior, exam training course attendance and these factors' effect on grading performance at an exam in macroeconomics.

In this section we analyze in more detail how attendance at exam training courses influence students' grading in macroeconomics, depending on students' prerequisites in terms of GPA from high-school. Our results provide interesting patterns for different segments of students, and we shall attempt to provide hypotheses and tentative causes for the results found within each segment.

We use GPA as segmentation variable, and operate with 3 segments: The Bright student – 41% of the population (those with GPA above average), the Normal student – 38% of the population (those with medium GPA), and the Poor student – 21% of the population (those with GPA below average).

If we look at all students in our population we get the following picture, if we measure exam grading by level of study activity and attendance of exam training courses

Avg. Exam Score	Took Exam Training		Absolute no. of Students	Took Exam Training	
	No	Yes		No	Yes
Less Studious	6.2	5.1*		54	61
More Studious	6.9	6.6		60	43

\*)  $p = 0,003$

We see that the grading average is about the same level in 3 of the 4 categories. Only one cell

differs; those who are less studious, but take exam courses, get *significantly lower* exam scores than the rest! So, don't substitute a proper work effort with exam training courses. This will most likely harm your performance.

However, different patterns are found for the three segments.

For **segment 1** (the Bright students) the results are presented below:

Avg. Exam Score	Took Exam Training		Absolute no. of Students	Took Exam Training	
	No	Yes		No	Yes
Less Studious	7.0	6.8		25	21
More Studious	7.1	8.3*		28	15

\*)  $p = 0.117$

For this segment grading is fairly high, even for students who prepare less. Among the less studious in this segment exam training has no effect. If, however, the bright student takes her studies seriously, the grading in macroeconomics increases (though not significantly) if the student attend exam training courses. This sub-segment may be called the 'high flyers'. One possible explanation why this small group attends exam courses could be their evaluation of the teacher. Remember that this group is quite heterogeneous in their teacher evaluations, and those who have a poor perception of the teacher may seek exam training to compensate for this – they don't want the 'poor' teacher to 'spoil' their achievement. Another explanation may be that they are simply ambitious, interested in the subject, and seek information wherever they can. Attendance of exam training has in fact a slight positive effect on their grading, but the grading of this group would have been high anyway.

For **segment 2** (the Normal students) the results are presented below.

Avg. Exam Score	Took Exam Training		Absolute no. of Students	Took Exam Training	
	No	Yes		No	Yes
Less Studious	6.0	4.5		20	26
More Studious	8.3*	5.3		20	16

\*)  $p = 0,000$

Compared to segment 1 this segment shows a quite different pattern. This segment performs well above pass-level in their exam grading in macroeconomics. However, if they attend exam training (perhaps due to personal uncertainty) their exam performance is likely to be poorer than they would have done without such training. However, if the students of this segment prepare intensively for classes they improve their grading significantly, *but only if they don't attend exam training courses*. This may be explained by the fact that training courses not always present theory and methods in exactly the same way as the teacher, and this may cause confusion in this weaker group. If they are less studious they are still worse off by taking the courses, but not significantly worse!

For **segment 3** (the Poor students) the results are presented below.

Avg. Exam Score	Took Exam Training		Absolute no. of Students	Took Exam Training	
	No	Yes		No	Yes
Less Studious	4.7	3.6		9	14
More Studious	4.0	6.4*		12	12

\*)  $p = 0.025$

Students in this segment score in general quite low at the exam in macroeconomics. This is so

whether they attend training courses or not. In particular this is true for students in this segment who 'give up' on the scheduled teaching, i.e. they don't prepare for classes, either because they prioritize their time towards work and family, or because they don't like the teacher. If this sub-group chooses to take exam training in order to 'repair' their lack of participation in the scheduled teaching they are even worse off than students who don't take such courses. However, if students in this segment are studious, i.e. they prepare systematically for classes, they do actually get some benefit in terms of a significantly higher average exam grade.

### **Conclusions**

Not surprisingly, strong entrance qualifications and the students' own effort in terms of class participation and preparation hours have a strong positive effect on grading performance. More surprisingly, student satisfaction with course and teacher has no significant effect on grading performance. This is due to the fact that a significant group of students with high grading has a very critical approach to the teaching. Also surprisingly, student participation in short exam training courses, supplied by external firms, seems to have a direct negative impact on exam performance. Especially a low work effort in terms of preparation hours and class participation during the regular course progress combined with participation in privately supplied exam training courses seems to lead to very poor grading performance. On the other hand, participation in privately supplied exam training courses does not seem to have a negative impact on grading performance, if students have either quite strong or quite weak entrance qualifications and do a proper work effort during the regular course progress. Hence, the following advice could be offered to students:

*If you are a Bright student (with high entry qualifications), you are likely to pass with high grading during your study. Regular class attendance will improve your grading, and so will time spent on study outside class. If you are a high achiever, you may benefit from attending exam training courses, but not as substitute for regular class attendance. If, on the other hand, you are satisfied with a good grade, comfortably above pass level, exam training courses are waste of time and money!*

*If you are a Normal student (with medium entry qualifications) your best strategy to pass exams is regular class attendance and intensive study activity. There is no substitution for this. Don't even think of taking a shortcut via external exam training courses. This will most likely only cause confusion and probably even deteriorate your performance, in particular if you believe you prepare regularly for classes!*

*If you are a Poor student (with low entry qualifications) you need to follow the scheduled teaching and prepare systematically for classes. If – and only if – you do so, you can benefit from taking exam training courses in addition to ordinary study. If on the other hand you don't prepare for classes you will most likely be worse off by taking external exam courses!*

Track 5 has the theme: 'Student experience: attractive teaching and learning'. Our study has identified factors the individual student must take into account when choosing his/her personal learning strategy. By being able to give empirically based advice to students on issues such as interaction between class attendance, class preparation, attendance of external training courses and one's own academic background we hope to have provided a framework for students who wish to optimize their learning strategy and thus improve exam results and reduce failure. Hopefully, this will add to the attractiveness of higher education and save resources in terms of time and money, both for the individual student, the university, and society as a whole.

The current study has covered only one course (Macroeconomics) at bachelor level. However, it is the intention to use the methodology of this analysis to develop a general model for monitoring exam results as a function of study behavior. In particular, it could be interesting to find out whether the results found in this study can be transferred to other disciplines than macroeconomics, in particular to disciplines with a 'softer' approach. Also, it is worth investigating if conclusions made at bachelor level remain valid at master level, or if the more 'mature' students conduct a different study pattern. Since CBS has more than 5000 students at each level (bachelor and master), the current approach may serve as a general model for gaining further insight in the student learning process, and thus contribute to develop empirically based advice to students on how to choose optimal study strategies based on their individual background.

### **Literature**

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