Available online at www.sciencedirect.com

ScienceDirect

Procedia - Social and Behavioral Sciences 228 (2016) 341 – 347

Procedia
Social and Behavioral Sciences

2nd International Conference on Higher Education Advances, HEAd´16, 21-23 June 2016, València, Spain

Relationship between class attendance and student performance

Anna Lukkarinen[a,*], Paula Koivukangas[a], Tomi Seppälä[a]

[a]*Aalto University School of Business, Runeberginkatu 14-16, 00100 Helsinki, Finland*

Abstract

We investigate the relationship between university students' class attendance and learning performance. We use data from a course in a university in which attendance to classes is not mandatory. The methods used are cluster analysis and regression analysis. We find that students form three distinct groups: 1) those who drop out before the final exam, 2) those who attend classes as well as the exam, and 3) those who study independently and attend the exam. Most importantly, we find that in group 2, attendance is positively and significantly related to performance, after controlling for the effect of other variables potentially related to performance. We also find that students in group 3 are characterized by compelling reasons for absenteeism and a good ability to proactively search for information and study independently. The results are relevant for teachers and students alike. First and foremost, they can be used as a motivator for students to attend classes and for teachers to bear in mind the relevance of class teaching for learning outcomes.

Peer-review under responsibility of the organizing committee of HEAd´16

Keywords: Attendance; absenteeism; performance; learning outcomes

1. Introduction

Students' class attendance and engagement plays an important role in today's higher education. Several previous studies have shown that class attendance is an important predictor of academic outcomes: students who attend more classes earn higher final grades (e.g. Kirby & McElroy, 2003; Moore et al., 2003; Purcell, 2007; Silvestri, 2003).

However, differing results exist as well. In a recent study, no statistically significant relationship between class attendance and student performance was identified after adjusting for control variables that included gender and age (Eisen et al., 2015). Cortright et al. (2011) found that the influence of regular attendance on examination performance

* Corresponding author. Tel.: +358-40-58-27-555.
E-mail address: anna.lukkarinen@aalto.fi

Peer-review under responsibility of the organizing committee of HEAd´16
doi:10.1016/j.sbspro.2016.07.051

is more important for female students than male students: female students earning above-average grades had attended more classes than female students earning grades below class average. No such difference was identified for male students.

Several factors can influence the level of attendance, including university culture, workload, teaching methods, and the teacher. Class attendance can vary considerably across countries, universities, and courses. For example, Marburger (2001) studied economics students in the United States, finding that their average lecture attendance rate was 81.5%. By contrast, attendance rates in Finnish universities have been found to be as low as 40-50% (Kolari et al., 2008).

This paper assesses the relationship between attendance and performance in a Finnish university. Two key characteristics of the Finnish university system are it being free of charge, and a high level of academic freedom. In accordance with the basic value of academic freedom, attendance at lectures is usually optional, although it may be highly recommended.

We report on our own experience of the levels of attendance at an advanced methodological course in a Finnish university. The course is worth six European Credit Transfer System (ECTS) credits, and it is an optional course targeted to master-level students. It consists of two types of classes: lectures and exercise sessions. The learning materials developed for the course are intended for use together with class teaching, and can be deemed relatively poorly suitable to be used as standalone for self-study. The course grade consists of the final exam (50%), five sets of homework exercises (20%), and a team project (30%). Passing the course requires passing both the final exam and the team project.

2. Method

2.1. Data collection

The data set includes 86 students that took the course in autumn 2014. All such students have been included in the data set who had registered to the course and who indicated their actual participation by i) attending at least one lecture (excluding the first lecture, after which the dropout rate tends to be high), ii) attending at least one exercise session, or iii) returning at least one set of homework exercises.

In the course, attendance to lectures and exercise sessions is not mandatory. In theory, a student could receive full points from the course without attending any teaching events. However, in order to incentivize students to attend exercise classes, a small symbolic increment to their grade was offered to students who actively attended exercise sessions. No incentive was offered for lecture attendance.

Data about attendance were collected by circulating an attendance list at every teaching event, which was signed by students who were present. In order to ensure that students did not sign in their absent colleagues, the number of attendants indicated by the list was cross-checked with the total number of students in class. After the course, we gathered input from a subgroup of students, those who had attended the exam but not many teaching events, via e-mail.

2.2. Variables

The variables of our analysis are described below.

2.2.1. Explained variable

Exam points. This is used as an indicator of each student's course performance. It is the number of points received by the student in the final exam. Grading is on a scale from 0 to 100, with 40 points required to pass. We use exam points instead of the full course grade, because the course grade also includes homework and project work points, which may have been done in groups and may thus not reflect an individual student's skill level. Two exams were offered. Students could choose whether to attend either one of them or both, in which case the highest of the two exam results was recorded.

2.2.2. Explanatory variable

Total attendance. This is the number of teaching events attended by a student. The maximum possible number of sessions attended is 17, which includes 11 lectures and 6 exercise sessions. All data exclude the first introductory lecture.

2.2.3. Control variables

Bonus motivation. This is used as an indicator of a student's underlying motivation to do well in the course. It is the number of bonus points received by the student from writing evaluations about their peers' course projects and from doing extra exercises.

Age. The student's age in years.

Gender. An indicator variable with the value of 1 for female students and 0 for male students.

Pre-course. This is used as a proxy to measure students' starting level. It is an indicator variable that receives the value of 1 for students who have taken and passed a course that is recommended as a preceding course to ensure sufficient preliminary knowledge.

3. Results and discussion

3.1. Clusters of students

When inspecting the data set along the dimensions of the explained and the explanatory variables, total attendance and exam points, it can be seen that the students form three distinct groups. The first group is, by definition, different from the other two: the group of those 43 students who did not attend the final exam – that is, who dropped out before completing the course.

The second and third groups consist of those who received exam points with varying levels of class attendance. We performed a two-step cluster analysis to form a clear separation between the two groups. The two clusters, as well as the first group, are presented in Figure 1. The groups 1, 2, and 3 consist of 43, 29, and 14 students, respectively. As the three groups are clearly different from each other, it is justified to investigate them separately. Otherwise, valuable information may be lost.

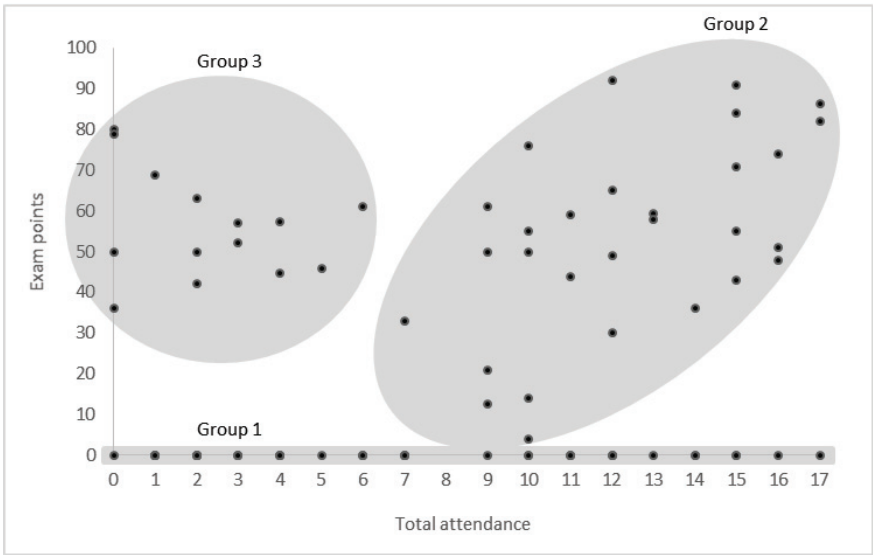

Figure 1: Three distinct groups of students

3.2. Descriptive statistics

Descriptive statistics of all variables are presented in Table 1, both for the full sample and for each group separately.

Table 1: Descriptive statistics of all variables by group

Variable	Unit or clarification	Min	Max	Mean	Standard deviation
Exam points	Grading range: 0-100 points	0	92	27.2	31.0
Cluster 1		0	0	0.0	0.0
Cluster 2		4	92	53.6	23.5
Cluster 3		36	80	56.2	13.2
Total attendance	0-17 sessions	0	17	8.0	5.3
Cluster 1		0	17	6.9	5.0
Cluster 2		7	17	12.4	2.8
Cluster 3		0	6	2.3	2.0
Bonus motivation	Rating range: 0-11 points	0	11	1.3	2.5
Cluster 1		0	6	0.6	1.2
Cluster 2		0	11	2.0	3.2
Cluster 3		0	10	1.5	2.8
Age	Years	21	57	25.4	4.7
Cluster 1		21	57	26.6	6.2
Cluster 2		21	29	23.9	2.1
Cluster 3		23	28	24.8	1.8
Gender	1: female, 0: male	0	1	0.2	0.4
Cluster 1		0	1	0.2	0.4
Cluster 2		0	1	0.3	0.5
Cluster 3		0	0	0.0	0.0
Pre-course	1: took and passed, 0: otherwise	0	1	0.5	0.5
Cluster 1		0	1	0.5	0.5
Cluster 2		0	1	0.5	0.5
Cluster 3		0	1	0.5	0.5

Interestingly, none of the students in group 3 received very low points in the exam. The minimum number of points is 36, while the minimum number of points earned by students in group 2, who attended classes more actively, is much lower at 4. Similarly, the average exam points of group 2 are, at 53.6 points, lower than the average of group 3, at 56.2 points.

In the following analysis, we limit our focus to group 2, which is formed by the majority of students who attended the exam. Group 1 is not meaningful in this context, as it contains no data about the exam. Furthermore, different rules or patterns can be expected to apply to the relatively small group 3.

Correlations between all variables in group 2 are presented in Table 2. Exam points have a positive correlation with attendance, bonus points, and gender (with females earning higher exam points). Belonging to the female gender is also positively correlated with attendance and bonus points.

Table 2: Correlations between variables in group 2

Variable	Exam points	Total attendance	Bonus motivation	Age	Gender	Pre-course
Exam points	1.00					
Total attendance	0.54	1.00				
Bonus motivation	0.35	0.17	1.00			
Age	0.00	0.17	-0.04	1.00		
Gender	0.35	0.35	0.30	0.07	1.00	
Pre-course	0.00	-0.12	-0.07	-0.21	-0.13	1.00

Note: Correlations between scale variables are measured with the Pearson correlation coefficient, correlations between scale and indicator variables are measured with the point-biserial correlation coefficient, and correlations between indicator variables are measured with the phi-coefficient. The two latter are both special cases of the Pearson correlation coefficient.

3.3. Regression analysis

As the results of the cluster analysis point to investigating group 2, we have built two multiple regression models with data from group 2. Model 1 includes all the control variables. As the sample size (n=29) presents limitations on the optimal number of explanatory variables, Model 2 only uses the scale control variables, dropping out the two binary variables. The models are presented in Table 3.

Table 3: Regression models

Variables	Model 1	Model 2
Constant	14.096	17.209
	(46.693)	(43.044)
Total attendance	3.940**	4.200***
	(1.467)	(1.354)
Bonus motivation	1.781	1.967
	(1.274)	(1.195)
Age	-0.687	-0.823
	(1.866)	(1.775)
Gender	6.295	
	(9.397)	
Pre-course	3.544	
	(7.830)	
R^2	0.384	0.368
Adjusted R^2	0.250	0.292

Standard error in parentheses.

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Both models point to the same result: class attendance is, unlike any of the control variables, related to exam success in a significant and positive manner. The correlations between the exam performance predicted by the models 1 and 2 and actual performance are 0.620 and 0.607, which corresponds to an explained part of 38.4% and 36.8% of total variation in performance, respectively. This can be considered reasonable when taking into account the character of the models. We have checked the statistical adequacy of the models to ensure that they satisfy the assumptions and requirements set for linear regression. The models exhibit no issues with multicollinearity (as indicated by variance

inflation factors), heteroscedasticity (as indicated by the Goldfeld-Quandt test), or error term normality (as indicated by the Bera-Jarque test).

3.4. Specific features of group 3

Group 3 – students whose attendance was very low, but who obtained relatively high exam points – presents another interesting target of research. In order to address it, we asked the students in this group via e-mail:

1. What influenced your decision not to attend classes?
2. What, in your view, enabled you to pass the exam nevertheless?

Responses were homogeneous in their content. The students in group 3 had compelling reasons for not being able to attend, as the timing of classes overlapped with their other courses or with work. This forced them to make and follow plans for self-study. Despite not attending classes, the students made a considerable investment in the course. They diligently did homework exercises and put significant effort in using sources beyond the course materials, proactively searching for and studying information from external sources.

Another interesting feature of group 3 is that it only consist of male students, although 20% of all course participants were female. Males may be more risk-taking than females or have higher confidence in their ability to succeed without attending classes.

4. Conclusions

4.1. Concluding remarks

Based on our findings, it makes sense not to assess all students as one homogeneous group but as several subgroups. While some students drop off despite having attended, and a small group of students succeed in the exam despite not having attended, we found that there is a key group of students for whom participation in teaching events is, indeed, a significant predictor of performance.

The results are relevant for teachers and students alike. They can be used at the start of a new course to serve a dual purpose. First, they can be used as a means to motivate students to attend teaching, because attendance is demonstrably related to learning outcomes. Second, they can be used to provide direction to those students who cannot or do not wish to attend teaching: independent study may be possible – this, of course, depends on the particular course in question – but requires considerable maturity, planning, and proactive search for information. In addition, the results can have a motivating effect on teachers: their teaching in class does, indeed, matter for learning outcomes.

4.2. Limitations and future research

The findings presented in this paper provide a lucrative basis for more extensive follow-up research using a larger data set, which would also enable the use of a wider set of control variables. In order to assess student's starting level and course plans in an appropriate manner, a test and a questionnaire, respectively, could be used at the start of the course under investigation.

As the dropout rate in the course we analyzed was high at 50%, we would find it interesting to conduct a survey of the dropouts: why did some students attend many, or even all, teaching sessions but then fail to attend either of the exams?

The generalizability of our findings is limited by the extent to which attendance and performance are dependent on teaching methods, the teacher, students' characteristics, and course contents. However, our findings do provide a relevant contribution to the existing base of research, and further reinforce the finding of previous researchers that class attendance is, indeed, related to performance.

References

Cortright, R., Lujan, H., Cox, J., & DiCarlo, S. (2011). Does sex (female versus male) influence the impact of class attendance on examination performance? *Advances in Physiology Education, 35*, 416–420.

Eisen, D., Schupp, C., Isserof, R., Ibrahimi, O., Ledo, L., & Armstrong, A. (2015). Does class attendance matter? Results from a second-year medical school dermatology cohort study. *International Journal of Dermatology, 54*, 807–816.

Kirby, A., & McElroy, B. (2003). The effect of attendance on grade for first year economics students in University College Cork. *The Economic and Social Review, 34*, 311–326.

Kolari, S., Savander-Ranne, C., & Viskari, E-L. (2008). Learning needs time and effort: A time-use study of engineering students. *European Journal of Engineering Education, 33*, 483–498.

Marburger, D. R. (2001). Absenteeism and undergraduate exam performance. *The Journal of Economic Education, 32*, 99–109.

Moore, R., Jensen, M., Hatch, J., Duranczyk, I., Staats, S., & Koch, L. (2003). Showing up: The importance of class attendance for academic success in introductory science courses. *American Biology Teacher, 65*, 325–329.

Purcell, P. (2007). Engineering student attendance at lectures: Effect on examination performance. University College Dublin, Ireland. International Conference on Engineering Education – ICEE 2007.

Silvestri, L. (2003). The effect of attendance on undergraduate methods course grades. *Education, 123*, 483–486.