

## CASE STUDY

### Attendance at university lectures: A study into factors which influence it, and exam performance as a consequence of it.

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#### Abstract

This article investigates whether various factors affect attendance rates at university lectures, and whether there is any relationship between attendance and exam performance. Data were collected over 7 years from a 3<sup>rd</sup> Year statistics module. It was found that the time of day that the lecture occurred made no difference to attendance, and that there was no difference in attendance between the genders. It was discovered that an increase in tuition fees led to a rise in attendance. Additionally, it was observed that higher attendance rates led to better exam performance.

**Keywords:** Attendance, Gender, Timetable, Tuition Fees, Exam Performance

#### 1. Introduction

Attendance records for a 3<sup>rd</sup> year undergraduate statistical software module at Coventry University (CU) were collected from 2011-2018. Each year, the module ran over 10 weeks, with a single two-hour lecture per week. There were 2 or 3 cohorts per year and approximately 30 students in each cohort, resulting in a total of 461 students included in this study.

In Section 2 of this article, it is investigated whether there was any significant difference in attendance between the males and the females. Section 3 explores whether the time of day of the class had any effect on attendance rates. Section 4 considers whether the increase in tuition fees resulted in an increase of attendance. Section 5 looks for any relationship between attendance and exam performance.

#### 2. Gender and Attendance

Some previous studies have suggested that females tend to have better attendance at lectures than males. Woodfield, Jessop and McMillan (2006), in a study of 650 students at Sussex University, found that the mean female attendance rate of 88% was significantly higher than the male attendance rate of 84%. Kelly (2012), in a survey at University College Dublin found that, for those who live on campus, there is significant evidence ( $p = 0.004$ ) that females have a higher probability than males of attending a lecture, although this difference was not found when all accommodation locations were included.

The CU module investigated in this article was attended by 245 males and 216 females in total over the seven years. The summary statistics for attendance according to gender are shown in Table 1:

Table 1. Attendance rates for males and females

Gender	No. of Students	Attendance (%)		
		Mean	St. Dev.	St. Error
Male	245	78.29	22.11	1.41
Female	216	80.97	18.61	1.27

On average the females attended slightly more often than the males (81% mean attendance rate compared with 78%). However, an independent t-test showed no significant evidence ( $p = 0.157$ ) of a difference in attendance between the genders, as shown in Table 2:

Table 2. T test for difference in male and female attendance rates

t	df	p	Mean difference	95% CI
-1.416	458	0.157	-2.69	(-6.41, 1.04)

### 3. Time of Day and Attendance

There is a stereotypical image of a student that they are often up late partying. This picture may have been perpetuated by fictional television comedies such as *The Young Ones* (1982) and *Fresh Meat* (2011). Nevertheless, based on the author's own personal experiences when a student many years ago, it is not too inaccurate a representation. This perception could lead to the conclusion that students are less likely to attend early morning lectures than later ones. Also, Evans, Kelley and Kelley (2017) considered that, due to their circadian rhythms at that age, people in their late teens naturally feel more sleepy in the mornings. They consequently recommended that university lectures shouldn't occur before 11am.

For the module in this article, it was decided to investigate whether there was any difference in attendance between a morning class and an afternoon class. Four of the cohorts had their lectures starting at 9am, and 10 of the cohorts had their lectures starting at 4pm. The summary statistics for attendance according to start time are in Table 3:

Table 3. Attendance rates for 9am class and 4pm class

		Attendance (%)		
Class Time	No. of Students	Mean	St. Dev.	St. Error
9 a.m.	119	81.60	20.00	1.83
4 p.m.	342	78.83	20.74	1.12

The morning lectures were slightly better attended than the afternoon lectures (students on average attended 82% of the a.m. lectures compared with 79% for the latter). However an independent t-test showed no significant evidence ( $p = 0.207$ , two-tailed) of a difference in attendance between the two lecture times, as shown in Table 4:

Table 4. T test for difference in morning and afternoon attendance rates

t	df	p	Mean difference	95% CI
1.264	459	0.207	2.77	(-1.53, 7.07)

This contradicts the image put forward earlier which may well be outdated. Attitudes of students could be different in more recent times. Leeds Beckett University (2017, cited in the *Yorkshire Evening Post*) conducted a survey of 1,070 sixth-formers and found that only 9% said that the thing they are most looking forward to at university is the nightlife, whereas 29% replied that studying a subject they are passionate about was what they most anticipated.

## 4. Cost of Fees and Attendance

The suggestion in Section 3, that students are more likely to attend morning lectures than they did in the past, could be expanded to investigate whether they attend lectures in general more often nowadays.

Up until 1997, undergraduate students at English universities didn't pay any tuition fees. In 1998 a £1,000 per year fee was introduced. In 2006 this was increased to £3,000, and in 2012 to £9,000 (Hubble and Bolton 2018). It could be postulated that, when paying more to learn, a student will 'want to get their money's worth', and attend more classes.

For the module discussed in this article, the pre 2012 fee-increase attendance rate and the post fee-increase attendance rate were compared. This was a 3<sup>rd</sup> year module so the higher fee applied to those students from 2014 onwards in this dataset. Seven of the cohorts payed the new, higher fees of £9,000, and 7 of the cohorts payed the previous, lower fees of £3,000. The summary statistics for attendance according to fees paid are shown in Table 5.

Table 5. Attendance rates pre and post the 2012 tuition fee increase

		Attendance (%)		
Fees	No. of Students	Mean	St. Dev.	St. Error
£3,000	245	76.78	20.74	1.33
£9,000	216	82.69	19.96	1.36

The attendance rate (83%) was higher for those who paid £9000 tuition fees than for those who paid £3,000 (77% attendance rate). An independent t-test showed strong evidence ( $p = 0.002$ , two-tailed) of a difference in attendance, as shown in in Table 6. This infers that students have attended more after the 2012 fee increase was introduced.

Table 6. T test for change in attendance rates after the 2012 tuition fee increase

t	df	p	Mean difference	95% CI
3.107	459	0.002	5.91	(2.17, 9.65)

There seems to be a scarcity of previous published research on any changes in attendance patterns post the 2012 fee increase. Neves and Hillman (2017), in the 2017 Student Academic Experience Survey, which received responses from 14,057 undergraduate students, reported that student attendance has remained reasonably constant since 2013, but figures from before that date weren't included. Nevertheless, they did find a significant positive association between student satisfaction with the number of their timetabled sessions and whether they thought their course gave 'value for money'. Additionally, Neves and Hillman found that 71% of students who were scheduled for 10-19 contact hours / week said they were satisfied with the number of hours, whereas only 55% of those who were scheduled for 0-9 hours / week expressed satisfaction. These both highlight the current importance that some students place on having a sufficient number of lectures.

## 5. Attendance and Exam Performance

Of course, some students may need persuading on the worth of attending classes. They may argue that, as nowadays the vast majority of lecture materials and subject resources are put online by university lecturers, there is little need for them to attend lectures, as they can learn everything at home. Hence, they may contend that whether they attend or not, they would still get the same score

in their assessment. In this section, it will be investigated whether there is any association between attendance and exam performance.

For this module, the author did put all of the lecture handouts online, usually a couple of days after each lecture. The assessment for the module took place a week after the final lecture, and consisted of a 90 minute exam. A scatter plot of exam mark against attendance % for all 461 students is shown in Figure 1.

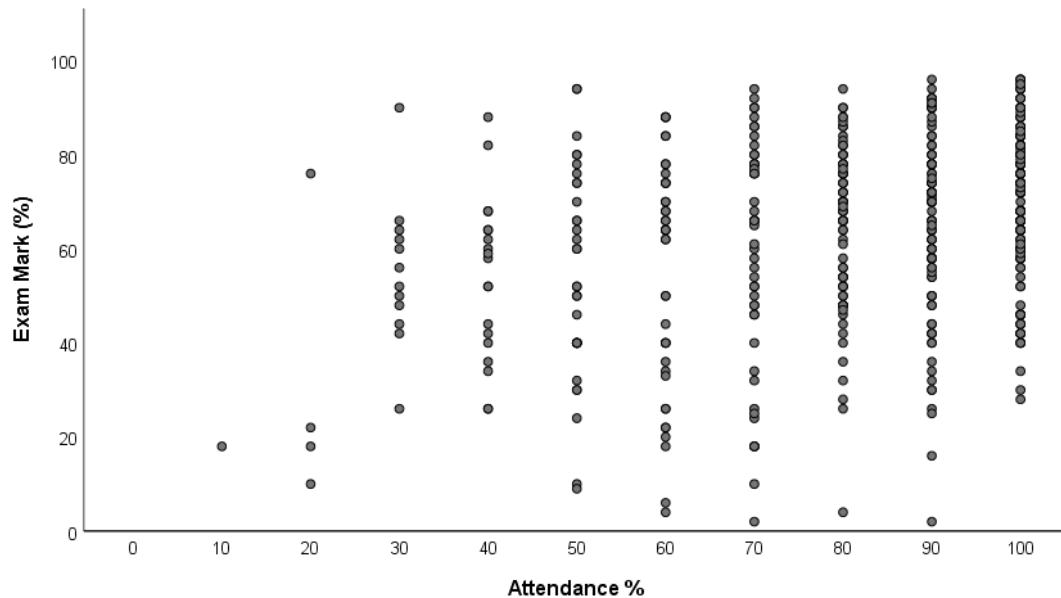


Figure 1. Scatterplot of exam mark against attendance %

The Pearson Correlation Coefficient was 0.316 with a p value < 0.001, which suggests very strong evidence of a positive relationship between attendance and exam mark. In other words, the higher the attendance, the higher the exam mark. This could be very useful at the beginning of future instances of this module as a tool to motivate students to attend well. The lecturer could possibly display the graph with the caption- 'the more lessons you attend, the higher your exam mark will be'.

The regression equation obtained was

$$\text{Exam Mark} = 38.4 + 0.311 \text{ Attendance} .$$

As there are 10 lessons in the module, missing one lesson would equate to missing 10% of lessons. Hence the above equation could be used as a warning to the students using the loose interpretation, 'Every time you miss a lesson, your exam mark will drop by 3% points'.

However, due to the variability of the points displayed in Figure 1, with many students with poor attendance actually doing well in their exam, the visual effect on the students may not be quite so convincing. A more effective chart to convey the intended message that it is better to attend, is a plot of probability of passing against attendance.

Hence a logistic regression analysis was carried out to predict the probability of passing the exam (i.e. scoring at least 40%) based on lesson attendance. The results are shown in Table 7.

Table 7. Logistic regression model for predicting probability of passing from attendance rate

	Estimate	St. Error	Wald	df	p	Odds Ratio	95% CI for Odds Ratio
Attendance	0.0345	0.007	27.406	1	<0.001	1.035	(1.022, 1.049)
Constant	-0.501	0.473	1.123	1	0.289	0.606	

The p value < 0.001 (based on a Wald Chi-Square test) tells us that attendance is a significant predictor for passing the exam. The model obtained was:

$$P(\text{Pass}) = \frac{1}{1 + e^{0.501 - 0.0345 \text{ Attendance}}}$$

E.g. If Attendance = 50%, then  $P(\text{Pass}) = \frac{1}{1 + e^{0.501 - 0.0345 \times 50}} = 0.768$ .

Based on these figures, the students could be told, ‘for those people who miss half the lessons, there is approximately a 1 in 4 chance of failing the exam’. This announcement, along with displaying a scatter chart of attendance rates and their predicted probabilities (Figure 2) could form the basis of a good ‘scare tactic’ at the beginning of the course to encourage the students to attend.

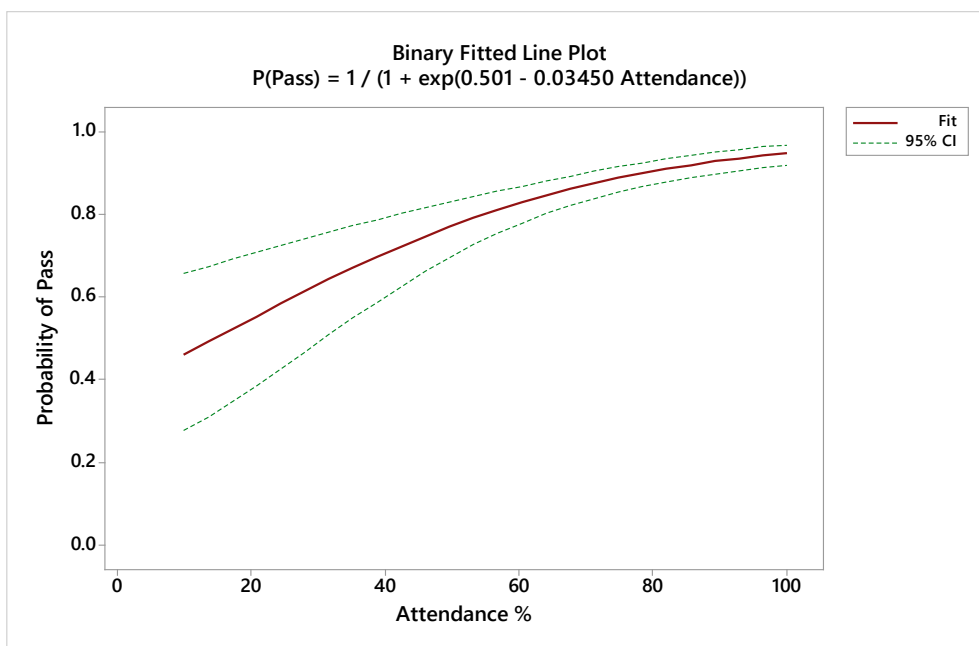


Figure 2. Probability of passing the exam according to percentage of lectures attended

From Table 7, it can be seen that the odds ratio is 1.035. This tells us that an increase of 1% in attendance increases the ‘odds’ of passing by a factor of 1.035. (Note that we use the definition of the ‘odds’ of passing as  $P(\text{Pass})/P(\text{Fail})$ ). If we consider number of lessons attended rather than the percentage of lessons attended, the odds ratio is  $1.035^{10} = 1.41$  (because there are 10 lessons). Hence the students could be further ‘warned’ with the loose interpretation ‘every time you attend a lesson, your odds of passing increases by around 40%.’

Similarly, a model to predict the probability of achieving a 1<sup>st</sup> Class mark (i.e.  $\geq 70\%$ ) in the module was obtained using logistic regression. This is shown in Table 8, with the accompanying plot in Figure 3.

Table 8. Logistic regression model for predicting probability of achieving a 1st from attendance rate

	Estimate	St. Error	Wald	df	p	Odds Ratio	95% CI for Odds Ratio
Attendance	0.0259	0.0052	25.178	1	<0.001	1.026	(1.016, 1.037)
Constant	-2.323	0.433	28.846	1	<0.001	0.098	

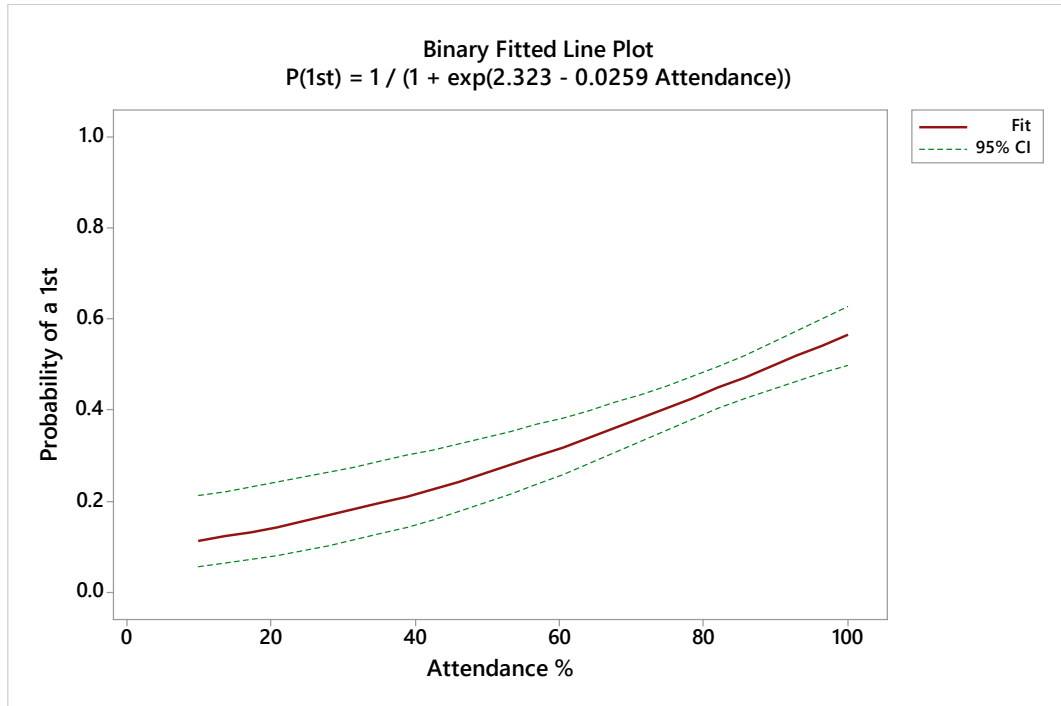


Figure 3. Probability of obtaining a 1<sup>st</sup> in the module according to percentage of lectures attended

From Table 8,  $p < 0.001$  (based on a Wald Chi-Square test) so attendance is a significant predictor for achieving a 1<sup>st</sup>. The model obtained was:

$$P(1st) = \frac{1}{1 + e^{2.323 - 0.0259 \text{ Attendance}}}$$

Considering ‘number of lessons’, the odds ratio is  $1.026^{10} = 1.29$ . Thus, this could be presented as ‘every time you attend a lesson, your odds of achieving a 1<sup>st</sup> increase by around 30%’

The finding in this study, that increased attendance is related to higher attainment, is consistent with numerous other studies. Colby (2005), who looked at a 1<sup>st</sup> year module in the University of Central England, found that students who attended fewer than 70% of the lessons had a 2 in 3 chance of failing that module. Halpern (2007) investigated a 2<sup>nd</sup> Year module at London Metropolitan University and found significant evidence of a positive relationship ( $r = 0.502, p < 0.001$ ) between attendance and coursework grade. Allen and Webber (2010) found that, for a module at the University of the West of England, every seminar the student attended increased their exam mark by around 4 % points on average.

## 6. Conclusions

In this study of attendance records from a 3<sup>rd</sup> year statistical software module, it was found that:

- There is no significant difference between males' and females' attendance rates;
- There is no significant difference between attendance rates for a 9am class and a 4pm class;
- After the 2012 tuition fees increase, attendance rates increased significantly;
- There is strong evidence that higher attendance is likely to lead to better exam performance.

Note that this is only a preliminary study, and further investigation would be beneficial. Interaction effects between the above factors could be explored, plus other factors such as prior attainment could be considered. Furthermore, data from classes from other subject areas would widen the scope of the conclusions.

Nevertheless, these findings give a useful insight into some aspects of attendance, in particular for this module. Furthermore, as discussed in Section 5, they can be used as a predictor for future cohorts, so can be used as a motivational tool to promote good attendance to incoming students.

## 7. References

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