

Correlation of examination performance with lecture attendance: a comparative study of first-year biological sciences undergraduates

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Abstract

Examination performance of first-year biological sciences undergraduates ($n = 152$) was found to be statistically significantly ($p < 0.0005$) correlated with lecture attendance. This correlation was particularly strong for non-Anglophone and UK ethnic minority students ($r = 0.603$), compared to white UK students ($r = 0.276$). On the basis of this we suggest that lectures are an important contribution to equal opportunities in undergraduate courses. © 1998 IUBMB. Published by Elsevier Science Ltd. All rights reserved

1. Introduction

The modern university incorporates diverse teaching methods and philosophies, applied to curricula which may be modular, part-time, or distance-learner oriented. Within this increasing diversity of tertiary education, however, the traditional lecture has persisted as a principal means of delivering course material, especially at the lower undergraduate levels. Lectures have many admitted disadvantages as a medium for the delivery of learning, and considerable effort has been exerted in educational circles to the development of alternative methods of dealing with larger classes [1,2].

This paper reports on our own experiences of using the lecture as a teaching method for the Cell Biology module at Level 1 of the Biological Sciences degree routes at Liverpool John Moores University, paying particular attention to the relationship between lecture attendance and performance. Cell Biology is a core module at Level 1 for all degree routes in the School of Biomolecular Sciences and a popular option for students in the School of Biology and Earth Sciences. All students are required to sit a single 90 min examination that consists of 30 compulsory short answer questions covering the material presented in the lecture series. On the basis of exam results from previous years, Cell Biology appears to be the most challenging element in the modular programme. Our study is therefore partly motivated by a desire to investigate the causes of poor performance, and to design ways to ameliorate this tendency.

The students have access to a wide range of learning support facilities, including audio-visual aids and

computer-assisted learning, in addition to the traditional library. One might suppose that this would enable students to follow the Cell Biology curriculum without the necessity for attending lectures. Here we present evidence that this is not the case for ethnic minority and non-Anglophone groups, where there is a significant correlation between lecture attendance and examination performance. This correlation is far weaker for Anglophone white students, and suggests that targeted tuition of poorly attending ethnic minority students may be the most rapidly effective way to improve both equal opportunities and overall class performance.

Several previous studies on a wide range of student groups have suggested that regular attendance and academic performance are correlated. This result has been found with cohorts as diverse as Baltimore elementary school pupils, Idaho agronomy undergraduates, and Indiana trainee pharmacists [3–7]. There is, however, some anecdotal evidence suggesting that occasional absences may have psychological benefits [8] and that personality type and study style may also be important [9,10] so further investigation is merited.

2. Statistical methods

Only those students for whom both an examination mark and an attendance record were available ($n = 152$) were included.

Both attendance patterns and examination performance appeared to be approximately normally distributed. In order to confirm this, χ -square analysis of

distributions was carried out, following the *z*-test/probability method [11]. No significant deviations from normal distribution were found in any case, thus justifying the use of parametric statistical tests on the data. When sub-groups were extracted from the cohort, e.g. ethnic minority students, male and female students, high-attending students, and low-attending students, the same test was applied. In all cases both attendance and examination performance displayed a normal distribution. The normality of the marks encourages us to believe that they provide a fair and reliable reflection of student ability.

A correlation coefficient was calculated for examination mark against attendance for the entire cohort of students, and found to be 0.341. A *t*-statistic [11] was calculated for *r*, and was found to be significant at $p < 0.0005$.

Sub-cohorts of high-attending students (7, 8 or 9 lectures in the 9-lecture series, $n = 66$) and low attending students (0, 1 or 2 lectures only, $n = 18$) were extracted. The mean examination performances for these two groups were 38.4 ($\sigma = 13.1$) and 23.0 ($\sigma = 7.1$) respectively. A *t*-test was performed to confirm the statistical significance of the improved performance in the high-attendees. Prior to this an *F*-test was carried out, which determined that the variances within each group were significantly different ($p < 0.01$). This required a heteroscedastic *t*-test to be chosen. A one-tailed version was used as it was predicted in advance that the high attendees would be better examination performers than the low attendees. The *t*-test demonstrated, at $p < 0.0001$, that high attendees are significantly better in examination performance than their low-attending colleagues.

In order to investigate any sex differences in performance and how they might be related to sex differences in attendance, the students were divided into male ($n = 63$) and female ($n = 89$) sub-cohorts. The average examination performance was 29.2 ($\sigma = 12.3$) and 36.5 ($\sigma = 11.9$) respectively, with average attendance of 5.5 ($\sigma = 2.4$) and 6.1 ($\sigma = 1.9$) respectively. The variances within groups in examination scores and attendance were not significantly different, thus allowing the use of homoscedastic *t*-tests. A two-tailed test was used as no prior prediction was made concerning the superiority of one sex group over the other. These demonstrated that attendance was not significantly different between male and female students. However, the superior examination performance of female students is statistically significant at $p < 0.001$. We therefore conclude that the female students perform better than their male counterparts for reasons unrelated to lecture attendance.

The correlation coefficients for examination performance against attendance in male and female students are 0.353 and 0.284 respectively. Both correlations are significant at $p < 0.005$.

Students were divided into ethnic minority/non-Anglophone ($n = 31$) and non-minority ($n = 121$) groups. The mean examination performance in the two groups was 32.3 ($\sigma = 11.7$) and 33.7 ($\sigma = 12.8$) respectively, and attendance was 5.7 ($\sigma = 2.2$) and 5.9 ($\sigma = 2.1$) respectively. *F*-tests confirmed that the variances in both performance and attendance in the two groups were not significantly different. A homoscedastic, two-tailed *t*-test was used which revealed no significant difference in either attendance or performance between the two ethnic cohorts.

However, the correlation co-efficient between examination performance against lecture attendance for ethnic minority students was 0.603, significant at $p < 0.0005$, whereas for Anglophone non-ethnic minority students it was only 0.276, significant at $p < 0.005$. We conclude that ethnic minority students are more likely to benefit from lecture attendance than their non-ethnic minority colleagues, and that ethnic minority students should therefore be encouraged to attend lectures, since they are more likely to suffer individual deterioration in examination performance from failure to attend.

3. Conclusions

- In the student group as a whole, examination performance displays weak but statistically significant positive correlation with lecture attendance.
- Female students are significantly better performers in exams than male students, but for so far undefined reasons unrelated to attendance.
- Examination performance in ethnic minority students is highly correlated with lecture attendance, compared with only a weak correlation in Anglophone non-ethnic minority students.

4. Discussion

On the basis of this study, it appears that lectures have a distinct beneficial effect on the academic performance of ethnic minority and non-Anglophone students. One possible reason for this may be that these groups are less comfortable with alternative learning resources and media. Many British ethnic minorities, although orally bilingual in English and their own languages, may have less facility for written English, or may have had less exposure to literature in English in their home environments. This problem may be even greater for the overseas non-Anglophone students, for whom the library may be a daunting place.

Possible further contributory factors have been suggested in the literature. For instance, poor attend-

ance and poor academic performance in African-American undergraduates may both stem from economic hardship factors [12]. Additionally, a large study on Cuban, Mexican, Haitian and Vietnamese high school students in the USA, concluded that hours spent on homework was a significant factor in overall academic performance [13].

The lecture provides a means of directing the learning of these groups during what may be the difficult first year of their studies. The lecturer may serve to highlight the core of the syllabus in a way in which reading lists and tables of expected learning outcomes cannot, as well as providing an accessible source of verbal assistance for students. This may be less of a requirement for Anglophone non-ethnic minority students who may, by virtue of their cultural preparation, have a greater 'speed off the blocks' in the first year of their tertiary education.

The implication of our work is clear: to abolish the lecture entirely may present a threat to equal opportunities.

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