Educational achievements of students on a five-year MPharm sandwich course compared with those of students on a standard four-year course

By Philip H. Rowe, PhD

AIM • **To determine whether the additional year spent as a registered university student on an MPharm sandwich course produces measurable improvements in educational achievement relative to the traditional four-year route.**

DESIGN • **Degree classifications awarded to sandwich and non-sandwich students were statistically compared. An analysis was also performed in an attempt to detect any biased entry into the two types of programme.**

SUBJECTS AND SETTING • **MPharm undergraduate students at the Liverpool School of Pharmacy.**

OUTCOME MEASURE • **Final degree classifications and intermediate results.**

RESULTS • **There was no statistically significant evidence that students electing for the two alternative routes differed in initial ability. However, there was clear evidence of higher final achievement among those who had followed the sandwich route.**

CONCLUSIONS • **There is evidence of higher standards of educational achievement arising from the sandwich mode of study. The proportion of first and upper second class degrees is increased from an estimated 63% on the non-sandwich to 82% on the sandwich variant of the programme.**

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There are 16 schools of pharmacy in the United Kingdom. Of these, most offer only a four-year MPharm course, but two — Liverpool John Moores University and Bradford University — offer a choice of the standard four-year programme or a five-year sandwich programme. John Moores University is therefore one of only two institutions where it is possible to investigate the relative educational effectiveness of the two types of programme. (In this paper these are referred to as the "sandwich" and "linear" versions of the programme.) In the sandwich programme, one year of professional placement is incorporated within the course and this replaces the preregistration training that is otherwise required after graduation. The current MPharm programme had its first intake of students in 1997 and so the five-year programme produced its first cohort of graduates in June 2002.

The sandwich course entails an additional year as a registered university student, which has financial implications for both the individual student and the state. There would be little justification for the additional effort and cost if no educational advantage ensued. The purpose of this study is to report the outcomes for John Moores University students who graduated in June 2002, and to compare levels of achievement for the two different programmes.

METHODS

Data concerning both final degree classifications and marks achieved at intermediate stages of the sandwich and linear MPharm programmes were collated on an anonymised database (ie, the database did not allow the determination of results for individually identifiable students).

In any cohort of students there are always a few whose performance is known to have been affected by adverse external factors. No attempt was made to remove such students from the following analysis since such procedures commonly introduce more bias than they remove. The only data excluded were two cases where examinations had not been taken and no data were available for analysis.

To allow a statistical comparison of the patterns of degree classifications achieved by different groups of students, the degree classes were coded numerically as first=1, second (division 1)= 2, second (division2)=3, third=4 and MPharm not achieved=5. This coded form of data was then subjected to the Mann-Whitney test (two-tailed) using the Minitab statistical package. The results reported are corrected for the effects of tied values.

The primary comparison was between the final degree classifications for students graduating from the sandwich and linear routes in 2002.

As a secondary analysis, it was recognised that the sandwich graduates for 2002 had spent the majority of their time (three and a half out of four years) being educated alongside the cohort that formed the linear programme graduates of 2001. It was therefore also of interest to compare the 2002 sandwich programme graduates with the 2001 linear programme graduates.

The choice of whether to undertake the four- or five-year programme is primarily in the hands of the students. This introduces the possibility of bias. It is conceivable that those who selected a particular route might be generally higher or lower achievers than those selecting the alternative. In such a case, any difference in final outcome could not be causally linked to the type of programme followed. A check for such bias was made by comparing the results for modules taken in the first semester of the final year (2001–2002). Sandwich and linear students complete the first semester of the final year together and only then do the sandwich students embark on their distinctive course. The results were aggregated (with weighting based on the credit value of each module) to produce a percentage mark for each student. These were then converted into equivalent degree classifications based on the usual bandings (40–49 per cent = third, 50–59 per cent = second (division 2), 60–69 per cent = second (division 1) and over 70 per cent = first). A comparison was made between students on the two different programmes. If any difference in final outcome was in fact due to biased entry into the two programmes, one would expect to see that differences were already present at this stage.

The actual award marks, rather than the degree classifications, were also analysed in order to test the main conclusion. In this case any possible bias can be directly accounted for by the use of an analysis of covariance. In this analysis,

award mark was the endpoint, degree route was the factor, and mark in semester one of the final year was used as a covariate reflecting general ability before any difference in treatment.

TABLE 1: FINAL DEGREE CLASSIFICATIONS FOR ALL STUDENTS WHO COULD HAVE GRADUATED IN 2002 AND 2001

	First	Second (division 1)	Second (division 2)	Third	Not achieved
Sandwich 2002	10	18	6	0	0
Linear 2002	14	53	28	1	3
Linear 2001	9	16	18	0	3

TABLE 2: RESULTS FOR THE FIRST SEMESTER OF THE FINAL YEAR (EXPRESSED AS EQUIVALENT DEGREES)

	First	Second (division 1)	Second (division 2)	Third	Not achieved
Went on to do					
Sandwich	9	18	5	2	0
Linear	19	54	24	2	3

RESULTS

The primary comparison of outcomes was that for all potential graduates in 2002 (Table 1). For both cohorts the most common outcome was a second class (division 1) degree, but for the sandwich students, first class degrees outnumbered second class (division 2) degrees, whereas for the linear degree this pattern was reversed, suggesting a considerably higher average level of achievement from the sandwich programme (P=0.0240).

As a secondary analysis, the 2002 sandwich graduates were compared with those from the 2001 linear programme (Table 1). The same pattern appears as was seen in the primary analysis. The 2001 linear programme students performed less well than the 2002 sandwich students, with second class (division 2) degrees again outnumbering first class degrees (P=0.0190).

If the degrees are placed into two broad categories (first and second class (division 1) versus all others) then for the potential graduates of 2002, the proportion of first and second class (division 1) degrees was increased from 68 per cent for the linear programme to 82 per cent for the sandwich programme. The proportion of first and second class (division 1) degrees achieved by the linear route in 2001 was only 54 per cent which contrasts even more starkly with the 82 per cent achieved by those who went on to take the sandwich route. If the results for the two cohorts of linear programme students are combined, 63 per cent achieved the higher class of degree.

As a test for bias, a search was made for evidence that students about to take the sandwich route were already outperforming the others in semester one of the final year (Table 2). Although there is a hint that the students on the sandwich route may already have been performing somewhat better, the difference is not marked and the results are far from statistical significance (P=0.3997). (Results are not presented in detail, but if the same exercise is carried out for semester two of the final year, when the two cohorts have been treated differently, a strongly significant difference in favour of the sandwich route is seen with P=0.0097).

The exploratory analysis based upon the award marks showed that the mark in semester one of the final year was (as one would expect) a strong predictor of final award mark (P<0.001) and with this covariate controlled for, the route taken emerged as a highly significant factor influencing the award mark (P=0.001). This analysis should of course automatically account for any biased entry into the two routes.

DISCUSSION

The possibility that students opting to take the sandwich route may have been, on average, slightly higher performers than those entering the linear route cannot be entirely excluded. However, if there was any such bias the test for its existence fell well short of statistical significance. In contrast, the final outcomes were clearly distinct — all statistical tests that should be sensitive to which route was taken, showed clearly significant differences. Some additional evidence to support the main conclusion was provided by using the final award mark (rather than grade of award) as the endpoint.

Although recognising the limitations of data restricted to a single cohort of students, the sandwich route does appear to enhance the final level of educational achievement and the proportion of first and upper second class degrees is increased from an estimated 63 per cent to 82 per cent.

ACKNOWLEDGEMENTS The author recognises the effort and dedication of all the academic and administrative staff who generated the data.

This paper was accepted for publication on 3 October 2002.