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THE RELATIONSHIP OF HOMEWORK TO

A-LEVEL RESULTS

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# The relationship of homework to A-level results

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## Summary

The database established during 1989 by the A-level Information System (ALIS) was utilized to consider the amount of homework which A-level students reported and their subsequent A-level results. Data were also available on prior achievement, ability tests, gender and home background

The findings varied from subject to subject, with General Studies being atypical, but in general A-level students were found to vary considerably in the amounts of homework which they reported and there was a tendency for those doing more homework to obtain better grades, even after controlling for prior achievement or ability.

There was also variation between classes in the amount of homework reported, but classes which reported doing more homework as a whole did not get better exam results, having controlled for cognitive variables.

## Introduction

The relationship considered here is between the amount of homework students reported and their actual and predicted A-level examination results. The data came from the 1989 survey of the A-level Information System (ALIS) (Fitz-Gibbon, 1985, 1990a, 1990b; Fitz-Gibbon, Tymms and Hazelwood, 1989). The ALIS data provide information on many factors influencing achievement at A-level such as prior achievement at 16, age, ability and gender.

There have been two recent reviews of the literature, relating to homework and academic attainment. Paschal, Weinstein and Walberg (1984) were able to identify 15 studies on which to base a meta-analysis. They concluded that homework had a positive effect on academic achievement, especially when commented upon or graded. However, Barber (1986) was very critical of that work, stating that 'while homework may have some effect on learning, the studies reviewed have little evidence to support the claim'. He also noted that only one of the studies involved deliberate manipulation of grades, and he comments that the findings of even that study were ambivalent.

More recently, Cooper (1989) reviewed homework studies and was able to find 20 in which the use and non-use of homework was experimentally manipulated. Although only 14 showed a positive relationship between homework and attainment, Cooper identified elementary schools as being the institutions where no gains were found. He also found that the gains at the high school level were higher than at the junior high level. Similar relationships were found in the 50 correlation studies

identified by Cooper, a notable example being that of Keith (1982) using the massive High School and Beyond data set.

In the UK there have been very few research studies relating to homework. Rutter *et. al.* (1979) found that those schools in which more homework was being set by staff generally had better pupil behaviour and greater academic success. Holmes and Croll (1989) looked at the third-year school exam results in a single-sex grammar school. The study showed that those who reported doing more homework achieved higher exam results having controlled for ability. They also found some differences across social class in the amount of reported homework and in the residual gains.

The evidence for the use of homework as a means of improving academic attainment, then, is not clear-cut, but there would seem to be a consensus that at secondary school the relationship between homework and achievement is a positive one. However, no study could be found which looked at homework at A-level or similar levels and the situation there may well be different from that which obtains at earlier ages.

As others have noted (Coulter, 1979; Cooper, 1989), there is more to homework than the simple question of whether giving it more produces higher attainment scores. Will homework at elementary school develop independent work habits for later life? What was the nature of the homework task or the way in which it was presented to the pupils, or returned to the pupils? These questions will not be touched on here, but of course they are important, as are a host of other surrounding issues. Indeed, Cooper goes so far as to state that: 'my literature survey led me to conclude that homework probably involves the complex interaction of more influences than any other instructional device' (p. 87).

Coulter's (1979) model for homework research underlines this perception of complexity. Nevertheless, so far as a teacher of A-level is concerned, the straightforward question as to whether more homework has a positive influence on exam grades or not is of interest, and that is the question which is to be addressed in this paper.

## The data

ALIS researchers collect questionnaire and ability test data from A-level students about half-way through the year in which they take their A-level examinations. This paper concerns the data collected in 1989 and includes about 3000 cases from schools and colleges from the north-east of England taking part in the project that year. An attempt was made to collect data from all relevant students and the response rate in schools was very good, being over 90 per cent on average. In colleges the response was more variable but was generally above 70 per cent.

Students were asked a range of questions about themselves, their attitudes, their aspirations, their families and the way in which they were taught A-levels. For the purposes of this paper, the most important variables were:

1   A-level grades for each subject (coded: 5 for an A; 4 for a B, and so on).
2   O-level/CSE grades (coded: 7 for an A; 6 for a B, etc.).
3   Gender (coded: 0 for male; 1 for female).
4   Ability test score: the average score for the maths and the verbal parts of the International Test of Developed Abilities (ITDA) (Ottobre and Turnbull, 1987).
5   Homework: how much time they spent each week on average outside class (homework) as reported on the questionnaire.

6 Institution attended (school or college).
7 Teaching group within the institution (class).
8 Socio-economic status (coded: 6 for professional; 5 for semi-professional, and so on).

**TABLE 1** Average number of hours spent on homework per week

| Subject | Time | SD | m-f* | hi-lo† |
|---|---|---|---|---|
| Biology | 5.0 | 3.0 | −0.6 | −0.6 |
| Chemistry | 4.6 | 3.0 | −0.6 | −0.9 |
| Economics | 4.3 | 2.7 | −0.5 | −0.7 |
| English | 5.4 | 3.0 | −0.7 | −0.1 |
| French | 5.2 | 2.6 | 0.0 | −0.4 |
| General Studies | 0.63 | 1.3 | −0.3 | −0.3 |
| Geography | 5.0 | 3.0 | −0.9 | 0.0 |
| History | 5.4 | 3.0 | −0.8 | 0.0 |
| Physics | 4.5 | 2.9 | −0.2 | −0.4 |
| Maths | 5.6 | 3.2 | −0.6 | −0.3 |
| Average‡ | 5.0 | 2.9 | −0.5 | −0.4 |

\* Average for boys − average for girls.
† Average for high prior achievers − average for low prior achievers.
‡ Except for General Studies.

### Amount of homework

Students were asked, in the questionnaire, to respond to the question 'About how much time have you generally spent out of lessons (i.e. on 'homework') on THIS subject EACH WEEK? Approx. — hours PER WEEK' separately for each of their A-level subjects.

As can be seen from Table 1, the average time was close to five hours. The mathematicians reported spending more time than any others on homework, although there was considerable consistency from subject to subject with the exception of General Studies, which apparently demanded relatively little homework. Girls reported doing more homework than boys by about 30 mins per subject per week, and there was some difference between those with modest prior attainment and those with high prior attainment. Those with higher O-level/CSE grades tended to report doing less homework than those with lower prior achievement by about 25 minutes per week per subject.

The number of hours spent on homework was not tightly related to any obvious other factors. The correlations with the average O-level/CSE score, parental occupation and hours spent in part-time employment were −0.10, 0.00 and 0.00 respectively. These correlations confirmed that there was a slight tendency for the academically less successful to spend more time on homework and showed no relationship between home background and hours spent on homework, or the number of hours spent in part-time employment.

### Analysis

The hours reportedly spent on homework were first examined to see if there was a tendency for students within the same class to report doing similar amounts of

**TABLE 2**   **Proportion of variance of hours spent on homework accounted for at class level**

| Subject | Percentage |
|---|---|
| Biology | 16 |
| Chemistry | 16 |
| Economics | 14 |
| English | 9 |
| French | 9 |
| Geography | 11 |
| General Studies | 23 |
| History | 19 |
| Maths | 16 |
| Physics | 16 |
| Average | 15 |

homework. The proportions of variance accounted for by class membership are set out in Table 2. (The figures were calculated using 'null' multi-level models.)

Class membership generally accounted for 15 per cent of the variance in hours spent on homework, although this figure varied from subject to subject. In General Studies a quarter of the variance could be explained by knowledge of which class the student attended. This large proportion reflects wide variation in how General Studies is taught. In some schools, for some pupils, the subject is not even timetabled.

The second stage of the analysis was to see if any relationship could be found between the hours spent on homework and A-level grades for (a) individual pupils and (b) classes as a whole. To this end, the performance at A-level was modelled using the generalized regression analysis available through the multi-level modelling software ML3 (Prosser, Rasbash, and Goldstein, 1990). This software allows the modelling of student level and class level variables simultaneously and overcomes many of the criticisms levelled against simple regression when it has been used to study educational data (Aitkin and Longford, 1986; Goldstein, 1987; Raudenbush and Bryk, 1986).

Each subject was modelled separately in two different ways. First, the A-level grade was regressed, at the pupil level, against the average O-level/CSE grade and gender. The amount of homework reported was divided into five categories, and the highest four were identified by dummy variables. The average amount of homework per class was also calculated. The dummies were then added into the model at the student level and the average amount added at the class level. The coefficients associated with the homework variables are reported in Table 3.

The second analysis was essentially the same as the first, except that the ability test scores were used as the main cognitive control, rather than the average O-level/CSE grade. The results are shown in Table 4.

Generally, the figures in Tables 3 and 4 do not present an entirely consistent pattern, but if General Studies is omitted, then, as the averages at the base of each table show, more homework was associated with higher than predicted grades. The pattern was clearer for Table 4 than Table 3, presumably because Table 3 was based on a model which included prior exam success and so, to some extent, controlled for the amount of homework which students had been prepared to do in the past. Table 4, on the other hand, which included ability test scores, did not include such control

**TABLE 3** Coefficients relating to homework: control for prior achievement and gender

| Subject | Pupil level | | | | Class level |
|---|---|---|---|---|---|
| | Hours on homework | | | | Av. homework |
| | 2.6–4.0 h | 4.1–5.0 h | 5.1–7.0 h | >7.0 h | |
| Biology | 0.13 (0.15) | 0.07 (0.18) | 0.24 (0.18) | 0.37 (0.19) | −0.04 (0.04) |
| Chemistry | 0.15 (0.13) | 0.41 (0.17) | 0.34 (0.17) | 0.33 (0.18) | −0.08 (0.06) |
| Economics | −0.15 (0.15) | −0.20 (0.20) | −0.32 (0.20) | −0.38 (0.23) | 0.01 (0.09) |
| English | −0.05 (0.16) | 0.12 (0.17) | −0.06 (0.18) | 0.14 (0.18) | −0.06 (0.04) |
| French | −0.08 (0.23) | 0.31 (0.26) | 0.17 (0.26) | 0.01 (0.28) | 0.11 (0.07) |
| General Studies | 0.03 (0.4) | −1.60 (0.65) | 0.045 (0.92) | 1.10 (0.68) | 0.12 (0.05) |
| Geography | 0.48 (0.16) | 0.61 (0.19) | 0.40 (0.18) | 0.74 (0.20) | −0.11 (0.06) |
| History | −0.01 (0.19) | −0.12 (0.21) | 0.09 (0.21) | −0.01 (0.21) | −0.05 (0.06) |
| Physics | −0.17 (0.13) | 0.03 (0.17) | 0.20 (0.17) | 0.05 (0.18) | 0.00 (0.05) |
| Maths | −0.10 (0.14) | −0.02 (0.17) | 0.11 (0.16) | 0.16 (0.16) | 0.11 (0.05) |
| Average* | 0.02 | 0.13 | 0.13 | 0.16 | 0.00 |
| Effect† | 0.01 | 0.09 | 0.09 | 0.12 | 0.00 |

\* Excluding General Studies.
† Effect = average/SQRT (mean variance at that level).

**TABLE 4** Coefficients for hours on homework: control for ability and gender

| Subject | Pupil level | | | | Class level |
|---|---|---|---|---|---|
| | Hours on homework | | | | Av. homework |
| | 2.6–4.0 h | 4.1–5.0 h | 5.1–7.0 h | >7.0 h | |
| Biology | 0.38 (0.24) | 0.36 (0.28) | 0.64 (0.28) | 0.74 (0.32) | −0.18 (0.08) |
| Chemistry | 0.18 (0.18) | 0.44 (0.23) | 0.31 (0.22) | 0.33 (0.25) | −0.14 (0.08) |
| Economics | −0.20 (0.19) | 0.01 (0.25) | 0.0 (0.27) | 0.05 (0.31) | −0.11 (0.11) |
| English | −0.21 (0.21) | −0.12 (0.23) | −0.05 (0.24) | 0.26 (0.24) | −0.02 (0.03) |
| French | 0.12 (0.40) | 0.68 (0.43) | 0.94 (0.43) | 0.27 (0.49) | 0.03 (0.10) |
| General Studies | 0.49 (0.52) | −1.5 (0.80) | −0.48 (0.93) | −1.9 (0.90) | 0.10 (0.06) |
| Geography | 0.42 (0.19) | 0.61 (0.23) | 0.44 (0.23) | 0.70 (0.27) | 0.0 (0.10) |
| History | 0.10 (0.26) | 0.02 (0.27) | 0.18 (0.28) | 0.18 (0.28) | −0.09 (0.09) |
| Physics | −0.28 (0.17) | 0.0 (0.22) | 0.13 (0.24) | 0.06 (0.25) | 0.01 (0.06) |
| Maths | 0.10 (0.19) | 0.23 (0.22) | 0.21 (0.21) | 0.21 (0.21) | 0.16 (0.06) |
| Average* | 0.07 | 0.25 | 0.31 | 0.35 | −0.05 |
| Effect† | 0.04 | 0.16 | 0.19 | 0.21 | −0.09 |

\* Excluding General Studies.
† Effect = average/SQRT (mean variance at that level).

and so shows more realistically, perhaps, the relationship between the amount of homework and A-level grades.

The averages indicate a fairly modest payoff for hard work. Students who worked for more than 7 h a week for one A-level tended to get a third of a grade better than students of the same gender and ability who worked less than 2 h a week, and if

students with similar prior achievement are considered, the advantage only amounted to about a fifth of a grade.

The final columns in Tables 3 and 4 indicate the class level effect of homework and represent an estimate of the influence of class homework policy. Overall, the effect was non-existent. That is to say, as far as classes were concerned, in those where much homework was reported, the A-level grades, having been controlled for individual cognitive measures and hours spent on homework, were no better than those in which little homework was reported. In other words, for two pupils doing the same amount of homework and with the same prior achievement or ability score but in two different classes, one where the student generally did a lot of homework and one where the student generally did little homework, there was no difference between their final A-level grades.

The picture, subject by subject, is not so clear because of the size of errors of the coefficients, but some relationships are worthy of note. First, the pupil level data will be considered: for Economics, Table 3 actually shows a negative advantage accruing for those who reported working for longer hours, although Table 4 would seem to indicate that this was a misleading result and that there was little underlying relationship. In Geography those who reported doing less than 2 h of homework a week would appear to be at a considerable disadvantage compared with others. The disadvantage was about 0.5 of a grade and may have been connected with project work.

The one subject with really atypical results was General Studies. Most students reported doing only enough homework to put them in the first category on Tables 3 and 4, but the few students who reported doing more than 4 h a week appeared to do much worse than expected, given their ability or their previous exam results.

At the class level, Table 3 is the most indicative because it was based on the most powerful control – average O-level/CSE grade – and therefore presents the best indication of the possible effect of class level action. The data indicate that for French, General Studies and Geography there was a tendency for students in those classes which reported more homework to have gained higher than predicted grades.

## Discussion

For those who would like unequivocal relationships on which to base advice and argument, the data give little comfort. There is surely some benefit in working hard, so far as A-level grades are concerned, but the payoff for working several more hours per week per subject would appear to be slight, and those classes where there was more homework were not always those classes which obtained better results than predicted on the basis of prior achievement or an ability measure.

However, when considering the value of homework it is worth bearing in mind two competing possibilities. The first is that more work brings more achievement, and the second is that more work can simply be a reflection of a worried state of mind and that it can add to the student's concern and in the long term be counterproductive. This is presumably what underlies the General Studies data. There is little syllabus content to follow in the Joint Matriculation Board exam, which is the one entered by most candidates in the sample, and one wonders what students were doing who reported working for more than 4 h a week on homework for it.

An alternative perspective could be that there is a certain amount of work, say, a couple of hours a week, which is needed for a student to do him or herself justice at A-level and that more than this gives minimal return for investment. This might be

because more and more practice or revision has limited influence on a student's ability to solve the kind of time-limited problem found on examinations, or to write an analysis under time pressure.

In summary, it may be stated that there was evidence that those students who worked for long hours gained slightly better grades than those who worked for more modest periods. This does not mean that if students who worked long hours cut back, then their grades would be hardly affected, but it is consistent with the idea that A-level grades are very difficult to influence, given that most students have already demonstrated a certain level of competence and that they follow a two-year, high-level course working for several hours a week in lessons and several hours a week outside class.

## Conclusions

The analyses of the 1989 ALIS data relating to homework have produced the following findings:

1  There was a wide variation among A-level students in the amount of homework which they reported doing.
2  The amounts of homework reported for different curriculum areas were broadly similar, with the single exception of General Studies.
3  Girls and students with poorer prior achievement reported doing more homework, but there was no evidence of variation across socio-economic groupings.
4  The amount of homework varied from class to class.
5  The more homework that the students reported doing, the better were their grades, even when students of the same ability were compared.
6  Classes which reported doing more homework did not fare better than classes which reported doing less homework over and above the differences which would be expected, given individual student cognitive and homework measures.

The above findings would seem to indicate that teachers have little influence on A-level results through homework policies, but this can be viewed in a positive light.

It is clear that A-level students do a lot of homework and that, for the sake of their own success, they are well advised to work hard. However, it is also clear that A-level teachers who pile on the work are not necessarily the teachers associated with 'good' results. Teachers who do demand many hours of students' home time per week might well look at this analysis and decide to ease up on this blanket pressure and monitor the outcomes which follow. The analysis also implies that students can work hard to do themselves justice at A-level and still be left with plenty of time to enjoy life.

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