

# Predictors of the academic performance of teacher education students

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**T**his study was conducted in two higher education institutions, one in England and the other in the Republic of Ireland. It seeks to account for the variation in the first-year academic performance on the teacher education course with reference to the students' prior achievement and how they interpret and approach the demands of the course. It examines differences between the two groups. It is based on a detailed questionnaire survey of all the first-year students in the two colleges in March 1996 and also on information gathered in September–October 1996 to ascertain students' academic achievement on entry to the course and on completion of the first year.

## Background and rationale

The theoretical rationale of the whole study stems from research in the United States (Astin, 1984; Tinto, 1987; Astin, 1993), the United Kingdom (Entwistle and Ramsden, 1983; Peers and Johnston, 1994; Sadler-Smith, 1999) and Ireland (Somers, 1994, 1996). In summary, determinants of first-year academic performance (outcome) pertain to measures of prior academic attainment and to the students' application of their ability and skills and the allocation of their resources. The latter include the student's perceptions of the learning environment, his or her approaches to studying and the amount of time spent in private study.

The 'approaches to studying' perspective adopted in this research emanates mainly from the work of the Gothenburg group in Sweden (Marton and Saljo, 1976, 1984), the research of Biggs (1978) in Australia and the work of the Lancaster group in the United Kingdom (Entwistle, 1981; Entwistle and Ramsden, 1983). This perspective is based on the theory that students enter tertiary education for a variety of reasons and these reasons influence the manner in which they go about their learning, which is called an approach to studying. Findings from research in several countries indicate a significant association between approaches to studying and academic performance (e.g. Entwistle and Tait, 1990; Peers and Johnston, 1994). There is some evidence that challenges the notion of a straightforward link between approaches to study and academic performance (Provost and Bond, 1997),

especially among mature-age students (Fogarty and Taylor, 1997). It appears that approaches to study may be dependent upon the academic context itself – for example, how students perceive the demands of assignments and their work load (Riding, 1997; Sadler-Smith, 1999). It seems that approaches to study are at the interface between the individual style of the learner and how he or she interprets the demands of the academic environment. It would seem to be important to take students' perceptions of their learning context into account when attempting to understand the factors that influence their achievement.

While students on a range of degree courses have been the focus of research into prior academic achievement, approaches to study and perceptions of the learning context (e.g. Entwistle and Tait, 1990), students on teacher education degree courses have not. Moreover, cross-cultural, comparative studies of these variables have not been conducted with students studying the same disciplines/professions, to the knowledge of the authors. Such studies would indicate further how variables interconnect in the determination of performance. Furthermore, it is expected that our understanding may become clearer by investigating students who are studying the same disciplines in different countries.

### **Aims and research design**

The research reported here aims to account for variation in the first-year academic performance (outcome) in terms of the first year student's experiences (process) in the academic system, the influence of prior achievement and other relevant variables. These are described below.

- 1 *Outcome* refers to the total first-year marks out of 100 (average marks awarded to each student in the first-year examinations and assignments, for both Irish and English students).
- 2 *Prior achievement* is defined as points/grades scored at the end of secondary school examinations – the leaving certificate examination (LCE) in the case of Irish students and the A-level examination in the case of English students.
- 3 *Process* is defined here as:
  - (a) Student perceptions of the learning context (PLC) (from the PLC inventory incorporated into the questionnaire).
  - (b) Approaches to studying (AS) (from the AS inventory incorporated into the questionnaire),
- 4 Other predictor variables:
  - (a) Age (less than 20, 20–5, 26–30, 31–40, greater than 40 years).
  - (b) Gender.
  - (c) Time spent studying (average number of hours spent studying outside of timetabled activities per week).
  - (d) Perception of the likelihood of successful completion of the course (certain, fairly certain, unsure).

- (e) Current satisfaction with the choice of course (three-point scale).
- (f) Living at home during term (yes or no).
- (g) Having a part-time job (yes or no).

Data for the measures of prior achievement and outcome were obtained from the student record office in the case of the English college and by direct contact with students, using a further short questionnaire, at the end of their first year, in the case of the Irish college.

The intention was to account for academic performance on the basis of the available evidence, trading simplicity and parsimony with predictive power. Factor analysis was used to determine factors from the data from the two inventories concerning PLC and AS. The factor scores were added as predictors along with the other variables noted above to form a regression model of output. Factor analysis is a technique for simplifying the interdependence of many variables. It finds a small number of underlying uncorrelated dimensions from linear combinations of the larger number of original variables. Linear regression is a conventional procedure for accounting for a (quasi-) continuous response, in this case the marks at the end of the first year of study, based on a number of predictors or dependent variables. Stepwise regression was used. It is a way of sorting out among all the predictors which ones best predict that response in order to achieve a parsimonious model. See Plewis (1999) for an accessible account of regression and Manly (1994) for factor analysis. The final section of the article compares the effects as between the English and Irish groups.

## **Analysis and discussion of results**

Both the Irish and the English data were combined in the factor analyses.

### *Perceptions of the learning context*

In the case of PLC, responses to eleven items were factor-analysed, using principal components extraction, followed by varimax rotation. A three-factor solution accounting for 57 per cent of the variance was selected, where the criterion for the selection of factors was that the eigen values should be greater than 1 (the Kaiser criterion). We conveniently labelled the three factors as 'hard work', 'unclearly about goals' and 'unhappiness' to reflect their components as simply and sensibly as possible. The first factor included, for example, 'the work load here is too heavy'. The second referred to lack of understanding about the goals of the course, e.g. 'having a clear idea of where you are going and what is expected'. The third bears on lack of happiness, e.g. 'there is a friendly atmosphere on the course'. (See appendix.)

### *Approaches to study*

Twenty-five items were similarly factor-analysed in the case of approaches to study. A three-factor solution accounting for 38 per cent of the variance

overall was selected. Here we conveniently labelled the three factors ‘meaning and intrinsically motivated’, ‘disorganised’ and ‘purpose and extrinsically oriented’. The first factor incorporates items that probed finding the course intellectually stimulating, setting out to grasp the meaning of set readings and finding academic ideas exciting. The second factor includes items such as ‘I’m slow to start work in the evenings’, putting off work, finding it difficult to organise study time and reading very little around the course. The third factor is characterised by items that bear on extrinsic motivation, e.g. approaching study with a strong sense of purpose and feeling that it is important to do well. (See appendix.)

All these factors, i.e. latent predictors, along with other variables, i.e. manifest predictors, were used to form a regression model of academic performance. This is described in the next section.

### *Accounting for academic performance*

Each college was modelled separately. The following variables were initially entered as predictors in regression models to account for academic performance:

- 1 Prior academic achievement scores.
- 2 Age, being over 25 years old – the original five unequal class-width categories were dichotomised.
- 3 Gender.
- 4 Time spent studying.
- 5 Perception of the likelihood of completing the course and getting a degree.
- 6 Current satisfaction with the choice of course.
- 7 Living at home.
- 8 Having a part-time job.
- 9 The scores associated with three factors for PLC:
  - (a) ‘Hard work’.
  - (b) ‘Unclarity about goals and standards’.
  - (c) ‘Unhappiness’.
- 10 The scores associated with three factors associated with AS:
  - (a) ‘Meaning and intrinsically motivated’.
  - (b) ‘Disorganised’.
  - (c) ‘Purpose and extrinsically oriented’.

Separate stepwise regression analyses of the English and Irish data were performed to find the statistically significant ( $p < 0.05$ ) predictors from the above list and to estimate the size of the effects in the two colleges. There were some problems with missing data: 80 per cent of the 168 English cases were complete while for the 123 Irish cases the figure was 55 per cent. The model for the English college accounts for 17 per cent of the variability (variance) in first-year academic performance, whilst that for the Irish college accounts for 39 per cent. (See Tables 1 and 2.)

**Table 1** Results of regression of English students' first-year marks on the independent variables

Multiple R	0.43	Adjusted R <sup>2</sup>	0.17		
R <sup>2</sup>	0.19	Standard error (SE)	6.89		
F	9.99	Significance of F	0.000		
<i>Variables in the equation</i>					
Independent	B	SE B	Beta	T	Sig. of T
Being over 25 yrs	7.4583	1.693	0.4086	4.406	0.0000
'Disorganised'	-1.6229	0.6145	-0.2099	-2.641	0.0093
A-level points	0.2933	0.0750	0.3628	3.910	0.0001
Constant	49.6221	1.2249		40.511	0.0000

**Table 2** Results of stepwise regression for Irish students' first-year marks on the independent variables

Multiple R	0.64	Adjusted R <sup>2</sup>	0.39		
R <sup>2</sup>	0.41	Standard error (SE)	6.07		
F	20.47	Significance of F	0.000		
<i>Variables in the equation</i>					
Independent	B	SE B	Beta	T	Sig. of T
Time studying	0.3532	0.1024	0.3535	3.448	0.0010
LCE points	0.0931	0.0211	0.4519	4.408	0.0000
Constant	4.2872	9.9214		0.432	0.6672

The variables that are significantly associated with English students' academic performance are:

- 1 Prior academic achievement (overall A-level points) – positive impact.
- 2 Being over 25 years old – positive impact.
- 3 'Disorganised' approach to study – negative impact.

The impacts are all in the direction expected

The variables that are significantly associated with Irish students' academic performance are:

- 1 Prior academic achievement score (overall points in the leaving certificate examination) – positive impact.
- 2 Time spent studying – positive impact.

The impacts in this case are also in the expected direction.

Thus four statistically significant predictors of performance emerge overall:

- 1 Prior achievement score.
- 2 Being over 25 years old.
- 3 Time spent studying.
- 4 'Disorganised' approach to study.

We now attempt to compare the impacts of the four predictors found for end-of-first-year marks. We do this by entering the four into the regression model for each college. This inevitably means relaxing the 0.05 level of statistical significance and reducing the parsimony for the model of each college. However, the advantage is to be able to compare the impacts of variables between colleges in cases where they fail to achieve strict (0.05) statistical significance. (It is important to recognise that a regression model is a complete entity, so that adding a new predictor will, in general, change the values of any existing parameters.) The results are displayed in Tables 3 and 4.

**Table 3** Results of regression for English students' first-year marks, including predictor variables found significant for Irish students

Multiple R	0.42	Adjusted R <sup>2</sup>	0.15		
R <sup>2</sup>	0.18	Standard error (SE)	6.88		
F	7.28	Significance of F	0.000		
<i>Variables in the equation</i>					
Independent	B	SE B	Beta	T	Sig. of T
Being over 25	7.0342	1.6343	0.4013	4.304	0.0010
'Disorganised'	-1.3438	0.6484	-0.1750	-2.073	0.0401
Time studying	0.0775	0.0799	0.0822	0.971	0.3335
A-level points	0.2849	0.0750	0.3550	3.800	0.0002
Constant	48.619	1.7601		27.623	0.0000

**Table 4** Results of regression for Irish students' first-year marks, including predictor variables found significant for English students

Multiple R	0.65	Adjusted R <sup>2</sup>	0.39		
R <sup>2</sup>	0.43	Standard error (SE)	5.99		
F	11.51	Significance of F	0.000		
<i>Variables in the equation</i>					
Independent	B	SE B	Beta	T	Sig. of T
Being over 25	2.1919	3.7074	0.0596	0.591	0.5565
'Disorganised'	-1.8301	0.9123	-0.2227	-2.006	0.0492
Time studying	0.1954	0.1102	0.2044	1.773	0.0812
LCE points	0.0845	0.0205	0.4217	4.117	0.0001
Constant	10.497	9.7552		1.076	0.2861

The overall regression models are both highly significant statistically as shown by the *F* test ( $p < 0.0005$ ). The effects are in the same direction for each group of students as indicated by the sign of the various contributions. However, the degrees of magnitude of the estimated effects are interesting and merit discussion.

The effect of the prior academic achievement score is very similar in each case, when it is recognised that prior achievement scores are scaled differently, and the effect is statistically highly significant. This can be seen in the

beta coefficients in Tables 3 and 4. These show that one whole standard deviation in prior achievement has the effect of approximately 0.4 of a standard deviation in outcome achievement in both colleges. The difference between these two beta coefficients is not statistically significant.

The association between entry scores and first-year academic performance is not surprising and confirms findings elsewhere, for example those of Moran and Crowley (1979) and O'Rourke *et al.* (1987) in the Irish context and those of Forrest (1989) in the English context.

Being over 25 in England is worth roughly seven percentage marks in output, while, because of the small size of the *T* statistic, the effect of being over 25 in Ireland is indistinguishable from zero. Thus being over 25 is significant in the English case but not in the Irish case (see Tables 1 and 2 also). However, of the sixty-seven valid cases in Ireland, very few were over 25, so the current study clearly does not provide sufficient evidence on which to draw conclusions about the impact of age in the Irish context. On reflection, it would have been better to ask the students their ages than have the broad categories used (see p. 90). In addition, the fact that there are so relatively few mature-age students in teacher education in Ireland may have implications for the other process variables measured in this study, specifically, approaches to study. There is very recent evidence that mature-age students experience their higher education differently, so that their approach to study may be different (Donaldson *et al.*, 1999). If so, these differences could mask other differences. There clearly needs to be further study to tease out confounding variables.

On the question of process variables, in line with expectations, reported time spent studying positively contributes to academic performance, but only in the Irish case. On the other hand having a 'disorganised' approach to study has a negative impact on performance in both cases. Stated more specifically, one extra hour claimed studying per week in the Irish case yields 0.2 of a mark more on average in the first-year result ( $p = 0.08$ ), while the corresponding effect in the English case is indistinguishable from 0 (see the  $p$  values of their *T* statistics in Tables 3 and 4). The negative effect of disorganised study habits is similar for Irish students and their English counterparts: an increase of one standard deviation in this variable reduces the outcome result by 1.8 marks, on average, while the corresponding reduction for English students is 1.3 marks. The difference between these is not statistically significant.

## Conclusion

The provisional nature of the regression analysis needs to be acknowledged. The reliability of the results depends on the predictors being accurately known, and such is not the case across all the relevant variables. The evidence is based on self-report and it may be that students' reporting of, say, time spent studying was far from accurate. Uncertainty in the predictors will give rise to increased uncertainty in the model. Reliable prediction of any

individual's end-of-year marks is ruled out because the  $R^2$  is small in both cases.

There are limitations associated with the small number of cases. There were inevitably some missing data. Some were caused by the fact that, in the Irish case, examination results were not available direct from the college and it was necessary to send a questionnaire to each student. The response rate was 75 per cent. This will inevitably have increased the unreliability.

The assumption underpinning the research, that human thought and behaviour can be adequately described through inventories seeking to test psychological traits, should be acknowledged. Entwistle (1997) has described a rich and complex model of the teaching-learning process in which he explains how learning strategies and learning outcomes depend on a wide range of interacting variables, including the characteristics of the individual student, the teaching provided and the context of departmental practices, assessment practices and how these requirements are interpreted by the student. Recognising the complexity of the model may involve more interpretive and qualitative research designs.

In our view, however, this complexity could also be addressed by quantitative approaches. More complex models will require considerably more data in order to estimate the greater number of parameters involved with adequate precision, so that effects can be readily seen. If there were sufficient data a linear structural equation approach could perhaps model the complexity of the situation better and allow for falsification of any predetermined model.

Our study points to influences which may be found to persist in more detailed work. It would be interesting if the similarities between the effect sizes of both prior achievement and the detrimental effect of a disorganised approach to study were found to be maintained in different contexts; i.e. across different colleges and countries.

## Appendix

### Matrices of factor loadings for the questionnaire items

(Loadings less than 0.3 are suppressed in the tables.)

*Perceptions of the learning context (P1, 'Hard work'; P2, 'Unclarity about goals'; P3, 'Unhappiness')*

<i>Item</i>	<i>P1</i>	<i>P2</i>	<i>P3</i>
A great deal of my time is taken up by lectures, practicals and tutorials	0.59	0.39	-0.35
In this department you are expected to spend a lot of time studying on your own	0.59		
I have a fair idea of the academic standard expected on this course		-0.73	
The workload here is too heavy	0.72	0.44	
There is a friendly atmosphere on this course			-0.80

I feel under a lot of pressure on this course	0.75		
This course gives students a chance to use methods of study which suit their own way of learning		-0.51	
It seems to me that most students here are happier and more satisfied than I am			0.68
It's hard to know how well you are doing on this course	0.67		
There is so much work to be done that it is very difficult to get down to reading around the course	0.70	0.40	
You have a clear idea of where you are going and what is expected of you on this course		-0.81	

*Approaches to study (A1, 'Meaning and intrinsically motivated'; A2, 'Disorganised'; A3, 'Purpose and extrinsically oriented')*

<i>Item</i>	<i>A1</i>	<i>A2</i>	<i>A3</i>
My main reason for being here is that I can learn more about subjects that really interest me	0.56		
I find it difficult to organise my study time effectively		0.71	
I spend a lot of my spare time finding out about topics which have been discussed in class	0.31		0.38
I usually set out to understand thoroughly the meaning of what I am asked to read	0.63		
I suppose I'm more interested in the qualifications I'll get from the course I'm taking	-0.59		
When I'm reading I try to memorise important facts which may come in useful later	0.45		
I usually don't have time to think about the implications of what I have read	-0.42	0.51	
I find studying academic topics exciting	0.58	-0.33	
I often find myself questioning things I hear in lectures and read in books	0.55		
I try to relate ideas in one subject area to those in another, whenever possible	0.54		
I need to read around the subject fairly widely before I present my ideas on paper	0.48		0.35
I am usually cautious in drawing conclusions unless they are well supported by evidence	0.34		0.43
It is important to do well in the course here			0.53
In doing special projects, essays or assignments, I try to work out several alternatives in interpreting the findings	0.38		0.33
Distractions make it difficult to do much effective work in the evenings		0.60	
Often I have to read things without having a chance to really understand them		0.54	

I tend to read very little beyond what is required for completing the assignments			0.56
When I'm doing a piece of work I try to bear in mind exactly what the particular lecturer wants	-0.44	0.58	
If the conditions are not right for me to study I generally manage to do something to change them			0.42
I'm rather slow in starting work in the evenings		0.73	
I generally approach my study with a strong sense of purpose			0.60
I generally put a lot of effort into trying to understand things which initially seem difficult			0.52
My habit of putting off work leaves me with too much to do at the end		0.73	
I like to be told precisely what to do in essays and assignments		0.42	0.45
I find this course intellectually stimulating	0.65		

## References

- Astin, A. (1984), 'Student involvement: a developmental theory of higher education', *Journal of College Student Personnel* 25, 297-308.
- (1993), *What matters in College: four critical years revisited*, San Francisco: Jossey Bass.
- Biggs, J. (1978), 'Individual and group differences in study processes', *British Journal of Educational Psychology* 48, 268-77.
- Donaldson, J. F., Graham, S., Kasworm, K., and Dirx, J. (1999), 'Adult Undergraduates' Participation and Involvement: future directions for theory and research', paper presented at the National Conference of the American Educational Research Association, Montreal, April.
- Entwistle, N. (1981), *Styles of Learning and Teaching: an integrative outline of educational psychology*, Chichester: Wiley.
- (1997), 'Understanding academic performance at university: a research retrospective', in D. Shorrocks-Taylor and V. Varma (eds), *Directions in Educational Psychology*, London: Whurr.
- Entwistle, N., and Ramsden, P. (1983), *Understanding Student Learning*, London: Croom Helm.
- Entwistle, N., and Tait, H. (1990), 'Approaches to learning, evaluation of teaching and preferences of contrasting academic environments', *Higher Education* 19, 174-83.
- Fogarty, G. J., and Taylor, J. A. (1997), 'Learning styles among mature-age students: some comments on the Approaches to Studying Inventory (ASI-S)', *Higher Education Research and Development* 16, 321-30.
- Forrest, G. (1989), 'The Relationship between GCE Advanced Level Grades and University Results in the UK: past and future', paper presented at the fifteenth international conference of the International Association for Educational Assessment, Sydney, November.
- Manly, B. F. J. (1994), *Multivariate Statistical Methods: primer*, London: Chapman & Hall.
- Marton, F. and Saljo, R. (1976), 'On qualitative differences in learning' 1, 'Outcome and process', *British Journal of Educational Psychology* 46, 4-11.
- (1984), 'Approaches to learning', in F. Marton, D. Hounsell and N. Entwistle

- (eds), *The Experience of Learning*, Edinburgh: Scottish Academic Press
- Moran, M., and Crowley, M. (1979), 'The leaving certificate and first-year university performance', *Journal of Statistical and Social Enquiry of Ireland XXIV* (1), 251.
- O'Rourke, B., Martin, M., and Hurley, J. (1987), *The Scholastic Aptitude Test as a Predictor of Third Level Academic Performance*, Drumcondra, Dublin: Educational Research Centre.
- Peers, I., and Johnston, M. (1994), 'Influence of learning context on the relationship between A-level attainment and final degree performance: a meta-analytic review', *British Journal of Educational Psychology* 64, 1–18.
- Plewis, I., (1997), *Statistics in Education*, London: Arnold.
- Provost, S. C., and Bond, N. W. (1997), 'Approaches to studying and academic performance in a traditional psychology course', *Higher Education Research and Development* 16, 309–20.
- Riding, R. J. (1997), 'On the nature of cognitive style', *Educational Psychology* 17 (1–2), 29–50.
- Sadler-Smith, E. (1999), 'Intuition-analysis style and approaches to study', *Educational Studies* 25 (2), 159–73.
- Somers, C. (1994), 'The Correlates of Academic Performance in the Context of the Transition from Second-level to Tertiary Education', paper presented at the seventh international conference on 'the First-year Experience', University College Dublin.
- (1996), 'Correlates of engineering freshman academic performance', *European Journal of Engineering Education* 21 (3), 317–26.
- Tinto, V. (1987), *Leaving College: rethinking the causes and cures of student attrition*, Chicago: University of Chicago Press.

## Acknowledgements

This study was funded by a grant from the Standing Conference on Studies in Education (SCSE).

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