LEARNING PREFERENCES IN RELATION TO SUBJECTS OF STUDY OF STUDENTS IN HIGHER EDUCATION

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***Abstract**: Applications for entry to Higher Education have persistently shown marked differences between ethnic minority groups and gender. Research into learning preferences suggests that these might be one reason for these differential choices. This paper reports a study of over 384 undergraduates and 483 PGCE students, exploring their learning styles by means of a 50 item Likert scale and comparing this with a small number of ranking questions based on preferred styles of teaching and learning. Four dimensions were identified: Approaches to Learning; Interaction Preferences; Beliefs about Knowledge; and Regulation of Study Strategies. Clear subject differences in these learning preferences were identified. There were some differences between those students electing to pursue a PGCE course (who tended towards the 'deep' learning end of the scales) and the undergraduate students, although the subject order remained consistent. Mathematics students lie at one end (characterising 'surface' learning approaches, belief in the transferability of a fixed knowledge base, less dependence on interaction) of the scale and English students at the other. There was little variation attributable to gender differences.*

Introduction

When UCAS first collected data in 1990 on the ethnic origins of applicants to Higher Education it posed a variety of questions about how students made their choice of subject (Woodrow, 1996). It is clear that students from different ethnic groups have shown differential subject choices. The data from UCAS for the 2000 entry shows such differences persist between the ethnic minority students and between genders. It is tempting to begin to draw speculative reasons to explain these differences, and some of these were explored in a previous article

(Woodrow, 1996) in which it was suggested that learning styles have a significant influence, amongst other factors.

On subject choice and learning styles Woodrow conjectured that the way in which Mathematics is taught and learned might well select people with particular personal characteristics - authoritative, focused and convergent personalities - which might not be those most attracted to teaching. DFE (1994) in a paper relating to shortages of maths and science students, also conjectured that

- Science and technology students liked the lack of essays, the highly structured courses, practical work, having an answer, being accurate and doing a vocational subject. They didn't like the fact that arts ' is all about learning' and studying in the arts was 'very isolated'
- Non-science based students disliked scientific subjects because they required extremely hard work, heavy reliance on experiments and practicals, emphasis on accuracy (too fiddly), full and inflexible timetables, few opportunities for self-development.

However what the subject-related learning styles really are and how they relate to subject variations in recruitment is still somewhat unclear. This research project is designed to begin to explore these issues.

Learning Styles

Individual differences in learning styles have been the focus of much attention in recent times, but there remains widespread confusion about the terminology used. The constructs themselves can be basically grouped into two main types, 'cognitive style' and 'learning preferences'. The underlying differences are essentially the degree of stability of the style. Cognitive style refers to a person's habitual way of thinking, perceiving and processing information and, like personality, is thought to be stable and independent of context (Witkin 1962; Riding, 1998). Learning preferences, by contrast, are seen to be modifiable and influenced by context, they are usually perceived as predispositions or orientations to learning (Dunn et a 1989; Biggs 1987a). Thus ownership of a particular cognitive style might well lead a student to choose a particular subject to study, whereas a learning preference might well be imposed on a student by

his/her choice of subject of study. In practice (like the nature/nurture debate) this is likely to remain an ambiguous dialectic.

Currently, the most prominent area of research on this area is Marton and Saljo's (1976) studies of 'deep' and 'surface' approaches. A deep approach consists of studying for its own sake, for personal interest and is meanings-related. A surface approach is essentially the opposite. It consists of studying to fulfil extrinsic demands and relying on memorising, whilst making little attempt to relate material to previous knowledge. Skemp (1977) identified a corresponding relationship to 'understanding' in his discussion of relational understanding and instrumental.

Disciplinary differences in learning

There has been some research into the categorisation of different academic subjects and one of the most widely used taxonomies is one devised by Biglan (1973). He distinguishes between 'hard' and 'soft' subjects. Those subjects that have a single paradigm, or hard subjects, would be more fixed in content as areas of interest and research methodologies are usually agreed. Under this classification, maths and science are hard subjects and humanities and social sciences soft.

This Enquiry

Vermunt (1996) identified a relationship between learning approaches and regulation of learning processes. Students' beliefs about knowledge are likely to play a major role in determining orientations towards learning. There is widespread belief that maths, foreign languages and sciences are characterised by more teacher-led methods that arts, humanities and social sciences. The criteria for success in the hard subjects have an emphasis on right and wrong answers. One can easily see a link between cultural philosophies which emphasise respect for authority and the attraction towards subjects that allow students to more easily reinforce expert knowledge. It seems likely that those

studying soft subjects will incline towards the more interactive techniques while an acceptance of the teacher as authority is more likely to occur in the hard subjects. Similarly stereotypes suggest talent or natural ability are necessary for success in maths, languages, music and art, whereas effort and effective study strategies are more likely to signify success in social science or humanities.

This Study

The study looks at the interrelationship of four aspects of learning*: **approaches to learning, interaction, beliefs about knowledge*** and ***regulation of study strategies*.** There is a complex and reflexive relationship between the personal and contextual domains of learning preferences, and it is only possible to speculate on whether the preferences have developed as a result of the subject matter or whether personal predisposition has led the individual to move towards subjects which reflect his/her preferences.

For this study a new questionnaire was developed. The questionnaire contained items relating to biographical details as well as a section of items referring to preferred methods of learning which were to be ranked in order. The largest section of the questionnaire, reported here, was a 50 item 4-point Likert scale. The items were subjected to item analysis and factor analysis which resulted in the identification/confirmation of the four dimensions.

The Sample

The sample consisted of a total of 867 students, 483 were working towards their Postgraduate Certificate in Education. The other 384 students were undergraduates, mostly in their first year of study in five specific areas, English, Art, Business Studies, Science and Maths. For PGCE students 155 were male, 328 female. The undergraduates 199 male, 185 female.

Results

The lower the score on a scale from 1 to 5,

- the greater the inclination towards a deep approach to learning,

- a relativist view of knowledge,
- a preference for interactive techniques and
- self-regulation of study.

Dimension 1: Approach to learning

Choices here are for learning by memorising, liking to be right, liking to compare grades with others.

The overall results for the PGCE students show a clear division between the soft subjects, English, Art and Humanities with lower scores, and the hard subjects of Maths, Science and Languages with the higher scores. Maths, MFL and DT students showed a tendency to prefer exact instructions from their tutors.

Table 1: Mean scores by subject - Approach to Learning

PGCE students (selected subjects)

Subject	N	Mean	Std Dev
English	88	2.9593	.5131
Art	52	2.9952	.6510
DT	49	3.3282	.5957
Science	94	3.3484	.5409
Maths	49	3.3622	.5617
MFL	36	3.4468	.6384
Mean	483	3.2490	.6010

Undergraduate students

Subject group	N	Mean	Std Dev
Business Studies	75	3.3369	.3929
English	75	3.3493	.5724
Science	89	3.3573	.5266
Art	47	3.4547	.2943
Mathematics	98	3.4611	.4436
Mean	384	3.3902	.4691

One surprising contradiction was that postgraduates whilst deeper learners were more extrinsically motivated (by exam success) than the undergraduates (perhaps because the ITT context is now so target driven).

Dimension 2: Beliefs about Knowledge

Table 2: Mean scores – Beliefs about Knowledge

PGCE students (selected subjects)

Subject	N	Mean	Std Dev
Art	52	1.9973	.5212
English	88	2.0373	.4723
Science	94	2.2857	.5907
DT	49	2.3499	.5298
MFL	36	2.3889	.6801
Maths	49	2.5510	.4957
Mean	483	2.2195	.5607

Undergraduate students

Subject	N	Mean	Std Dev
Business Studies	75	2.2971	.5133
English	75	2.3981	.3405
Science	89	2.5169	.5560
Art	47	2.5973	.4061
Mathematics	98	2.6509	.5482
Mean	384	2.4948	.5408

This includes questions about preferring general understanding to learning details, reading round to memorising, forming one's own ideas.

The relative scores in the different subject areas are very similar to the *approach to learning* scale. The soft subjects, English, Art and Social Sciences have the lower scores and the hard subjects, Maths and MFL, the highest.

This indicates that students of hard subjects are more inclined towards a belief in the transferability of a body of knowledge and are more concerned in acquiring detailed information than general ideas.

Dimension 3: Interaction and Participation

This covers asking questions, working on groups, and giving presentations

Tables 3: Mean scores - Interaction and Participation

PGCE students (selected subjects)

Subject	N	Mean	Std Dev
English	88	2.1006	.5547
Art	52	2.1813	.4694
Science	94	2.2128	.4983
MFL	36	2.2540	.5194
DT	49	2.3440	.6135
Maths	49	2.4738	.6418
Mean	483	2.2501	.5624

Undergraduate students

Subject group	N	Mean	Std Dev
English	75	2.5758	.5502
Art	47	2.5850	.3334
Business Studies	75	2.5951	.2813
Mathematics	98	2.7744	.4835
Science	89	2.8843	.5492
Mean	384	2.6936	.4782

PGCE students and undergraduate students studying soft subjects are much more likely to interact and participate in the classroom than those studying hard subjects. Students of hard subjects may be reluctant to question their instructors, but in other aspects of participation, for example, giving presentations, maths and science students were more likely to enjoy taking part than social science students.

Dimension 4: Regulation of Study Strategies

Students of hard subjects relied much more on external regulation than students of soft subjects. They showed a reluctance to look beyond their tutors and lecturers for explanations and information. English and Art students on the other hand, were more likely to take control of their own learning by reading round their subject and discussing lectures with their friends.

Table 4: Mean scores – Regulation of study strategies

PGCE students

Subject	N	Mean	Std Dev
English	88	2.1676	.5453
Art	52	2.2332	.5920
DT	49	2.3367	.5193
Science	94	2.3378	.5372
MFL	36	2.3611	.5854
Maths	49	2.6862	.6541
Mean	483	2.3592	.5890

Undergraduate students

Subject	N	Mean	Std Dev
English	75	2.4417	.5629
Business Studies	75	2.6117	.3405
Art	47	2.6512	.3058
Mathematics	98	2.8362	.5565
Science	89	2.8427	.5197
Mean	384	2.6941	.5096

The Overall Learning Preference Scale

Maths students overall are shown to use a more surface approach, have a more dualist view of knowledge, interact less and are less inclined to self-regulate their studies than any other students whilst English students appear consistently at the opposite end of the scale. Overall the learning preference scores of undergraduates are higher than those of their PGCE counterparts but the difference between the scores is greatest for English students and least for Maths students.

Table 5: The mean score for the whole scale

PGCE students

Subject	N	Mean	SD
English	88	2.3568	.2825
Art	52	2.5481	.3009
MFL	36	2.6040	.3362
Science	94	2.6305	.2883
DT	49	2.7282	.2762
Maths	49	2.8242	.3656
Mean	483	2.6019	.3402

Undergraduate students

Subject	N	Mean	Std Dev
English	75	2.7556	.3608
Business Studies	75	2.8388	.1537
Art	47	2.8528	.1174
Science	89	2.8672	.2869
Maths	98	3.0190	.2607
Mean	384	2.8768	.2755

Generally, students of soft subjects have lower scores than those of hard subjects with Geography and Business studies students in most cases appearing midway between the extremes. Science is usually conceived as a hard subject but in the results presented here it appears that Science students have learning preferences which are more similar to Humanities students that to Maths students.

General and domain-specific learning preferences

As expected the results from the study show that surface learning, external regulation, belief in transferable knowledge and less interaction in the classroom were more common among students in the hard subjects, particularly maths. The results were consistent in both samples of students. Soft subjects attract a greater proportion of female students and the PGCE sample in particular consisted of 68% female students. However when comparisons were made between male and female students across the whole sample, the scores were very similar with the exception of a small difference in the regulation of study score which indicated that females are slightly less likely to be externally regulated. This lack of 'gender' related learning preferences was somewhat of a surprise, and it suggests that whereas learning preferences may well be one significant factor in groups of students choosing their academic career subjects, there are clearly other factors which enter this equation. What it did confirm, however, was that the variations found between subjects were indeed subject related and not a consequence of the differing gender balances between subjects. The consistency of the results across all four dimensions indicates that there is a relationship between them and that a low score on one dimension is likely to be accompanied by a low score on the other dimensions. Clearly these are also directly related to the subject being studied. However, the underlying dimensions, whilst functionally interdependent, are distinct and the intention is not to speculate on cause and effect relationships.

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