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The Relationship Between Learning Styles, Attendance and Academic Performance of Pharmacy Undergraduates

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Abstract

This paper reports a mixed methods study of academic performance of Pharmacy undergraduates in the University of Manchester. The study examines the relationship between learning styles, as defined by Honey and Mumford (1992), with attendance and academic performance at university. It uses data gathered from questionnaires, supplemented by administrative records.

We present evidence that students with a tendency towards the "activist" style of learning have less favourable attendance records than their peers. The study also suggests a relationship between learning style and examination marks. The implications of these relationships with respect to curriculum design and learning support are discussed.

Keywords: *attendance, examination performance, learning styles, Pharmacy students*

Introduction

To qualify as a Pharmacist in Great Britain involves the successful completion of a four-year M. Pharm. degree at an accredited university, followed by a pre-registration year, involving both training and professional practice. The early years of university study involve an intense diet of lectures, together with practical classes and computer-based learning, and are somewhat remote in day-to-day content from the practice of pharmacy. This is, of course, largely necessary in order to complete the study pre-requisite to becoming a Pharmacist. In general, the situation changes steadily through the course, as more clinical content is introduced. The learning styles of pharmacy students are therefore particularly interesting. Do Pharmacy students' learning styles reflect the requirements of the profession, or the requirements of the course?

Objectives

The main objectives of this study were to examine:

- the preferred learning styles of first year Pharmacy and Chemistry students (Chemistry students serve as a control group – see below)
- the relationship between learning styles and academic performance in the first year of a Pharmacy programme
- the relationship between learning styles and course attendance
- the relationship between learning styles and self-declared number of hours of independent study
- the relationship between learning styles and students' favourite aspects of the course.

First year Pharmacy and Chemistry students are the subject of this study. This is in contrast to the more common approach where Pharmacy students are compared with Medical or Nursing students. Pharmacy and Chemistry students were selected because students from these disciplines tend to have similar academic backgrounds; the courses also have similar styles of teaching in the early years. Once in the workplace, however, the day-to-day experience of a Chemist is quite different from that of a Pharmacist with clinical responsibilities.

The Honey and Mumford Learning Styles Questionnaire

The concept of learning styles was introduced some four decades ago. The literature contains many descriptions of learning styles, with multiple meanings and interpretations

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and varying degrees of overlap. For example, Dunn *et al*. (1979) define learning style as the ways that an individual is affected by their environment, emotional and sociological needs and physical characteristics. Sternberg (1997) defines learning style as how people prefer to learn. Honey and Mumford (1992) define the learning style as a description of the attitudes and behaviours which indicate an individual's preferred style of learning. Jarvis and Woodrow (2001) define learning style as approach to learning, interaction preference, belief about knowledge and study strategies. Duff (2004) defines it in terms of individual information processing strategies.

Some studies have referred to learning style as a relatively stable and permanent structure or personality trait. Some have defined it as a process, with general tendencies or abilities to adapt to particular approaches (Duff, 2004). Hartley (1998) defines learning style as automatic, whereas learning strategies are considered optional by Cassidy (2004).

Overall, the studies on learning styles have highlighted the diversity of ways that people learn (Hawk, 2007). However, there are contradictory views on the educational and training relevance of learning styles. A systematic literature review on educational implications of learning styles was conducted by Coffield *et al.* (2004). The study was critical of the use of learning styles in educational settings because of factors such as contradictory evidence, incoherent theories and low levels of validity and reliability. They suggested, however, that learning styles could be used as a tool to encourage self-development.

The conflicts and disagreements in the literature on the learning styles are not always seen as evidence for their irrelevancy to education. For example Rayner (2007) states that the empirical research on learning styles involve testing, re-testing and verification. Conflicts and disagreements are an expected part of this process and are not specific to learning styles (Reyner, 2007).

A wide variety of inventories for evaluating learning styles exists, and each has both advantages and disadvantages (Cassidy, 2004). The learning styles questionnaire (LSQ), first published in 1982 (Honey and Mumford, 1992), was used in the current study to evaluate students' learning styles.

The LSQ is widely applied to educational settings (Duff and Duffy, 2002), and has been used extensively by many learning institutes. The questionnaire has also been tried in different countries (Honey and Mumford, 1992); hence it was judged to be a useful and reliable tool for investigating different ways of learning in a multicultural setting such as a UK-based university. Additionally, the LSQ's items are based on behaviours and are easy to understand (Duff and Duffy, 2002). This is not to say that LSQ is the perfect instrument; it has its critics, and there are concerns with respect to its reliability and validity (Duff and Duffy, 2002). Nevertheless, none of the other inventories addressing learning styles have been consistency validated (Duff, 2004) and LSQ does not appear to have lower status than other tools.

According to Honey and Mumford (1992), people can be divided into four groups based on their learning styles: activists, reflectors, pragmatists, and theorists. Activists tend to act first and consider the consequences afterwards. Reflectors tend to be cautious and tend to adopt a low profile. Theorists adopt logically sound, coherent theories for each observation; they are analytical, and dedicated perfectionists. Pragmatists are keen on trying ideas to see if they work in practice; they like making practical decisions and solving problems.

The learning styles questionnaire measures people's tendencies towards a particular learning style by using 80 statements, 20 for each of the learning styles. Participants respond by putting a tick next to a statement if they agree more than they disagree with the statement. There is no right or wrong answer, but they get one point for each statement ticked. Hence every participant will end up with four scores, one for each style of learning. Scores range from zero (agreed with none of the relevant statements) to twenty (agreed with all of the relevant statements) (Honey and Mumford, 1992). The scores are defined in five bands, ranging from very strong preference to very low preference, for each style of learning.

Methods

Research governance

This project has been approved by the Manchester University Research Ethics Committee and was conducted in accordance with their guidelines and advice. Data were collected, stored and correlated anonymously. The information gathered in the questionnaires was linked to other sources through the use of students' registration numbers. These codes are confidential to selected University staff and the students themselves. Thus, the researcher was unable to identify individuals on the basis of these codes.

Staff involved in the project did not have routine access to the questionnaires, and so could not normally identify the individual students. However, the code could be broken if the researcher had grounds for concern about an individual. It was explained to the students that staff might exceptionally break the code in order to help or advise students about their studies (by means of a cover letter supplied with the questionnaires). This was judged to be necessary to safeguard the well-being of participants who might have benefited from intervention. In practice such intervention was not necessary.

Individual students were informed of their preferred learning styles (activist, pragmatist, theorist or reflector) within a few days of completing the questionnaire, and given examples of potentially useful learning activities for each learning style. Students were also made aware of any learning activities that they might find difficult, so that these could be practised or complemented. The possible effect of raising students' awareness as a result of completing the LSQ was addressed by:

referring them to relevant references for further information, including Honey and Mumford (1986) which includes a section on "How to improve each learning style".

providing them with the contact details of the researcher as another source of information.

Data collected

The learning styles of first year Pharmacy students were correlated with: quantitative data (their first year examination marks, hours of weekly independent study and attendance records) and qualitative data (students' favourite aspect of the course, and work and attendance problems). A control group of first year Chemistry students also completed the learning styles questionnaire.

Records of student attendance at first year classes

The attendance data were collected as units of absence, where each timetabled session missed is marked as one unit of absence for that student. This could refer to anything from one to three hours depending on whether a tutorial, lecture, or practical class was missed. Students with more than 20% absence were identified as having work and attendance problems.

Examination marks

Composite end of year examination marks were obtained from University records.

Honey and Mumford Learning Styles Questionnaire (LSQ)

The LSQ was scheduled during Freshers' Week (the week before the start of formal teaching), in a timetabled session. The results of the test, in the form of a preferred learning style, were given to the students within a few days of completing the test.

ABC questionnaire of students' attitudes, backgrounds and choices

The ABC questionnaire was designed and validated in-house and has been described previously (Sharif *et al*., 2007). It was completed during a timetabled practical class, in the second semester of the first year. In this study, questions about the average weekly hours of independent study and students' favourite aspects of the Pharmacy course were considered.

Results

The learning styles questionnaire (Honey and Mumford, 1992) was completed by 275 first year Pharmacy students (1999-2001 intake, of whom 65% were female), and 127 first year Chemistry students (41% female) over the same period, at the University of Manchester. This corresponds to response rates of 76% for the Pharmacy and 37% for the Chemistry cohorts (percentages of the class list over three years).

In the Chemistry cohort, there were no relationships between examination marks and completing the LSQ. Pharmacy students who did not respond to the LSQ, however, had lower average results in the first year ($t = 4.03$, $p < 0.001$). The average first year examination mark for Pharmacy respondents was 64.3 (standard deviation = 10.1), and for non-respondents 58.2 (standard deviation = 11.0). Hence the study was not immune to response bias and this should be considered when interpreting the findings.

Preferred learning styles for Pharmacy and Chemistry students

There are significant differences between Pharmacy and Chemistry students' scores in each learning style (table I). At entry (during Freshers' Week) Pharmacy students had higher "reflector" scores and lower "activist" scores than Chemistry students.

Learning Style	Means and standard deviations of scores		t values
	Pharmacy students	Chemistry students	
Activist	8.7 (3.7)	10.1 (3.6)	-3.68**
Theorist	11.7 (3.1)	12.0 (2.5)	- 0.97
Reflector	15.1 (3.2)	13.0 (3.2)	6.06**
Pragmatist	10.7 (3.0)	10.9 (2.9)	-0.32

Table I. Means and standard deviations (in brackets) for scores in each learning style, and t values for comparison of these between Pharmacy and Chemistry students. t values identified by ** are significant at the 0.01 level.

The scores of male and female students for each of the learning styles were then compared (table II). Among Pharmacy students, males had significantly higher pragmatist scores than females ($t = 3.23$, $p < 0.01$). This result is in contrast to that in a similar analysis of learning styles, reported by Honey and Mumford (1992), where no significant differences between male and female average scores were found. For the latter analysis Honey and Mumford used a random sample drawn from professionals and junior managers (in commerce or industry).

	Average scores obtained for each style of learning			
	Activist	Reflector	Theorist	Pragmatist
Pharmacy male (n=69)	9.1 (3.6)	15.1 (3.3)	11.8 (3.0)	11.5 (2.8)
Pharmacy female (n=173)	8.4 (3.6)	15.0 (3.1)	11.6 (3.2)	10.3 (3.0)
Chemistry male (n=75)	10.3 (3.6)	12.9 (3.4)	12.1 (2.4)	11.2 (2.9)
Chemistry female (n=52)	9.8 (3.6)	13.4 (3.0)	11.8 (2.7)	10.5 (2.8)

Table II. Means and standard deviations (in brackets) for scores in each learning style for male and female Pharmacy and Chemistry students. "n" refers to the number of students in each category.

Not surprisingly, the results from the ABC questionnaire indicate that practical classes are the single most popular component of the Chemistry undergraduate course (39 of 66 respondents, 59%). Perhaps more surprisingly, about half of Pharmacy students (113 of 220) selected practical sessions as their favourite aspect of the Pharmacy course. The study did not find any evidence for a relationship between preferred learning styles and the reported preferred elements of the course.

The relative popularity of practical sessions as a traditional teaching method does deserve comment. These data pertain to students who graduated in 2002 – 2004, and were collected during their first year, so subsequent changes in students' perceptions of e-learning materials are certainly possible, as a result of major developments in this area. Nevertheless, the data suggest that the traditional diet of lectures and practical classes should not be replaced lightly.

There were weak significant correlations between learning styles and self-declared independent study. The higher the activist score, the lower the time reported as spent on independent studies; whereas high-scoring theorists and reflectors spent more time on private studies. No significant relationship was seen for pragmatist scores (table III).

Scores in each of the learning styles (n=219)	Pearson coefficient
Activist	-0.1*
Reflector	0.2 *
Theorist	0.2**
Pragmatist	0.0

Table III. Pearson coefficient for correlation between scores in each learning style and the average hours reported spent on independent study. ["n" refers to the number of students. Values identified by * and ** are significant at the 0.05 and 0.01 levels, respectively.]

Attendance

A weak significant correlation was observed between units of absence and scores for activist style (table IV).

Scores in each of the learning styles (n=270)	Pearson coefficient
Activist	0.2**
Reflector	- 0.1
Theorist	- 0.1
Pragmatist	0.0

Table IV. Pearson coefficient for correlation between scores in each learning style and units of absence. ["n" refers to the number of students. Values identified by * and ** are significant at the 0.05 and 0.01 levels, respectively.]

There was also a tendency for students receiving work and attendance warnings to have high activist scores ($t = 2.64$, $p < 0.01$), (table V).

	Mean activist score
Had a work and attendance problem	10.7 (3.4) n=17
Did not have a work and attendance problem	8.3 (3.7) n=171

Table V. Means and standard deviations (in brackets) of activist scores for students classified as having work and attendance problems. ["n" refers to the number of students in each category]

Examination marks

There were weak positive correlations between first year examination marks and reflector and theorist scores. A weak negative correlation was also observed between examination marks and activist scores (table VI). No significant relationship was observed between learning styles and the second, third or the fourth year examination marks.

Scores in each of the learning styles (n=256)	Pearson coefficient
Activist	-0.2**
Reflector	0.2**
Theorist	0.1*
Pragmatist	0.0

Table VI. Pearson coefficient for correlation between scores in each learning style and first year examination marks. ["n" refers to the number of students. Values identified by * and ** are significant at the 0.05 and 0.01 levels, respectively.]

Discussion

In designing learning programmes there is often an assumption that learners process and organise information in a uniform way (Sadler-Smith and Smith, 2007). The current study supports the alternative view that students learn in many different ways. Moreover, it has demonstrated links between students' initial learning styles and the subject chosen for study at university. Even though Chemistry and Pharmacy students have similar entrance qualifications, reflectors tend to prefer Pharmacy, activists tend to prefer Chemistry.

Once at University, Pharmacy students with activist preferences have, on average, poorer attendance records, lower times spent in independent study, and poorer first year examination results than their peers. The correlation between learning styles and examination marks disappears in subsequent years of the course. This is more likely to be a product of students' adaptation to different ways of teaching than to changes in the course; although the third and fourth years of the course involve the introduction of many new teaching styles (clinical tutorials, projects, etc), the second year is similar to the first year. If students' learning styles can adapt of their own accord, then speeding up the process of adaptation (acclimatisation) might be helpful. We suggest that students may be empowered if they understand the issues and are made aware of their own learning strengths and weaknesses at an early stage. Further, technology has made available a wide variety of alternative electronic teaching methods. The present study suggests that using these to replace traditional lectures and (especially) practical classes may be unpopular; however using them to supplement the learning experience, particularly of activists may be beneficial.

There are some interesting comparisons between our study and that of Austin (2004). Austin studied the learning styles of practising pharmacists in Canada, using questionnaires based on Kolb's theory of learning styles (Kolb, 1999). Like Honey and Mumford, Kolb identifies four learning styles: accommodator, converger, assimilator and diverger. These map quite closely, but not exactly, to activist, pragmatist, reflector and theorist respectively. Austin reports under-representation of accommodators among practising pharmacists, paralleling our observation that activists are less common among pharmacy students. Although Austin has also probed preferences in teaching methods, it is difficult to compare results, because the range of teaching methods offered to practising pharmacists in Canada for CPD was rather different from that available to students in the UK.

Conclusion

The current study demonstrates significant correlations between student performance and preferred learning styles. The literature suggests that knowledge of learning styles can empower individuals and organizations to select the learning activities that will enhance the effectiveness of learning.

We recommend:

- Empowering students by helping them to become more familiar with their learning tendencies and how to best work with them.
- Catering for differences in students' learning styles by offering a range of learning activities and approaches that appeal to students with different preferred learning styles.

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