Undergraduate nursing students' learning styles: A longitudinal study

Sandra Fleming *, Gabrielle Mckee, Sylvia Huntley-Moore

School of Nursing and Midwifery, Trinity College Dublin, 24 D'Olier Street, Dublin 2, Ireland

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SUMMARY

This paper reports on the main findings of a longitudinal study of the learning styles of one cohort of undergraduate pre-registration nursing students at an Irish university. The Honey and Mumford (2000a) Learning Styles Questionnaire was administered to a sample of students in their first (n = 202) and final year of study (n = 166), the final sample number (58) was based on matched pairs. The most common dominant learning style in first year was the dual learning category (35%) while a large proportion of the students (53%) in their final year had no dominant learning style. The preferred learning style of students in their first (69%) and final (57%) year was reflector. Learning styles were significantly different at the two time points and there was a significant relationship between some learning styles and students' age but not with academic achievement. Total scores of all learning styles showed significant improvements across the two time points of the study. An important implication for nurse education practice is the need for nurse educators to be aware of students' learning styles and in an attempt to maximise students' learning potential, utilise a range of teaching and learning methodologies and assessments that develop all learning styles.

Introduction

It is generally acknowledged that learning styles indicate an individual's preferred way of learning or how the individual acquires information (Felder and Brent, 2005). Learning styles also influence the way in which learners master the goals and objectives of an educational programme (Rassool and Rawaf, 2008). Although reference to learning style appeared in the research literature as far back as the late 1800s it is thought that the term learning style was first used in 1954 by Thelen (Poon Teng Fatt, 2000) and it is only in the last four decades that research has been active in this area (Cassidy, 2004).

Despite the abundance of literature on learning styles and instruments to evaluate learning preference, the concept of learning styles is not universally accepted and controversy abounds about their meaning and even their existence (Felder and Brent, 2005). The interpretation of the literature on learning styles is fraught with difficulties, mainly attributed to the plethora of definitions, models, interpretations and tools available (Coffield et al., 2004a; Desmedt and Valcke, 2004; Price, 2004). As a result of this diversity, the literature is inconclusive as to which learning style model or tool is the most suitable, resulting in difficulty in making informed choices about which one to utilise. A further complication emerges as this vast body of research draws researchers from varied specializations such as psychology, management, education, etc.(Coffield et al., 2004b) and

lack of engagement and discourse between the disciplines results in "fragmentation, with little cumulative knowledge and cooperative research" (Coffield et al., 2004b p1). In addition many small scale studies have been conducted focussing on the application of certain models to small samples of students in specific contexts (Coffield et al., 2004b) and this lack of robust studies has proved problematic in relation to the impact of learning styles on teaching and learning. According to Desmedt and Valcke's (2004) citation analysis of the literature on learning styles, nursing and nurse education research on learning styles has been dominated mainly by investigations using Kolb's Learning Style Inventory (LSI).

Background

The results presented here are part of a larger study conducted in an Irish University to establish the learning profiles of students on entry to and exit from six Schools of the Faculty of Health Sciences (Nursing, Medicine, Dentistry, Physiotherapy, Clinical Speech and Language and Occupational Therapy) by administering the Approaches and Study Skills Inventory for Students (Tait et al., 1997), Learning and Study Strategies Inventory (Weinstein et al., 1987) and the Learning Styles Questionnaire (LSQ) (Honey and Mumford, 2000a).This paper reports on the main findings from the Learning Styles Questionnaire for the nursing student cohort.

Since 2002 pre-registration nurse education in the Republic of Ireland has been offered in universities and institutes of technology as a four year honours bachelors degree programme comprising theoretical and clinical instruction of no less than 4600 hours (An Bord Altranais, 2005). In the School of Nursing where this study was conducted the

* Corresponding author. Tel.: +353 1 8962691; fax: +353 1 8963001.
E-mail addresses: flemins@tcd.ie (S. Fleming), gmckee@tcd.ie (G. Mckee), shuntley@tcd.ie (S. Huntley-Moore).

theoretical component of the programme is taught by academic staff through lectures, tutorials and laboratories. A range of assessments are used to test students' theoretical understanding as they progress through the programme including seen and unseen examinations, individual and group projects, assignments and a research proposal, while in clinical practice students are assessed using a clinical competency assessment tool and the students' individual portfolio of evidence.

In a systematic review of learning styles models Coffield et al. (2004b) identified 71 models of learning styles and classified them into 5 arbitrary groups called 'families' (Fig. 1). Honey and Mumford's LSQ is classified under the flexible stable learning preference family, which acknowledges that while there is some long-term stability in learning style, it is not a fixed trait and it may change slightly from situation to situation. Honey and Mumford's (2000a) Learning Style Questionnaire, 80-item version tool is designed to measure preferences for learning styles. It builds on the earlier work of Kolb and identifies four preferred learning styles; Activist, Reflector, Theorist and Pragmatist. Honey and Mumford (2000a, p6) define learning style as "a description of the attitudes and behaviours that determine our preferred way of learning." This definition of learning style has been used in this study.

The LSQ describes four learning styles within a learning cycle. It can be used to enable the individual to identify how they learn and can help them to become a more effective learner by identifying their learning strengths and the under-utilised and underdeveloped styles which need strengthening. Honey and Mumford (2000a) purport that a prerequisite to becoming an all-round learner, that is an individual with a strong to very strong preference for several learning styles is an awareness of one's preferred learning style. They identify four mutually dependent stages in the cycle of learning: experiencing; reviewing; concluding and planning and acknowledge that an individual may develop a preference for one stage over another. Each of the four stages is identified with a different learning style (Fig. 2). Distortion can occur if one stage is overused to the detriment of the other stages.

Honey and Mumford (2000b) established norms to facilitate interpreting questionnaire results. In addition to these general norms they have developed norms for a number of occupational groups including nurse tutors (n = 144) and student nurses (n = 189). These norms indicate that the pattern of learning is the same for nurse tutors and nursing students. The highest mean score for both groups is Reflector, followed by Pragmatist, Theorist and Activist. Honey and Mumford (2000b, p17) assert that using the specific norms for an occupational group helps in understanding the 'reality' of the group. The preferred learning style is attributed to the highest scoring learning style of a participant. The preferred learning style can be categorised into one of 5 categories: very low, low, moderate, strong, very strong (Honey and Mumford, 2000b). Learning styles can also be defined as dominant/non dominant. The definition of dominant used is this paper is that of Astin et al. (2006), where the dominant learning style is defined as, a learning style score that falls into the strong or very strong category.

Rassool and Rawaf (2007, 2008) provide the most recent research on the use of the LSQ with undergraduate nursing students. Their exploratory study involved 4 cohorts of 2nd year undergraduate mental health branch nursing students (n = 110). By comparing the mean scores against Honey and Mumford's norms for nursing students they found that the majority of students (44%) favoured Reflector as their dominant learning style. This finding is congruent with Cavanagh et al., 1994 and Astin et al., 2006 studies. The second most favoured dominant learning style in the Rassool and Rawaf (2008) study was Activist (16%). This finding is incongruent with Cavanagh et al. (1994), where the Activist was the least favoured style. Cavanagh et al.'s (1994) finding is in keeping with Astin et al. (2006) and the norm patterns for student nurses identified by Honey and Mumford (2000b). Both Rassool and Rawaf (2008) and Dux (1989) identified the Pragmatist as the least preferred learning style. The 'dual' learning style category emerged as an additional learning style category, and the second largest learning style group in the distribution of learning style preferences within Rassool and Rawaf's (2008) study. They attribute the dual learning style to students whose scores were classified in the strong or very strong preference in two categories. Of the 30% of students who had dual learning styles, 48% were classified as Reflector–Theorists and 18% as Theorist-Pragmatists.

The majority of studies identify Reflector as the most frequently preferred learning style and Activist as the least frequently preferred style of nurses. This finding is in keeping with the nursing norms identified by Honey and Mumford (2000b), and tells us that nurses like to think about things in detail, observe and evaluate from a range of perspectives before taking action, they appreciate the opportunity to repeat a learning experience and are more likely to benefit from situations that are introduced at a slower pace and that enable them to observe before participation.

Nursing is a profession where knowledge and practice do not remain static but are ever changing. It can be argued that nurse education should enable students to become effective lifelong learners equipped with the learning skills required for their profession. This can be achieved in different ways; by nurse educators knowing their students' learning style preferences (Lohri-Posey, 2003), and applying this knowledge in the selection and utilisation of teaching, learning and assessment strategies, or by nurse educators exposing students to a range of teaching, learning and assessment opportunities (Colucciello, 1999) to enable them to develop beyond their learning style comfort zone and become more flexible in their learning range.

Methodology

Aim

This study is a non experimental within subject longitudinal design. The primary aim of the study was to examine changes in students' learning styles over time from a preference and dominance point of view. In addition the study aimed to ascertain if there was a

Learning styles and preferences are largely **constitutionally based** including the four modalities: VARK e.g. Dunn and Dunn	Learning styles reflect deep-seated features of the **cognitive structure** including 'patterns of ability.' e.g. Riding	Learning styles are one component of a relatively **stable personality type** e.g. Myers-Briggs	Learning styles are **flexibly stable learning preferences** e.g. Honey and Mumford	Move on from learning styles to **learning approaches, strategies, orientations and conceptions of learning** e.g. Entwistle.

Fig. 1. Family of learning styles (taken from Coffield et al., 2004b, p9).

Cycle of Learning	Learning Style	Characteristics of Learning Style
Stage 1. Experiencing	Activists	Primarily concerned with the here and now, they are enthusiastic and like to experience by taking direct action and participation. Students with this preferred learning style will be more likely to benefit from hands on experience.
Stage 2. Reviewing	Reflectors	Like to think about things in detail, observe and evaluate from a range of perspectives before taking action, they appreciate the opportunity to repeat a learning experience. Students with this preferred learning style will be more likely to benefit from situations that are introduced at a slower pace and that enable them to observe before participation.
Stage 3. Concluding	Theorists	Like to see how things fit into the bigger picture, they adopt a logical, systematic and analytical approach to problem solving and are likely to benefit from learning situations whereby the connections and relationships between the various learning opportunities is apparent or clearly established.
Stage 4. Planning	Pragmatists	Like to see how things work and can be applied to practice. They like to experiment and see the relevance of their work and adopt a practical problem solving approach to situations. Students with this referred learning style will be more likely to benefit from situations whereby they can see the practical advantage of their learning.

Fig. 2. The Links between the Stages in the Cycle of Learning and Learning Styles (Adapted from Honey and Mumford, 2000a,b).

relationship between students' learning styles on entry to and exit from a four year Bachelor of Science (Nursing) Programme and their age or academic achievement.

Sample

The questionnaire was administered to a convenience sample of students. In the first year of the study the population available was 202, due to absences from class on that day and the voluntary nature of the questionnaire the response rate was 68%. In their final year the sample population was 166 and the response rate was 83%. Responses were excluded from analysis if the questionnaire was incomplete or students did not complete the questionnaire at both stages of the study, the sample number available for analysis was 58 (42%) based on matched pairs. Age was categorised into mature/non mature status. The criteria used for this categorisation was based on the University and Irish Nursing Board definitions of a mature student, older than 23 years of age on application to programme.

Data collection

Collection of student data took place at two time points, within the classroom in the first term of the academic year for first year students and in the same setting in the last term of the final year of their programme. A member of the research team outlined the details of the project to the entire nursing student class. The delivery of the questionnaires and their completion took on average 30 minutes. Students returned the questionnaires, both complete and incomplete, to the member of the research team before leaving the classroom. Completion and return of the questionnaires was taken as consent to participate in the study.

The LSQ results were posted to each student so that they were aware of their learning style profile. Students' completed questionnaire in year one was used as the baseline for their questionnaire in their final year. Students' assessment results were sourced from the School database. In first year the students completed six assessments in total. These included three written examinations, including seen and unseen written examinations, two group assessments, and a written assignment. In the final year there were three assessments; a research proposal, a written examination and a reflective practice assignment. All the assessments in the first and final year were used in the analysis. Ethical approval for this study was sought and granted by the School and Faculty Ethics Committees.

Questionnaire

Honey and Mumford's (2000a) 80-item questionnaire and scoring methodology were used to assess learning styles.

Analysis

All questionnaire responses were analysed using version 14 of the SPSS statistical package. Descriptive statistics were derived to show preferred learning styles. Paired sample T-tests were used to examine changes in student learning styles from the first to final year. The level of significance was set at $p = 0.05$. Spearman's rho was used to see if there was a relationship between the students' learning styles in the first and the final year of the degree programme and students' academic achievement or age. As there was 4 comparisons in the age analysis the level of significance was adjusted using Bonferroni adjustment to $p = 0.015$. There were 20 comparisons for the assessments and learning style score analysis and the level of significance after Bonferroni adjustments was set at $p = 0.0025$.

Results

Student demographics

The sample was made up of 97% females and 3% males. In first year, the minimum age was 17 years, the maximum age was 49, with a mean age of 20.85 ± 6.01 years. 79% of first year students were under 23 years of age and 21% were over 23 years of age.

Preferred learning style

The preferred learning style score in the first (69%) and final (57%) year was Reflector. This was followed by Activist in first year and Pragmatist in the final year (Fig. 3).

Changes in individual learning style scores from first to final year

T-tests were used in the first instance to analyse changes within a student learning style score from first to final year (Table 1). There was a significant difference in the Reflector ($p = 0.0001$) and Theorist ($p = 0.009$) scores between the two stages. When the scores for all learning styles were totalled there was a significant increase in students' learning style scores from first to final year ($p = 0.0001$), indicating an overall improvement in learning style scores as a whole.

Dominant styles

The distributions of the dominant learning styles are depicted in Fig. 4. The most common dominant learning style in the first year was in the dual learning category (35%) while in the final year the majority of the cohort had no dominant learning style preference (53%). The second most common dominant learning style in the first year was Reflector (24%) and was Activist (22%) in the final year. The most common dual learning style was Activist/Reflector, in both first and final year, 17% and 10% respectively, while Activist/Theorist was next in the final year—3%, and Reflector/Theorist was next in the first year—3%. An additional 'other' category emerged and was attributed to students whose scores were classified in the strong or very strong preference in three or more categories, this accounted for 9% of first year and 5% of final year students.

Examination results

There was a significant correlation between the students' first year Pragmatist score ($p = 0.001$), and their assignment (Table 2). A higher Pragmatist score was associated with higher assignment results. There was no significant correlation between any of the learning styles and any of the other five assessments in the first year and the three assignment results in the final year.

Age

There was a significant correlation between students' age and Activist score in the final year ($p = 0.006$), (Table 3) the older student was associated with higher Activist scores.
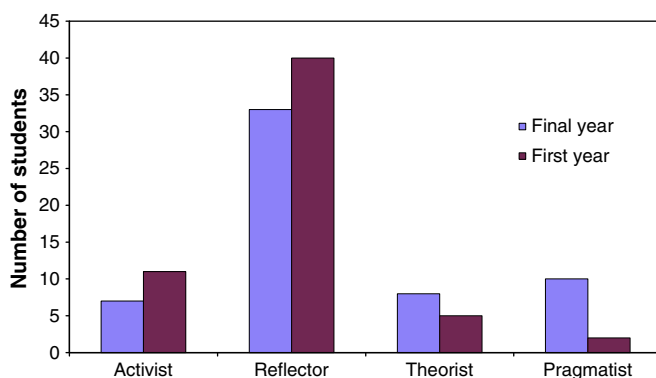
Table 1
T-test results of learning styles in first and final year of the programme n = 58.

	First year mean ± Sdev	Final year mean ± Sdev	t value	Level of significance (2 tailed)
Activist	10.40 ± 3.54	10.19 ± 2.66	− 0.314	0.754
Reflector	14.02 ± 3.04	12.07 ± 2.64	4.540	0.0001*
Theorist	11.00 ± 2.62	9.98 ± 2.36	2.689	0.009*
Pragmatist	11.05 ± 3.05	10.19 ± 2.47	2.405	0.019
Total LSQ scores	35.22 ± 5.99	46.47 ± 47	− 14.191	0.0001*

* Significant at p > 0.05 level.

Discussion

The preferred learning style of the cohort at first and final year was Reflector. This concurs with the findings of a number of previous studies (Hodges 1988; Cavanagh et al., 1994; Astin et al.,2006; Rassool and Rawaf 2007, 2008). First year students' second preference was Activist which concurs with Hodges (1988), using the LSI, however, Cavanagh et al. (1994) and Astin et al. (2006) found Activist to be the least favoured learning style. The preferred learning style of the cohort changed from the first year to the final year. In the first year the profile is consistent with the norms for nursing students and nurse tutors identified by Honey and Mumford (2000b) while in the final year the profile is similar to that identified by Rassool and Rawaf (2007, 2008) for the second year undergraduate students. In the absence of similar longitudinal studies to make comparisons with, it is difficult to ascertain whether this change is reflective of the development of the student as they progress through the programme or influenced by the educational environment and programme delivery or the impact of learning in the practice placement. On a cautionary note Honey and Mumford (2000b) recognise that identifying a learner as having a strong preference for a style does not indicate that they actually use the style to full effect.

This study found that 21% of students at first year and 53% of the cohort at final year had no dominant learning style. While this finding is consistent with Dux (1989) it differs from Rassool and Rawaf's (2008) findings whereby 79% of nursing students had a dominant learning style. This study also identified that 35% of the students at first year and 21% of the cohort at final year had dual or multiple learning styles. This is congruent with Rassool and Rawaf's (2008) identification of dual learning styles in a large percentage of students and Ramprogus (1988) and Dux' (1989) recognition that a large proportion of students were all rounders. A student with a dual or no dominant learning style may be more receptive to a programme that provides a variety of teaching and learning experiences over the student who has a very strong preference for a particular style. Both Dux (1989) and Ramprogus (1988) suggest that students may
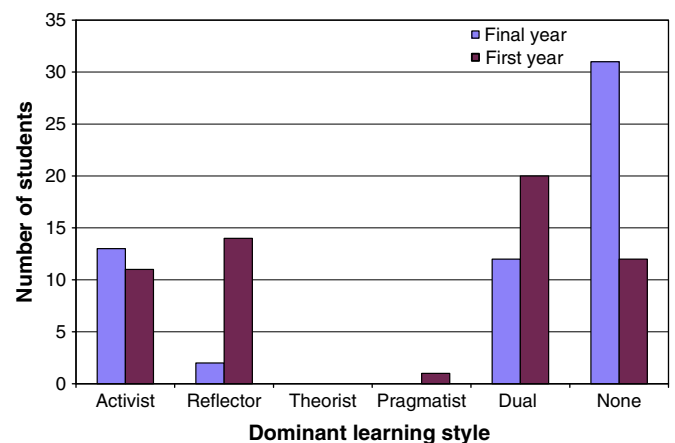

Fig. 3. Distribution of preferred learning styles of first and final year student nurses.

Fig. 4. Distribution of Dominant learning styles in first and final year student nurses.

Table 2
Spearman's rho correlation coefficients between learning styles and results in first and final year assessments.

	First year		Final year	
	P value	Level of significance	P value	Level of significance
Activist	−0.066	0.625	0.017	0.899
Reflector	0.011	0.932	0.139	0.299
Theorist	0.300	0.022	−0.222	0.094
Pragmatist	0.409	0.001[*]	0.196	0.141

[*] Significant at p>0.0025 level.

commence their education as all rounders which again concurs with the findings of this study. Being an all rounder, having strong and very strong preferences in several styles (Honey and Mumford, 2000a) signifies "greater 'learning' flexibility" (Astin et al., (2006:481). Indeed the ability to utilise several learning styles is advocated as it enables individuals to become effective, flexible, resourceful all round learners and professionals who can benefit from a wide range of learning opportunities utilising whatever combination of learning styles the learning situation requires (Kolb, 1984; Dux, 1989; Rakoczy and Money, 1995; Linares, 1999; Honey and Mumford, 2000a; Felder and Brent, 2005). This has implications for curriculum development. An important challenge for nurse educators is to acknowledge the diversity of learning styles among students and develop curricula that support a balanced teaching approach that promotes flexibility in the acquisition and application of knowledge. Exposing students to a range of learning style experiences enhances their learning and assists them in becoming effective learners who can adapt to their multifaceted working and learning environment (Dux, 1989; Rakoczy and Money, 1995; Colucciello, 1999; Meehan-Andrews, 2009).

While acknowledging that the LSQ is not a psychometric instrument (Honey and Mumford, 2000a; Coffield et al., 2004a), many studies assert that learning style is a weak predictor of academic performance (Linares, 1999; Duff and Duffy, 2002; Coffield et al., 2004a; Rassool and Rawaf, 2008). We found that a high Pragmatist score in year one correlated with high assignment results. However this was the only significant result out of 20 comparisons between the different learning styles and the various assessments and this study indicates learning styles are not a good predictor of academic performance.

In relation to the students' age and learning style this study identified that older students had better Activist scores in their final year. This indicates students who benefit from situations whereby they see the practical relevance of their learning and benefit from hands on experience. How reflective this is of the attributes that the mature student brings to the programme or the practical orientation of the nursing programme is not known.

Our findings support Honey and Mumford's (2000a) assertion that learning style is not a fixed trait. Most students' individual learning style changed over the two time points with the greatest improvement occurring in the Activist learning style (Fig. 5). Students also showed significant changes in individual learning style scores between the two time points in the Reflector and Theorist scores

Table 3
Spearman's rho correlation coefficients between students age and learning styles in first and final year.

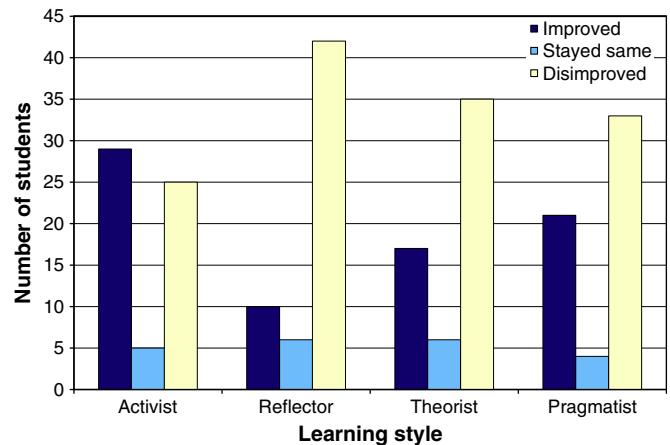|	First year		Final year	
	P value	Level of significance	P value	Level of significance
Activist	0.023	0.088	0.397	0.006[*]
Reflector	−0.315	0.033	0.284	0.056
Theorist	0.252	0.092	0.053	0.727
Pragmatist	0.318	0.031	0.192	0.202

[*] Significant at p>0.015 level.

Fig. 5. Changes in individual learning style scores from First to Final year.

and a significant increase in the total scores across all learning styles. This was in contrast to Rakoczy and Money's (1995) longitudinal study of diploma nursing students, who using the LSI, found no significant differences between students on any of the LSI scales across the study timeline. Studies suggest many possible contributing factors to changes in learning style scores and development: the use of a variety of learning styles according to the subject being studied, (Sutcliffe, 1993) the course design, the assessment strategy utilised (Rassool and Rawaf, 2008), and the influences of socialisation and education during one's nursing career (Ramprogus, 1988) as well as possibly the developmental growth process (Kolb, 1984). Further research is required to determine the influence of these factors and also how reflective our findings are of the learning experiences of students prior to entry to the programme.

Limitations

The study was carried out in one university and the number of matched responses was small. Completing more than one question-naire at the one time may have impacted on the number of questionnaires that were fully completed. Interpretation of and comparison to other studies are made difficult by limited research data available using the LSQ with BSc undergraduate nursing students, different types and versions of learning style tools being utilised, differences in approaches to data analysis and differences in student cohorts e.g. students in Higher Education and non-Higher Education settings.

Conclusion

The preferred learning style of nursing students in this study both in their first and final year was Reflector. Learning styles means were significantly different at the two time points and there was a significant relationship between some learning styles and students' age but not overall with academic achievement. Overall students tended to be all rounders rather than having one dominant learning style and all round scores showed significant improvements across the two time points of the study. Perhaps the most important challenge for nurse education is to identify how we can enable students to use learning styles to their full effect and to create a balanced teaching approach that caters for the learning styles of all students but also seeks to stretch students beyond their learning style comfort zones in order to help them to maximise their learning potential during their undergraduate education and in their continuing professional development.

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