Role of Gender and Linguistic Background on Students' Learning Styles in an Inter-Professional Science Unit

Hemant Mehta, Abdur Rouf

(School of Arts and Sciences, Australian Catholic University, Australia)

Abstract: Inter-professional education is the current trend in health related degree programs. This study aimed to determine the role of gender and linguistic background on students' learning styles in a science unit. Human Biology 1 is the inter-professional unit taken by Nursing, Physiotherapy and Exercise Science students at the Australian Catholic University. Students were invited to participate in a survey, which consisted of questions requesting demographic information and their learning preference(s) based on the "VARK" sensory modalities: visual, aural, reading-writing, and kinesthetic; an English Language Acculturation scale was also used. Analysis of responses indicated an overall student preference for multiple learning styles: 47% of females and 42% of males stated that they were quad-modal learners, with approximately a quarter of either gender preferring uni-modal learning style. Of the 26% of students being uni-modal learners, 25 were from ESB and 35 from NESB; and, of the 45% being quad-modal learners, 50 were from ESB and 54 from NESB. This study provides evidence that students had similar learning preferences in the science unit, irrespective of gender or linguistic background, and that more students can be reached through multi-modal instruction in an inter-professional science unit.

Key words: learning styles, learning science, inter-professional education

1. Introduction

Traditionally, most training and education in health care has been delivered using the learning objectives of a particular profession or occupation. This segregated approach is not appropriate in today's health care system where complexity, technology and specialization are the norm (Easton et al., 2009; Proudfoot et al., 2007). Building a health workforce that is more adaptable and more able to work effectively in teams and across discipline and sector boundaries is a critical element in many health reforms currently being initiated by governments around the world, including Australia. One way to meet the current challenges and develop a health system that is effective and sustainable is by the establishment of a health workforce that has well developed professional and inter-professional capabilities, a workforce that learns together and works together (L-TIPP, 2009). Inter-professional education (IPE) is a process whereby students of various professional groups learn with, from and about each other to improve collaboration and the quality of patient care (UOQ, 2012; CAIPE, 2002). Inter-professional education (IPE) provides the opportunity for health care professionals to learn about the roles of

Hemant Mehta, BSc Hons, MPhil, MES, Ph.D., Lecturer in Medical Science, School of Arts and Sciences, Australian Catholic University; research areas: medical science education. E-mail: Hemant.Mehta@acu.edu.au.

Abdur Rouf, MBBS, MPhil Path, MCPS CliPath, GradCert HE, Lecturer in Medical Science, School of Arts and Sciences, Australian Catholic University; research areas: medical science education. E-mail: Abdur.Rouf@acu.edu.au.

their colleagues within the team (Henderson & Alexander, 2011). Through IPE, health professionals can acquire knowledge, skills and professional attitudes germane to quality health care that are not readily achieved in any other way (Horsburgh et al., 2001). Health care workers who are educated and trained to work together can reduce risks to patients, themselves and their colleagues (Easton et al., 2009).

Well-designed inter-professional learning sessions involving medical and pharmacy students has the potential to improve collaboration between these professions (Hattingh et al., 2010), and increase students' awareness and ability to work as members of the health professional team (Westberg et al., 2006). Teaching in a tertiary learning environment where a diverse body of students learns together can be challenging for instructors to meet the educational needs of all the students (James et al., 2011; Lujan & DiCarlo, 2006). Students in an inter-professional cohort may have a variety of learning preferences and styles. There are numerous learning style models that focus on aspects such as personality characteristics, information processing style, or instructional preferences (Ramirez, 2011; Mansouri et al., 2006; Tanner & Allen, 2004; Fleming, 1987). Although each model may have limitations, knowledge of students' learning preferences can help academics to develop effective curricular approaches.

A commonly used model categorizes learning preferences that are based on the sensory modality by which one prefers to take in new information: visual (V), auditory (A), reading-writing (R), and kinesthetic (K). The VARK instrument was developed by Neil Fleming (1987). Science coursework, regardless of the pedagogical style of the instructor, is generally rich in the amount of information being presented. First-year medical students prefer multiple learning styles (Lujan & DiCarlo, 2006). Approximately 64% of the medical students in Michigan and Turkey had multi-modal learning preferences (Baykan & Naçar, 2007; Lujan & DiCarlo, 2006) compared to 56% of dental students (Murphy et al., 2004). Nursing and midwifery students usually adopt multiple learning styles in their study of science units, including visual, aural, read-write and kinesthetic (VARK) learning styles (James et al., 1011). Medical students' learning approaches are not affected by non-English-speaking background (Wilson et al., 2011). However, James et al. (2011) found that students from non-English speaking backgrounds had a significantly higher preference for read-write and kinesthetic styles than for visual and aural (James et al., 2011).

There are very few comparative studies of students' learning styles in science-based courses such as exercise science, physiotherapy and other health sciences. With internationalization of tertiary education, students' literacy in English language is an important consideration for learning and teaching. Furthermore, it has been reported that a majority of male undergraduate physiology students preferred multi-modal instruction (specifically the VARK modes) whereas a majority of female students preferred single-mode instruction with a preference towards kinaesthetic style (Wehrwein et al., 2007). Human Biology 1 is an inter-professional unit currently taught to a large cohort of Nursing, Physiotherapy and Exercise Science students at the Australian Catholic University. The aims of the present study were to determine if undergraduate students enrolled in the first-year inter-professional unit were predominantly quad-modal learners, and to investigate the role of gender and linguistic background on students' learning styles.

2. Methodology

A predominantly quantitative approach was taken in this horizontal study. Permission was sought in advance from science lecturers for distribution of questionnaire survey (see Appendix 1) at the end of a lecture time in Week 3 of Semester 2. An information letter was distributed together with the questionnaire to all prospective

participants, that is, all BExSc, BN, and BPhysio students. Students were assured of the voluntary, confidential, and anonymous nature of the study. Parity was ensured by giving all the students the opportunity to participate in the study, and all students were treated with respect; non-participating students were not disadvantaged in any way. Privacy was assured by placing a closed post-box for submission of survey response near the exit door of lecture theatre. The survey was analyzed by descriptive statistics using the software, SPSS Statistics 19. The Australian Catholic University Human Research Ethics Committee (approval: N2011 42) approved this study.

3. Results

A total of 231 students returned completed questionnaire. This included 160 BN students (138 females; 22 males), 52 BExSc students (35 females; 17 males), and 19 BPhysio students (13 females; 6 males). The demographic information of the survey participants is presented in Table 1.

Table 1   Demographic Data of Participants Enrolled in Inter-Professional Science Unit

	% (n)
Gender	
Females	**80.5** (186)
Males	**19.5** (45)
Age (years)	
<20	**33.8** (78)
20 – 30	**49.8** (115)
>30	**16.5** (38)
Country of birth	
Australia	**41.6** (96)
Other	**58.4** (135)
Linguistic background	
ESB	**48.9** (113)
NESB	**51.1** (117)
First language	
English	**44.6** (103)
Other	**55.4** (128)
Nationality	
Australia	**60.2** (139)
Other	**39.8** (92)

ESB = English speaking background; NESB = Non-English speaking background

Table 2 shows data relating to students' preferred learning modality.

Table 2   Students' Preferred Learning Modality

Learning style	**%** (n)
Uni-modal	**26.3** (60)
Di-modal	**18.0** (41)
Tri-modal	**9.6** (22)
Quad-modal	**46.1** (105)

Figure 1 shows the popularity of the four learning styles based on the tally of the scores for V, A, R and K learning modes. The visual style was the most preferred, followed by read-write, kinesthetic, and then aural.
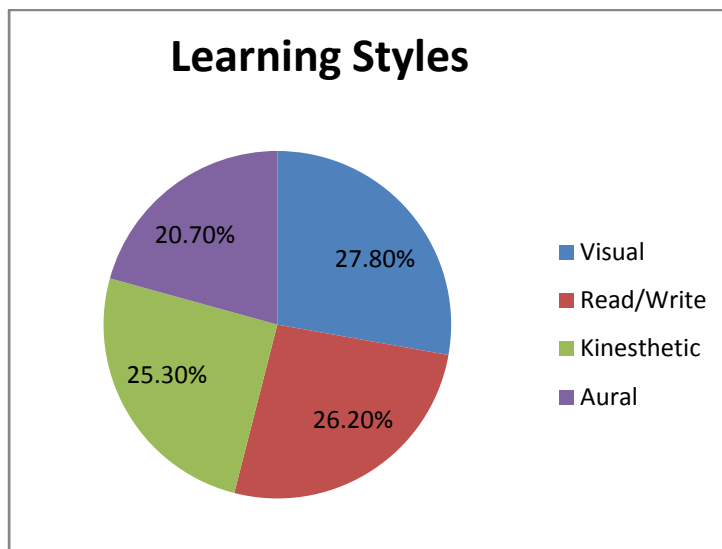
Figure 1   Popularity of The Four Main Learning Styles

The student responses were assessed for gender difference in learning style preference. Of the 183 female students, a majority of students preferred multiple learning styles: 47.0% stated that they were quad-modal learners, 8.8% tri-modal, and 19.1% di-modal. Only 25.1% had indicated that they preferred uni-modal learning (19 students preferred R, 17 V, 9 K, and 1 A). Similarly, male students also predominantly preferred multiple learning styles. Of the 45 male respondents, 42.2% stated that they were quad-modal learners, 13.3% tri-modal, 15.6% di-modal, and 28.9% uni-modal (8V, 2R, 2K, and 1 A).

In an undergraduate program where approximately half the students speak a language other than English as the main language, the proportion of students favoring learning by the aural mode was less than those who prefer visual, read-write and kinesthetic styles. 26.0% of students (60 out of 231, which include 25 ESB and 35 NESB) stated that they were uni-modal learners, whereas 74.0% (79 ESB; 92 NESB) preferred two or more learning styles. 45.0% of students (104 out of 231, which include 50 ESB and 54 NESB) stated that they were quad-modal learners.

4. Discussion

In this study, it was found that both genders enrolled in science-based inter-professional unit predominantly preferred quad-modal (VARK) instruction. This is in contrast to the findings reported in an earlier study of undergraduate physiology students (Wehrwein et al., 2007), in which a majority of female students preferred a single-mode instruction. Our study supports the contention that students prefer multi-modal instruction in science-based courses. The findings of this study support those of other studies on medical students (Baykan & Naçar, 2007; Lujan & DiCarlo, 2006), dental students (Murphy et al., 2004), nursing and midwifery students (James et al., 2011) predominantly preferring multi-modal learning styles. As Tanner and Allen (2004) point out, it is essential that an instructor's teaching style in science courses provide access for students with different learning styles; more students can be kept interested in science by adopting a teaching style that derives from multiple pedagogical approaches rather than a singular approach.

It was expected that fluency in English language may be an important factor in students' preference of learning modality. This study found that both, ESB and NESB students almost equally preferred multi-modal

learning in the science-based unit. Hence, this study provides evidence that students' learning approaches in an inter-professional, science-based unit are not dependent on linguistic background (ESB or NESB). This is consistent with a previous study on medical students (Wilson et al., 2011), which found that medical students' learning approaches were not affected by non-English-speaking background.

The aural mode of instruction has less of an appeal compared to visual, read-write and kinaesthetic modes. As complex scientific and technical terminology is covered in tertiary health courses, such words are usually more meaningful after they have been read, written, and heard several times, compared to having to rely on what was heard casually. The use of graphs, diagrams, and animations are often useful visual aids to learning complex scientific phenomena.

Learning approaches are an inherent part of the makeup of each student in a cohort (Newble & Clarke, 1986), like personality traits that integrate with the educational program. However, research has proven that the learner's prior knowledge exerts the most influence on learning (Clark & Mayer, 2003), and that learning styles reflect the nature of the educational program (Norman, 2009). In a science-based inter-professional learning environment it is crucial, more than ever before, that multi-modal instruction is used for reaching a large cohort of learners with diverse learning preferences and styles.

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Appendix 1: Questionnaire Survey

Role of Gender and Linguistic Background on Students' Learning Styles in an Inter-Professional Science Unit

Gender: [ ] male   [ ] Female

Age: [ ] < 20 years   [ ] 20-30 years   [ ] > 30 years

Country of Birth: _____

Linguistic background: [ ] English speaking   [ ] Non English speaking

First language learnt: _____

Course enrolled: [ ] BExSc   [ ] BN   [ ] BPhysio

I am an: [ ] Australian student   [ ] International student

Which of the following learning style/s do you prefer in your study of science unit?

(Indicate as many that apply. You may use numbers 1, 2, etc. to indicate order of preference):

    [ ] Aural *(i.e. using the sense of hearing)*

    [ ] Visual *(i.e. using the sense of seeing)*

    [ ] Kinaesthetic *(i.e. using practical/laboratory activities)*

    [ ] Read/Write *(i.e learning through both, reading and writing)*

Have you experienced any difficulty in learning science? [ ] No   [ ] Yes

If Yes, please explain:

_____
_____
_____

Which strategies have you found effective for learning science?

_____
_____

Any additional comments?

_____
_____

Please continue over the page →

English Language Acculturation Scale (ELAS)

<u>Instructions</u>: *Please indicate how descriptive each statement is of you by circling the number corresponding to your response.*

		Only non-English language(s)	More non-English than English	Both non-English and English equally	More English than non-English	Only English
1	In general, what language(s) do you speak?	1	2	3	4	5
2	In general, what language(s) do you read?	1	2	3	4	5
3	What language(s) do you usually speak at home?	1	2	3	4	5
4	In which language(s) do you usually think?	1	2	3	4	5
5	What language(s) do you usually speak with your friends?	1	2	3	4	5

Reference:
Salamonson, Y., Everett, B., Koch, J., Andrew, S., & Davidson, P. M. (2008). English-language acculturation predicts academic performance in nursing students who speak English as a second language. *Research in Nursing & Health, 31*(1), 86-94.