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Attitude to the subject of chemistry in undergraduate nursing students at Fiji National University and Federation University, Australia

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Summary Attitude to the subject of chemistry was quantified in first-year undergraduate nursing students, at two geographically distinct universities. A purpose-designed diagnostic instrument (ASCI) was given to students at Federation University, Australia ($n=114$), and at Fiji National University, Fiji ($n=160$). Affective and cognitive sub-scales within ASCI showed reasonable internal consistency. Cronbach's α for the cognitive sub-scale was 0.786 and 0.630, and 0.787 and 0.788 for affective sub-scale for the Federation University and Fiji National University students, respectively. Mean (SD) score for the cognitive sub-scale was 10.5 (5.6) and 15.2 (4.1) for students at Federation University and Fiji National University, respectively ($P<0.001$, t -test). Mean (SD) score for the affective sub-scale was 13.1 (5.1) and 20.7 (4.3) for students at Federation University and Fiji National University, respectively ($P<0.001$, t -test). An exploratory factor analysis ($n=274$) confirmed a two-factor solution consistent with affective and cognitive sub-scales, each with good internal consistency. Quantifying attitude to chemistry in undergraduate nursing students using ASCI may have utility in assessing the impact of novel teaching strategies used in the education of nursing students in areas of bioscience and chemistry. However, geographically distinct populations of undergraduate nurses may show very different attitudes to chemistry.

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Introduction

Nurses require an understanding of human physiology, much of which requires some understanding of chemistry. However, some aspects of bioscience, particularly chemistry, are perceived as difficult by many student nurses (Scalise, Claesgens, Wilson, & Stacy, 2006). Entry into undergraduate nursing programmes is often by non-traditional pathways (Birks, Al-Motlaq, & Mills, 2010), and although the pre-university entry study of chemistry has been shown to be a strong indicator of success in an undergraduate nursing programme (Carpio, O'Mara, & Hezekiah, 1996; Feldt & Donohue, 1989), it is not compulsory for all nursing degrees. An understanding of chemistry by those enrolled may vary considerably however, as newly qualified nurses continue to develop and expand their roles, a commensurate increase in their need to understand the principles of chemistry may underpin many future practices.

The concept of an attitude towards the subject of chemistry is somewhat nebulous (Osborne, Simon, & Collins, 2003). Attitude can be considered as a tendency to respond to a certain stimulus (in this instance, chemistry), where the response has cognitive, affective, and behavioural elements. Rosenberg and Hovland (1960) suggested a clear distinction between cognitive, affective, and behavioural responses associated with a particular attitude, and that attitude may be quantified within this tripartite structure. However, this view of attitude requires responses which are consistent (Fazio & Williams, 1986) and a single instrument may be inadequate for quantifying such a multi-dimensional phenomenon. In contrast, others have proposed that attitude could be viewed as a two component construct comprised with only cognitive and an affective components (Bagozzi & Burnkrant, 1979). Somewhat simplistically, attitude can be summarised as being positive or negative, however, attitude also has characteristics such as importance, certainty, and accessibility (Visser, Bizer, & Krosnick, 2006). Therefore, an instrument to quantify attitude to the study of chemistry may potentially have factors within it which align to a more complex structure.

In order to quantify the influence of teaching on attitude, appropriate and valid instruments which measure attitude are required. The Chemistry Expectations Survey (CHEMX; Grove & Bretz, 2007), Chemistry Attitudes and Experiences Questionnaire (CAEQ; Coll, Dalgety, & Salter, 2002), and the Colorado Learning Attitudes about Science Survey (CLASS; Barbera, Adams, Wieman, & Perkins, 2008; Heredia & Lewis, 2012) are validated tools that have been used to quantify attitude to chemistry in undergraduate students. Also, the Attitudes to the Study of Chemistry Inventory (ASCI; Bauer, 2008; Xu & Lewis, 2011), and its more recent shortened version ASCIv2 (Xu, Southam, & Lewis, 2012) may also be suitable tools to quantify attitudes to chemistry in undergraduate students. As curricula continually evolve to satisfy the demands of the workplace, appropriate assessment tools which measure both achievement and attitude may become increasingly important. Therefore, our aim was to apply a questionnaire to quantify attitude to the subject of chemistry (ASCI), in two cohorts of undergraduate nursing students. These two cohorts are geographically distinct, and

differ in their pre-requisite university entry requirements for chemistry.

Methods

Ethics committee approval was obtained from both institutions before data collection. The Attitudes towards the Subject of Chemistry Inventory (ASCI; Bauer, 2008) was given to first year undergraduate nursing students at two universities. The ASCI is a twenty item semantic differential where each item is quantified with a seven point Likert scale (see Fig. 1). ASCI was originally validated in the US with undergraduates majoring in chemistry (Bauer, 2008), and subsequently, a shorter version of the original 20 item questionnaire was developed by Xu and Lewis (2011), also in chemistry undergraduates. This shortened version (ASCIv2) has been used in Australia (Xu et al., 2012) and the US (Brandriet, Xu, Bretz, & Lewis, 2011), and contains eight items in two subscales, 'intellectual accessibility' – congruent with the cognitive component of attitude, and 'emotional satisfaction' – congruent with the affective component of attitude.

Participants

ASCI was completed by 114 first year students enrolled in the Bachelor of Nursing programme at Federation University – a regionally focussed dual-sector education provider in the state of Victoria, Australia. At Federation University, students were undertaking a 13-week first year university course in introductory human anatomy and physiology, with a weekly 3h lecture and a weekly 1h tutorial. Within this course, a number of topics with 'chemistry content' were introduced, examples of which are: electrolyte and acid-base balance, nutrition and metabolism, and endocrinology. ASCI was distributed to students in a tutorial class setting (maximum number in each tutorial was 25 students), during a normal teaching period.

ASCI was completed by 160 first year students enrolled in the Bachelor of Nursing programme at Fiji National University – a regionally focussed education provider in the South Pacific. The School of Nursing at Fiji National University is one of the oldest nursing education institutions in the South Pacific Region and has been in existence since 1893. As part of the Fiji National University College of Medicine, Nursing and Health Sciences, the school offers both introductory and advanced nursing programmes in Fiji and throughout the region. The cohort surveyed were 1st year, 1st semester students, and the questionnaires were distributed and completed during a lecture period.

Data analysis

Scale reversal was carried out on ASCI items 1, 3, 6, 7, 9, 11, 12, 14, 15, and 18, thus allowing all 'negative' terms to be chosen with 1 as the response, and all 'positive' terms to be chosen with a 7 response. Therefore, the maximum total score was 140 which represented a maximum 'positive attitude', and a minimum score of 20 represented a 'negative attitude'. Items which constituted the cognitive sub-scale

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