# Why such success? Nursing students show consistently high satisfaction with bioscience courses at a regional university

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## ABSTRACT

### Background
An understanding of anatomy, physiology and pathophysiology is considered essential for graduate nurses, but many nursing students find such courses difficult and anxiety-provoking. This was contrary to the authors' experiences, so student perceptions were studied at the survey institution.

### Objective
This paper examines nursing students' satisfaction with bioscience and nursing courses in the first two years of a Bachelor of Nursing at an Australian university, in order to suggest strategies for effective bioscience teaching.

### Design
Quantitative data for student satisfaction, measured on the Likert scale, were collected for three bioscience and 11 nursing courses from 2010 – 2012. Mean satisfaction was compared among courses and offerings by ANOVA, with offerings nested within courses, and correlation analysis was used to examine the relationship between student satisfaction and pass rate. Qualitative data were sourced from open questions, emails and forum posts and examined for recurrent themes.

### Results
Students rated the three bioscience courses in the top four of the 14 courses. There was no relationship between satisfaction and pass rate. Qualitative responses showed satisfaction with the course content, the learning materials, the delivery style and lecturer support.

### Conclusion
It is possible to deliver bioscience courses that are appreciated by nursing students. Four principles are suggested in this paper that may improve student satisfaction with bioscience courses and, therefore, result in more effective learning and better prepared nursing graduates.

## INTRODUCTION

Nurses often spend the most time with a patient and a well-informed nurse may be the first to detect a change in their health status. Therefore, an understanding of human anatomy, physiology and pathophysiology (often collectively called 'bioscience') is essential to good nursing practice (Whyte et al 2011; Friedel and Treagust 2005; Jordan and Reid 1997; Karch and Kent 1990) and also helps a practitioner understand the rationale for patient care (Jordan and Reid 1997). A positive relationship has been found between the level of knowledge of bioscience among nurses and patient care outcomes (Prowse and Heath, 2005; Prowse and Lyne, 2002; Jordan and Hughes, 1998). Bioscience is taught as a range of distinct courses in 25 of 28 nursing programs in Australia.

Although an understanding of bioscience is clearly important, several studies have shown that nursing students are often anxious about studying anatomy and (especially) physiology, but nevertheless appreciate the importance and relevance of it to their careers (Friedel and Treagust 2005; Gresty and Cotton 2003; Jordan et al 1999). Two recent Australian studies have also found that nursing students have negative attitudes towards bioscience.

Birks et al (2011) surveyed 163 first year students at one university. At the end of each semester the students were asked to indicate which of the four units of study they found (a) the most and (b) the least enjoyable; (c) the most valuable and (d) the least valuable. For the first (introductory) bioscience unit, 25% rated it as the most enjoyable but 20% as the least; in relation to its perceived value 31.5% rated it as the most valuable and only 2.9% rated it as the least valuable. For the second (advanced) bioscience unit, only 8.7% rated it as the most enjoyable and 32% the least, but nevertheless 16% rated it as the most valuable and 11.6% the least. Birks et al (2011) suggested the discrepancy between enjoyment and value of the more advanced unit may have been because students had lost interest in science or lacked the background to cope with new material.

Craft et al (2013) surveyed 273 nursing students at one university and found over 50% were anxious about studying bioscience but 93% understood why it was necessary for their careers. Therefore, in both cases, nursing students had negative perceptions of the process of studying bioscience but nevertheless appreciated the importance of the content to their career. Such perceptions may be because they (a) lack basic biological knowledge (McKee 2002), (b) have attempted but failed science in high school (McKee 2002) or (c) view nursing as a caring profession (Lumb and Strube 1993) but science as inherently 'non-caring' and, therefore, lacking relevance to nursing (Dawson 1994; Walker 1994).

Considering the discrepancy between the perceived value and the enjoyment of studying bioscience courses, it is argued that strategies for making bioscience more enjoyable are likely to improve learning outcomes. Furthermore, in contrast to the findings given above, the authors' experiences of teaching an integrated sequence of bioscience courses to health science students during the past 20 years have been extremely positive. Case studies of success can be used to suggest strategies for effective learning and teaching: in this paper evidence is given for successful teaching, student feedback is analysed and used to reflect on practice. This has identified four principles that appear to contribute to extremely high student satisfaction with bioscience courses at a regional Australian university.

A three year undergraduate Bachelor of Nursing has been offered by the regional university (henceforth called RU) where the authors are employed, since the late 1980s. Bioscience courses in the nursing program have always been delivered by staff with science qualifications, which is also the case for the majority of Australian and international nursing programs (Logan and Angel 2014); this is at least partly because of concerns that nursing academics might not have sufficient discipline knowledge to teach science or to help students apply it to practice (Wharrad et al 1994; Courtenay 1991).

Many RU nursing students are mature age, study by distance, have low tertiary entry scores, and lack writing and study skills. Some have transferred from vocational programs offered by technical colleges. Classes are relatively large, with over 750 new students enrolling in the program in each of 2011 and 2012.

## METHODS

This was a confirmatory study to examine student satisfaction with three bioscience and 11 nursing courses within the first and second year of the Bachelor of Nursing at RU where student feedback has been solicited through the online learning platform (Moodle) for every offering of all undergraduate courses since 2010. Voluntary responses of less than 100% of the solicited population are unlikely to be representative or random (Liu 2006), but in this case the data consistently represent students who were sufficiently motivated to complete the questionnaire.

Evaluations open in the latter part of each term and close before results are released to ensure that responses reflect the student's learning experience and are not biased by their level of achievement. Summary numerical data for each course are made available to all university staff and students. The three bioscience courses are scheduled in the first and second years of the nursing program so these were compared with all first and second year nursing courses. Data were used for the three most recent offerings of each course as these had the highest response rates (table 1).

**Table 1: The nursing (code NURS) and bioscience (code BIOH) courses offered in the first two years of the Bachelor of Nursing at RU.**

| Course name | Course code | Year of study |
|---|---|---|
| Introductory Anatomy and Physiology | BIOH11005 | 1 |
| Professional Nursing Identity | NURS11146 | 1 |
| Foundations of Nursing Practice 1 | NURS11149 | 1 |
| Therapeutic and Professional Communication | NURS11152 | 1 |
| Advanced Anatomy and Physiology | BIOH11006 | 1 |
| Holistic Nursing Assessment | NURS11150 | 1 |
| Beginning Nurse Practice | NURS11151 | 1 |
| Health and Behaviour | NURS 11153 | 1 |
| Human Pathophysiology | BIOH12008 | 2 |
| Acute Nursing Management | NURS12147 | 2 |
| Pharmacology for Nurses | NURS12151 | 2 |
| The Psychiatric Consumer | NURS13113 | 2 |
| Person Centred Approach to Chronic Disease | NURS12146 | 2 |
| Legal and Ethical Issues in Health Care | NURS12148 | 2 |

Students were asked to respond to six statements about learning resources and assessment by choosing Strongly Disagree, Disagree, Neutral, Agree and Strongly Agree, and these categories assigned scores from 1 to 5 respectively on the Likert scale. The first statement, "Overall, I was satisfied with the quality of this course", provided the opportunity to obtain reliable, robust and comparative data for student satisfaction across courses. Opportunity for comment was also provided by two free response questions: "What are the best aspects of your course?" and "What aspects of your course are most in need of improvement?" Responses to these questions for two courses (BIOH11006 and BIOH12008) gave considerable insights into factors that contributed to student satisfaction. Comments from students made in unsolicited email or Moodle forum posts were also examined.

When completing course evaluation surveys, students are advised that no student may be identified but that aggregated data may be used for research purposes. To ensure anonymity, no comments from the course evaluations were used in this report. Open, voluntary student comments from other sources (forums and emails) have been de-identified and reported below. The data for satisfaction were analysed by nested ANOVA (Zar 2010), with courses as a fixed factor and offerings as a random factor nested within each course. Sample sizes were at least 200 per course (table 2) and since they were constrained by the number of voluntary responses power was calculated retrospectively, using the effect size from the empirical data. Correlation analysis was used to examine the relationship between student satisfaction and pass rate.

**Table 2. Mean student satisfaction on a Likert scale of 1 to 5 where 1 indicates strongly dissatisfied, 3 neutral and 5 strongly satisfied. n = total responses for the last three offerings of each course. The three left hand columns give the results of a posteriori Tukey tests in relation to each of the three bioscience courses. Course codes in bold italic show no significant difference between each bioscience course and the others in the program. For example, BIOH 12008 was not significantly different to NURS 11149 or BIOH11006, but had significantly greater satisfaction than all other courses in the program.**

| BIOH 12008 | BIOH 11006 | BIOH 11005 | Mean satisfaction | *n* |
|---|---|---|---|---|
| *NURS11149* | NURS11149 | NURS11149 | 4.66 | 452 |
| *BIOH12008* | *BIOH12008* | BIOH12008 | 4.59 | 347 |
| *BIOH11006* | *BIOH11006* | *BIOH11006* | 4.37 | 383 |
| BIOH11005 | *BIOH11005* | *BIOH11005* | 4.24 | 399 |
| NURS11153 | *NURS11153* | *NURS11153* | 4.17 | 316 |
| NURS12147 | NURS12147 | NURS12147 | 3.98 | 337 |
| NURS12151 | NURS12151 | NURS12151 | 3.96 | 460 |
| NURS12148 | NURS12148 | NURS12148 | 3.96 | 463 |
| NURS13113 | NURS13113 | NURS13113 | 3.82 | 396 |
| NURS11151 | NURS11151 | NURS11151 | 3.79 | 238 |
| NURS12146 | NURS12146 | NURS12146 | 3.75 | 393 |
| NURS11152 | NURS11152 | NURS11152 | 3.73 | 275 |
| NURS11150 | NURS11150 | NURS11150 | 3.52 | 405 |
| NURS11146 | NURS11146 | NURS11146 | 3.50 | 314 |

## RESULTS

Mean student satisfaction among courses and the sample size for each are in table 2; response rates ranged from 21% to 67%. There was a highly significant difference in student satisfaction among courses ($F_{13, 25}$=9.173, $P < 0.001$, power=1.00) and among offerings nested within each course ($F_{25, 5139}$=5.67, $P < 0.001$, power=1.00). The three bioscience courses were rated in the top four for satisfaction, with scores above 4.0, and *a posteriori* Tukey analysis showed the three bioscience courses had significantly greater satisfaction than nine of the eleven nursing courses (table 2). The significant variation among the random factor of successive offerings of the same courses was not further investigated but is likely to reflect that (a) different lecturers taught some offerings of some courses and (b) enhancements were made in response to student feedback. There was no correlation between student satisfaction and mean pass rate (r=0.006, n=14, *P*=0.98) (figure 1).

The data are robust in that satisfaction was measured on the Likert scale, which provides a quantifiable measure on an interval scale that is independent among courses, which is a more realistic and reliable measure of student attitude than comparative studies where students are asked to rank courses against each other (Birks et al 2011). Comparative ranking only provides ordinal scale data; differences between

ranks are not necessarily equivalent and the same rank does not necessarily indicate equivalence among courses across different terms or years a course is offered.

Qualitative responses to the open ended questions also demonstrated high student satisfaction with bioscience courses. In 2012, 90% of respondents for BIOH12008 and 75% for BIOH11006 nominated the lecturers and teaching methods as the best aspects of the course and 78% and 40% of respondents, respectively, did not identify any aspect of these courses that needed improvement.
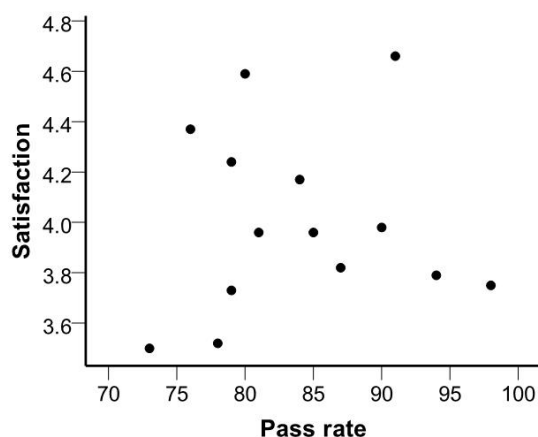


Figure 1: No correlation between pass rate (percentage) and satisfaction scores for courses in the Bachelor Nursing at Regional University ($r$=0.006, $n$=14, $P$=0.98).

## DISCUSSION

All courses in the nursing program scored well for student satisfaction and it is notable that none had mean satisfaction scores below 3.5 of a possible 5. This may, in part, be due to a concerted effort by the RU learning and teaching community to reflect on teaching practice and respond to student feedback. Statistical comparison showed nursing students were highly satisfied with the bioscience courses at RU, even though pass rates in these were within the lower range of the courses within the Bachelor of Nursing. Furthermore, the lack of any relationship between satisfaction and pass rates across the program is evidence that students are not simply equating success with satisfaction.

Although pass rates for RU nursing bioscience courses (72 – 84%) are higher than the 55 – 65% reported at other tertiary institutions (Durai et al 2012) and 63% (Whyte et al 2011) it does not appear to be because courses at the former are relatively easy or lacking in content. First, the bioscience courses are part of an accredited program which requires their content and depth to be regularly reviewed by staff in Science and Nursing, as well as by an external accreditation panel. Second, it is notable that both nursing and allied health students from other Australian universities often take these bioscience courses by cross-institutional enrolment, which requires prior approval by the student's principal institution.

The finding that students are highly satisfied with bioscience courses at RU are inconsistent with previous studies at other Australian institutions (Craft et al 2013; Birks et al 2011) and further research is needed to identify why. There are at least three possible reasons. First, one important contributor to student satisfaction is the commitment and capability of teaching staff, including their command of the subject, clarity of presentation, interaction with students, organisation and preparation, ability to motivate students and their presentation skills (Kane et al 2004; Hativa et al 2001; Elton 1998; Feldman 1997; Horan 1991; Sherman et al. 1987; Hildebrand 1973). All three bioscience coordinators have undergraduate qualifications in general science (which included physiology, but none are medically trained) and, for two, their doctoral and current research is in animal ecology. Wharrad et al (1994) also found that 72% of bioscience teachers in nursing programs

in the United Kingdom held a PhD in science and only 15% had a nursing qualification, but concluded that while being taught by a subject specialist was advantageous, the lack of a nursing background meant that the material was rarely presented in a way that was related to nursing practice. It is possible the RU instructors' initial *lack* of detailed anatomical, physiological, pathophysiological and nursing knowledge made it necessary for them to first teach themselves and then put the material into a nursing context, thereby seeing things from the point of view of a starting student and thus developing a conceptual, rather than a highly-detailed, factual treatment of the material. Their sound knowledge of general science also made it possible to develop explanations and course materials that could be understood by students with little or no prior knowledge of basic science (which is often the case for nursing students (McKee 2002)). Thus the instructors embedded strategies and used innovative delivery methods that minimised anxiety and targeted the learners' needs (Gordon et al 2012), as well as using assessment strategies that fostered originality and encouraged students to question (McKillup and McKillup 2007). Starting from an assumed zero background basic concepts are introduced, expanded upon and then gradually fleshed out until the students, sometimes to their surprise, find themselves with sufficient understanding to apply their knowledge in the workplace: *"I felt really nervous, but I remembered the diagram about acidosis in your lecture and told the intern he was wrong and the doctor said: That girl is right!"* (student reporting on a hospital placement in 2000).

Second, all three of the bioscience coordinators have received awards for teaching excellence; two have qualifications in education. They frequently consult with each other and the nursing faculty to ensure the bioscience courses are well integrated and relevant to the program. Students have acknowledged the quality of curriculum design and delivery: *"I have learned so much this term, you would not believe it! (I don't believe it myself). I am sure in part, it is because of the numerous and varied resources you have made available. But MAINLY, it is because of your clear understandable delivery of the material"* (student forum post 2012). It is also possible that the necessity to teach students by distance has resulted in better teaching to both internal and distance students. Both distance and on campus education now rely largely upon web-based learning platforms such as Moodle. Distance delivery requires a higher level of communication skills, a sound grasp of information technology, and empathy and respect for students of disparate backgrounds. Class websites are easy to navigate, meet a variety of learning styles, and are relatively simple in layout and format. Communication and engagement are enhanced by email, discussion boards and blogs. It is notable that students who have transferred to RU from other institutions (or are taking courses cross-institutionally) have reported their previous bioscience courses consisted of a loosely organised set of topics, with little continuity or overall integration, and did not relate well to their nursing program. *"Just a note to say thanks for the best course I've ever done. I'm soooo glad I decided to take this subject at RU after I failed at [another university]. You make it all so clear and interesting as well"* (student email 2012).

Finally, the bioscience courses have been the major part of the workload and therefore the primary responsibility of each coordinator for the past five years. Unfortunately, some science staff have said that teaching to non-science rather than science majors is 'second rate' and, therefore, an unpleasant and unrewarding chore. The authors do not share these attitudes. Instead, they have recognised a unique opportunity to create enthusiasm for science and an understanding of the scientific method in a large group of 'naive' students. Nursing students, with their variety of backgrounds, abilities and interests are rewarding to teach, yet teaching outside of the 'area of interest' was one of the five most common 'dislikes' of lecturers (Brown and Atkins 1997). More research into the attitudes of academic staff is warranted to identify if this is a sector-wide phenomenon that may contribute to the dissatisfaction with bioscience courses reported elsewhere among nursing students.

## CONCLUSION

It is possible to deliver bioscience courses that are appreciated by students, even though they deal with relatively complex concepts and are often content heavy. The methods described in this paper can be summarised by four principles: sound content knowledge and a conceptual delivery approach; a student-centred attitude and perspective; quality materials; and excellent communication. First, the teacher has to have sufficient knowledge, commitment and confidence to develop and offer clear and conceptual explanations instead of excessive and often irrelevant detail. Second, they need to be able to see things from the student's perspective and, therefore, start at an appropriate level; take advantage of prior student knowledge and experiences; and put concepts into the context of the health professional. Third, they need to provide well organised, quality materials that cater for a range of learning styles. Finally, to achieve this they also need to communicate clear expectations, give detailed and prompt feedback, respect the diversity within their classes and encourage interactions with students.

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