Chapter 2: Biological Sciences delivering to Education students

Education Background
The BEd Human Movement and Health Education degree program was restructured during 2000. From 2001 the degree program would include, in the first year of study, 6 credit points of physics in Semester 1 and 6 credit points of human biology in Semester 2. During the discussions criticism was levelled about the perception that the delivery and content of the science were not very relevant for the degree program. The suggestion was that the physics and biology units should be customised for these education students by including materials relevant to the teaching requirements of the students after graduation.

Development proposal
It was proposed that Biological Sciences should,
- develop and implement a customised unit of study for BEd Human Movement and Health Education students (target group);
- take an existing unit of study, BIOL1003 Human Biology, that is given to a variety of client faculties, and tailor it for a specific group of students so that the material presented would be more relevant to their needs within their profession; and
- ensure the model used could be transferred to other disciplines.

Summary of development
The unit of study EDUH1016 Human Biosciences was developed for the target students. The unit allowed for a mix of core lectures (as delivered to the BIOL1003 Human Biology students) and guest lectures, but students were to be kept together for their own laboratory sessions. The guest lectures covered topics designed to help illustrate the content of the unit in the context of the students’ professional pathway. The laboratory component of the unit included cameo presentations of more contextually relevant materials that would appeal to the students. The students were supported in their learning through a WebCT site that enabled them to contact the unit coordinator and have online discussions with their peers.

The unit of study EDUH1016 Human Biosciences was delivered for the first time in 2001. Evaluation of the unit included student evaluation of the components of the unit (by use of survey and focus group interviews), teacher evaluations of the design of the unit and evaluation of the transfer of knowledge from the first year unit of study to a second year unit of study.

Detail of development and evaluation

Timeline
| Semester 1, 2001 | Create a new unit of study for BEd Human Movement and Health Education students |
| Semester 2, 2001 | Deliver the new unit of study Evaluate participant reaction, students and staff Modify unit of study, if necessary |
| Semester 1, 2002 | Evaluate knowledge transfer from first year to second year |
| Semester 2, 2002 | In-depth evaluation Identify and document other teaching programs where the model might be applied |
**Unit of study – learning resources**

*Lectures*: EDUH1016 *Human Biosciences* students attend the same lectures as BIOL1003 *Human Biology* students, but also receive three additional lectures delivered by ‘guest’ lecturers (in 2001 these were Tony Curtayne and Gail Sunderland from Education and Murray Thomson from Biological Sciences). These three lectures presented the content in a human movement context.

*Laboratories*: EDUH1016 *Human Biosciences* students attend laboratories on Friday mornings and are encouraged to work in peer groups.

- Laboratories 1-3, are specially designed for the students (laboratory 2 includes an introduction to the EDUH1016 *Human Biosciences* WebCT site, including a practice discussion and practice quiz).
- Laboratories 4-9 have the same topic and material as used for BIOL1003 *Human Biology* but changes have been made to the delivery, especially in the inclusion of contextualised discussion.
- Laboratory 10 is structured for the students to give a poster presentation on a relevant topic on sport and musculo-skeletal issues.

*Weekly quiz*: EDUH1016 *Human Biosciences* quizzes are delivered via WebCT which enables the use of a variety of formats (multiple choice; matching; and one-word text entry), as opposed to the multiple choice only questions of the Human Biology unit of study.

*Materials*: EDUH1016 *Human Biosciences* students receive the same lecture summaries, flexible study modules and First Year Biology CD-ROM as BIOL1003 *Human Biology* students. However, the practical notes are modified to put the content in the context of the professional focus of the students. Included in the practical notes are flexible study modules designed to allow independent learning at the students’ own pace. The recommended textbook had a CD-ROM associated with it.

*WebCT site*: An entirely new web site was created for these students. The WebCT site follows the WebCT template of a site menu and a homepage. The site menu contains general First Year Biology information such as First Year Biology Information Booklet, extracts from the First Year Biology Skills Book, and laboratory safety. In addition, there are links to the University library homepage and Badham Library for access to online reference materials in pdf format. The EDUH1016 *Human Biosciences* homepage has unit specific links to learning resources, including web lecture notes, weekly announcements, self-test quiz and crossword solutions, online learning modules and online self-assessment modules, data from class investigations, weekly quiz, email help from academic and technical staff, and a discussion area.

*Revision of the unit of study*

Information obtained through the evaluation process was used to:

- guide modification of and enhancement to the teaching materials;
- guide changes aimed at improving the student learning experiences within the targeted first year unit of study; and
- assist in evaluation of the underlying model for teaching reform.
Evaluations
There were several evaluations done during the initial implementation of this new unit of study:
• the first was an evaluation of the development of the unit;
• the second was the evaluation of teaching that is normally undertaken for every unit of study;
• the third was an investigation of the amount of transfer of knowledge and understanding that took place between the junior unit of study and the intermediate unit of study; and
• the fourth was a measure of the perceptions of the teaching staff with respect to the relevance of the junior unit of study and the intermediate unit of study.

1. Unit of Study development
The EDUH1016 Human Biosciences unit of study was evaluated in 2001 using a student survey and a student focus group. Feedback from the focus group indicated that the unit of study relates to the degree program, is well integrated and the resources provided are excellent. The paper-based survey sought general demographic data and asked questions about students’ perceptions of the unit of study, what IT skills they thought would be needed, what their preferences were for working together or alone, what resources they had used in supporting them in their learning, what they perceived to be the purpose of the special lectures, and specific questions about all the resources. The survey instrument is presented in Appendix 1A whilst the full analysis of the survey is in Appendix 1B. A summary of the analysis is presented here.

• Demographics
Of the 109 students taking the unit 73% responded to the paper-based survey of which 60% were female (40% male), all were full-time students, and almost all of whom are either direct school leavers or at least not long out of school (89%), 95% were used to using the Internet with 94% using email.

• Information technology skills
While a very large majority of students expected to be using computers in EDUH1016 Human Biosciences, in every area of IT use, students’ actual use of IT surpassed their expected use, e.g. 81% of students expected to use the Internet whereas 92% indicated that they had needed to use the Internet for EDUH1016 Human Biosciences. This was particularly evident in the areas of use of database and electronic discussion groups, where actual use was double or more than that expected. In the use of email in their studies, around half of the students initially felt it would not be needed, but almost 90% actually did use email in their studies.

As asked whether email supported them in their learning, 84% of the students responded with the majority of responses (72%) finding email helpful in their studies. In particular they reported that the interactions with the unit coordinator were valuable.

• Peer-peer interactions
As asked about whether they worked with other students within the unit of study, the majority indicated that they had at least discussed aspects of the unit (85%), shared lecture or practical notes (79%) and helped others within the unit (54%). In such a cohesive cohort, it is perhaps not surprising that the vast majority of students would discuss the EDUH1016 Human Biosciences subject with their peers at least occasionally.
**Extent of collaborative study**

Most students (80%) occasionally or frequently meet with other students for study. Only 18% of students always study alone, although there were no respondents that always studied collaboratively. Pearson’s correlation (see full evaluation report in Appendix 1B) was used to investigate links between the various forms of social interaction and Internet and email use. Students who share notes with others are more likely to find the peer group, the resource room, Internet and email useful in their studies. Those who help other students to catch up are likely to find lectures, the Internet and email useful in their studies. Those who find the peer group useful in their studies are more likely to study collaboratively, and also find the resource room, Internet and email useful.

**Student use of resources – quantitative evaluations**

The more traditional course components of lectures have a high usefulness rating – with 79-87% of students finding them useful or very useful. The practicals are very highly regarded by the students, with no students regularly skipping these classes and over 96% finding the practicals and the practical notes useful or very useful in their studies. Lecture notes on the Web, both special (for three lectures) and standard, were the second most appreciated resource with only two students not accessing them and only one student not finding them useful.

The flexible study modules, the textbook CD-ROM and the First Year Biology CD-ROM all have a usefulness rank of 50-60% with 20-30% of students failing to use these resources. The flexible study modules are paper-based guided reading assignments based on the textbook. They are designed to encourage independent learning. These modules replace one of the three weekly lectures. Thus the 23% of students who did not attempt the modules were effectively skipping one third of their lecture sessions. In addition, the flexible study module material did not appear in the weekly quizzes, since these were designed primarily to test practical work. The first test of the flexible learning material encountered would have been in the final examination. As a result of these findings, questions on the flexible study module material were added to the weekly quizzes as an improvement for 2002.

The Web-based life sciences library references (Badham Library) were found to be useful by some 60% of students, while around 40% either did not use the references in this digital form or did not find them useful for this purpose. The references are digitally scanned references essential for completing the experiment report. The references are also available by physically attending the library and either reading or photocopying them. Use of the library in general is reasonably high at 85%, but one quarter of the cohort did not find it a useful resource for EDUH1016 Human Biosciences.

The Internet was found useful by some 85% of students and email was quite highly ranked at around 70%.

The student peer group was found useful by around 80% of students in their studies. This must be encouraging for the unit organisers who spend considerable effort fostering these collegial relationships.

There are many intercorrelations between use of digital and other media. In particular, those who use and find the flexible study modules useful are significantly more likely to
be users of the First Year Biology CD-ROM, the textbook CD-ROM, the practical notes and almost all of the WebCT resources and information. The self-test quizzes, which are done on paper in the practical notes then self-marked via the answers on the Web, are a type of independent study. They are also highly correlated with use of the flexible study modules and both CD-ROMs. Again these three resources are all used at the discretion of the individual, whereas attendance at lectures and practical classes seem to be regarded as compulsory parts of the unit.

- **WebCT use**
  Students were expected to use the WebCT site to keep themselves informed about the unit’s requirements, to receive messages from the unit coordinator and to enter into online discussions. Most students had not been involved in the online discussions (78%), giving excessive workloads, problems with accessing them and a dislike of the medium as reasons. A few students indicated that they liked the discussions especially as they knew one of the discussion questions would appear on the examination paper.

- **Summary**
  The feedback gained from evaluation of the unit of study was used by the unit coordinator to make appropriate changes to the unit’s delivery for 2002.

### 2. Unit of Study Evaluation using the Course Evaluation Questionnaire

The School of Biological Sciences Course Evaluation Questionnaire was used to investigate students’ responses to the teaching and resources available for the unit of study. The questionnaire is in Appendix 2A with the analysis in Appendix 2B. There were 31 statements about the unit of study, broken down into sections on general issues about the unit, about the lecturer(s), about the laboratory work and about the demonstrators. Students were given a Likert five-point scale (5 = strongly agree, 4 = agree, 3 = uncertain, 2 = disagree, 1 = strongly disagree) to indicate their agreement to the statements. A synopsis of the Likert means is given below:

<table>
<thead>
<tr>
<th>Section</th>
<th>No. of statements in section</th>
<th>Likert mean score</th>
</tr>
</thead>
<tbody>
<tr>
<td>General issues about the unit</td>
<td>10</td>
<td>3.56</td>
</tr>
<tr>
<td>Lecturer(s)</td>
<td>9</td>
<td>3.95</td>
</tr>
<tr>
<td>Laboratory classes</td>
<td>6</td>
<td>3.85</td>
</tr>
<tr>
<td>Demonstrators</td>
<td>6</td>
<td>4.17</td>
</tr>
</tbody>
</table>

It would appear that the students found the unit of study well organised and presented, and that they appreciated the teaching staff, especially those who worked with them in the laboratory classes.

A Student-Staff Liaison Group meeting was held towards the end of the unit in which the student representatives forwarded comments from their peers on all aspects of the unit of study. Overall they rated the unit as very relevant to their degree program and enjoyable. They indicated that the unit was well structured and they liked using the WebCT site for gaining access to information but not for discussions.
3. **Transfer of knowledge**

The students who completed EDUH1016 Human Biosciences unit of study in 2001 went on to take EDUH2013 Anatomy and Physiology in 2002. There were 61 responses to the short survey which asked two questions about their perceptions of the reasons for including the EDUH1016 Human Biosciences unit of study in the degree program. The survey instrument is in Appendix 3A whilst the full analysis is in Appendix 3B.

The implementation of the survey complied with The University of Sydney’s Ethics Committee Guidelines for research with humans. A copy of the approval document is in Appendix 3C. The approval enabled us to seek permission from the students to correlate performance with their perceptions of the reasons for including the first year unit of study in their degree program.

There was a 67% response rate to the survey, which was done in class time. The gender balance was 72% female and 28% male; with most students studying full-time (98%) and most students in the school leaver category (93%). Whilst all of the students had taken the first year EDUH1016 Human Biosciences unit of study, 18% of the students had taken an additional 6 credit points of junior biology and 15% had taken an additional 12 credit points of junior biology.

**Question 1** Why do you think that the program coordinator required you to do the unit of study EDUH1016 Human Biosciences before going on to take the unit of study EDUH2013 Anatomy and Physiology?

Most students were evenly divided between thinking that the coordinator wanted them to have a general introduction and background knowledge, or that they were provided with the basic concepts of the discipline as a foundation on which to build. Most of these responses referred to the lectures; only one response identified the use of practical work.

There was a small group of students (4%) who considered that the unit of study was specifically pre-teaching the work before the EDUH2013 Anatomy and Physiology unit.

A further number of students (7%) felt that the work overlapped significantly with the EDUH2013 Anatomy and Physiology unit and also that it (EDUH1016 Human Biosciences) was very detailed.

**Question 2** As you studied EDUH2013 Anatomy and Physiology how did you use your understanding from EDUH1016 Human Biosciences? Why did you use the knowledge from EDUH1016 Human Biosciences in the ways you did?

Responses focussed on how the students used their previous understanding in the second year subject. More than a third of the students (36%) echoed their previous answer to the first question, by responding that they had built on their previous work to form a more detailed and comprehensive knowledge in the second year subject.

Another large section of respondents (28%) found last year’s notes, practical book and textbook of great help in coming to grips with the demands of the second year subject. In particular, because the textbook was the same, students found that there was continuity between the first and second year subject.
Some students (15%) found there was so much overlap between the two units, that they felt EDUH2013 *Anatomy and Physiology* was a revision of the previous work in EDUH1016 *Human Biosciences*. In fact 8% of students felt that EDUH2013 *Anatomy and Physiology* was actually simpler than EDUH1016 *Human Biosciences* and 8% of students indicated that they did not use the knowledge from the previous year’s unit.

Pearson’s correlation was used to look for significant linkages between previous study, perceptions of transfer, gender, age and final performance in the second year unit of study. The only significant correlation is between final performance and whether the students had taken more than the 6 credit points of junior biology.

### 4. Interviews with biology and education staff

The three staff closely associated with the biology first year unit and the education second year unit of study were interviewed to ask them about their involvement in the development process and how well they perceived it was carried out. The responses to the questions (in Appendix 4) indicated that these staff members had been kept adequately informed during the process and had been able to have a suitable level of involvement at all times. The innovations introduced into the unit received favourable comment from the staff in Education (the special lectures and the WebCT site). In particular the special lectures are seen as the window onto the second year Education unit. The discussions held on the Web, in 2001, were not seen as particularly successful as not many students took part. For 2002, the staff looked at better ways to introduce this type of learning support to the students and included a contribution mark.

Whilst it is possible to customize existing units of study for particular groups of students, there are often other issues to take into account. For example, keeping the EDUH1016 *Human Biosciences* unit of study compatible/equivalent to BIOL1003 *Human Biology* is very difficult because the content is too detailed for the BEd *Human Movement and Health Education* students, many of whom do not have a science background. Many of the BEd *Human Movement and Health Education* students, whilst enjoying the subject matter and finding it very relevant, are struggling with the content. This was reiterated by a number of students in the second year survey. Ideally EDUH1016 *Human Biosciences* should be a stand-alone unit, however funding constraints make this difficult.

**Summary of Teaching Improvement**

The model took the approach of ‘value adding’ to an existing unit of study. The existing unit of study was reviewed and components that could be made more relevant for the BEd *Human Movement and Health Education* students identified. These identified activities and materials were then contextualized for the target group of students and delivered to them in isolation from the BIOL1003 *Human Biology* students through the creation of a new unit of study EDUH1016 *Human Biosciences*.

This involved some modification to the content and some focus on the professional pathway of the student cohort. Subsequent to the 2001 evaluation process and the student-staff liaison discussions modifications were made to EDUH1016 *Human Biosciences* for 2002. In particular, completion of flexible study modules (replacement for one lecture per week) was linked to assessment in the weekly quizzes. In fact, all lecture material has been included in the weekly quizzes so that students obtain ongoing feedback on their understanding in all components of the unit of study. Engagement in the WebCT discussions was enhanced by incorporating a small participation mark (2%
of total) and making each discussion group smaller (15 in 2001 reduced to 6 in 2002) and randomly assigned.

To improve student completion and understanding of prelab work, a student suggestion was implemented – there is a group discussion in which students have to volunteer the information to their staff member.

One of the most important changes was moving the end-of-laboratory discussion activity to the beginning of the subsequent session. This enabled students to review the material during the week and the subsequent discussion enabled misconceptions to be addressed and assisted students with the quiz.

Putting the material and assessments in context is important for student learning. Therefore the primary goal of the project was to tailor the BIOL1003 Human Biology unit of study for the BEd Human Movement and Health Education students so that it was more relevant to their professional degree program. This model could be applied to any unit of study but is particularly appropriate for service courses delivered to client faculties with professional degree programs. The model has already been adopted, in principle, by the School of Physics for the PHYS1002 Physics 1 (Fundamentals) unit taken by the same (i.e. BEd Human Movement and Health Education) students. In 2002 the new cohort of students took the new unit of study EDUH1017 Sports Mechanics.