Understanding Student Expectations in Developing Environmental Science Courses

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Abstract: Developing relevant and innovative University courses is a complex and often difficult task. This is particularly true when developing environmental science courses as the banner of environmental science has the potential to include an extremely vast array of subject material and course content. Added to this is the diversity of students entering these courses, and their associated course expectations and aspirations. A third component that cannot be ignored when developing courses includes employer demands and expectations of graduates at course completion. As tertiary educators we therefore have the challenge of developing innovative environmental science courses that are academically challenging, but meet the expectations of students, staff and potential future employers. To ensure that we meet this challenge it is vital that we determine the expectations of all relevant parties (students, staff, and potential employers) and develop our courses accordingly. Here we report on the 'student expectations' component of this. To determine student expectations we conducted a survey of all commencing first year environmental science students. The survey asked students to provide information on drivers for course selection, preferred learning styles, the importance of different approaches to teaching, subject interest areas and employment aspirations. Our results found that environmental science students have a preference for fieldwork and hands-on experience and are very supportive of teaching that combines different teaching methods. On-line teaching was not supported by commencing environmental science students. Commencing students showed a very strong interest in key subject areas of environmental science such as wildlife, animal conservation, national and marine parks, conservation and marine wildlife; however, some of the critical areas of environmental science such as population statistics, social sciences and chemistry did not attract the same level of interest. Most commencing students had some idea on where they would like to gain employment on course completion. Knowledge relating to student expectations is vital, particularly when designing courses, developing specific unit content and undertaking marketing and course information sessions. With this knowledge we can be confident that students enrolling in environmental science will, to a large extent, have their expectations met.

Keywords: Environmental Science, Tertiary Education, Student Perceptions, Expectations, Employment Demands

Introduction

THE COMPLEXITIES OF developing university courses is, in some ways, a direct result of the nexus between student expectations of what a course should offer, the different learning styles of students, and the eventual outcomes that employers expect in graduates. Given the diversity in student backgrounds, interests and learning styles (Ramburuth and McCormick 2001), as well as the range of employer needs, it is extremely challenging to develop courses that meet everyone's expectations. Developing a sound understanding of each of these areas should allow educators to cater courses more effectively for both the student base and future employers.

One particularly challenging discipline to develop courses for is environmental science. The large diversity of courses under the banner of environmental science has the potential to cause considerable mismatches between the courses themselves and the expectations of both students and employers. Courses in this area include environmental management, wildlife management, earth sciences, marine and freshwater biology, environmental law and policy, natural resource management and park management, just to name a few.

A further complicating factor in developing courses in environmental science relates to the student base entering the courses. Students originate from a diverse range of backgrounds, ranging from traditional high-school leavers, Technical and Further Education (TAFE) graduates, mature-age workers that need to upgrade their qualifications and mature-age 'change of career' candidates. Although their backgrounds are diverse, they all have one common link – a passion for the environment. This has led these first year environmental science students into the arena of tertiary education, with a desire to learn more and ultimately reduce the impacts that humans are having on our planet.

The challenge we face as educators is to take this diverse group of students, with their variety of expectations and learning styles, and develop them into

highly employable graduates in their chosen field. To achieve this we need to develop an understanding of the student base as they enter their chosen courses.

Therefore, the aim of this study was to examine the expectations of one particular group of environmental science students at Deakin University, Victoria, Australia.

Four undergraduate environmental science courses are offered at Deakin University, these being:

- Bachelor of Environmental Science (Environmental Management),
- Bachelor of Environmental Science (Wildlife & Conservation Biology),
- Bachelor of Environmental Science (Marine Biology),
- Bachelor of Environmental Science (Freshwater Biology & Management)

The Environmental Management and Wildlife & Conservation Biology streams are offered at the University's Burwood campus in metropolitan Melbourne, while the Marine Biology and Freshwater Biology & Management streams are offered at the University's rural campus in Warrnambool.

Specific Research Questions Included

1. What is the demographic profile of environmental science students commencing study at Deakin University in 2006?
2. Why did the students commencing study in 2006 select environmental science as their course of study?
3. What is the preferred learning style of commencing environmental science students?
4. What is the desired career path for commencing environmental science students?

Methods

In order to answer the research questions stated above, a six-page survey was completed by all new first-year students enrolled in the Bachelor of Environmental Science at Deakin University in February 2006.

Before students commence their course of study they are invited to an information session during Orientation Week (the week prior to class commencement) where they meet their lecturers and fellow students. Ninety three environmental science students attended this session in 2006. These 93 students were commencing study in one of the four courses of Environmental Science i.e. Environmental Management, Wildlife & Conservation Biology, Marine Biology and Freshwater Biology & Management. This represented approximately 65% of the total number of enrolling students. For the purposes of this study, we have focused on students who have entered the course directly from secondary school (high school).

The cover letter attached to each questionnaire outlined issues of confidentiality and advised students not to write anything on the questionnaire that could make them identifiable. Respondents returned the questionnaire in a box as they left the information session. By completing the questionnaire, respondents were consenting to participate anonymously in the study. The questionnaire was completed by students before classes commenced, thus eliminating any possibility of coercion on student participation. The study was approved by the Deakin University Human Research Ethics Committee (EC365-2005).

The questionnaire, using a combination of open-ended and closed questions (for example, yes/no, Likert scale), was based around five main themes:

1. participant background;
2. drivers for course selection;
3. preferred learning styles;
4. subject interests;
5. future careers.

Data were analysed in SPSS (Statistical Package for the Social Sciences), using descriptive statistics and inferential statistics where appropriate (Chi-square, one-way ANOVA). Comparative data were statistically significant at $P \leq 0.05$.

Results

A total of 93 students participated in the survey across the four environmental science courses (Wildlife & Conservation Biology (n=39); Environmental Management (n=22); Marine Biology (n=25); Freshwater Biology & Management (n=7)). Survey results for the Marine Biology and Freshwater Biology & Management courses were merged due to the small number of responses from students in the Freshwater Biology & Management course.

Students were asked to provide broad demographic data to allow for definition of the student group who participated in the course. Sixty percent of the 93 students surveyed were female. The ratio of males to females was significantly different between the different course groups (χ^2=6.875, d.f.=2, p=0.032), with females being less represented than expected in the group of environmental management students.

Most participants were less than 21 years of age (77% of participants), and as such their highest level of education was at the high school level (83% of participants). A small group of students had completed another course before enrolling in one of the environmental sciences courses at Deakin University (10% had diplomas from Colleges of Advanced and

Further Education; 6% had previous University degrees). [1]

Table 1: Responses to Questions Relating to Drivers for Selecting a Particular Course. Values for each Course are Based on Responses by each Student on a Scale of 1-5 (5 = very important, 1 = very unimportant). Chi-square Tests Indicate any Differences between Students in Different Courses

Drivers for course selection	W&CB	EM	M&FW	Chi-square	P (df)
Environmental interests	4.56	4.38	4.50	2.230	0.693 (3)
Employment opportunities	3.87	3.77	3.72	4.241	0.35 (8)
High school teachers	2.15	2.36	1.94	14.056	0.080 (8)
Family and friends	2.64	2.82	2.06	16.939	0.012* (8)
Course attractiveness	4.31	3.81	3.84	10.282	0.246 (8)
Being outdoors	4.56	4.41	4.47	8.026	0.236 (6)
*indicates significant differences between courses. W&CB = Wildlife & Conservation Biology, EM = Environmental Management, M&FW = Marine Biology and Freshwater Biology & Management					

Drivers for Course Selection

The survey asked participants to rank the importance of a number of factors influencing course selection, including environmental interests, employment opportunities, recommendations from high school teachers, influence from family/friends, course attractiveness (e.g. course name, content), and love of the outdoors. There were only small differences in the importance scores given to the individual questions relating to drivers for choosing an environmental science course between students from the different courses (Table 1). The only difference was within Marine Biology and Freshwater Biology & Management students who were less likely to be influenced by family and friends, than students in the Environmental Management and Wildlife and Conservation Biology courses.

Student responses from the different courses were merged to examine the relative importance of each of the different drivers for choosing a course. There was a significant difference in the importance of the different drivers for choosing a course ($F=111.427$, $df=5,550$, $p<0.001$). The most influential drivers for course selection were environmental interests and being outdoors (Tukey $P<0.05$). Whilst less important, employment opportunities and course attractiveness were both important factors in choosing a course (Tukey $P<0.05$). Of least importance when choosing a course was the recommendation from teachers and the influence from family and friends (Tukeys $P<0.05$) (Figure 1).

[1] Reported percentages may not total to 100% due to rounding and/or multiple responses.

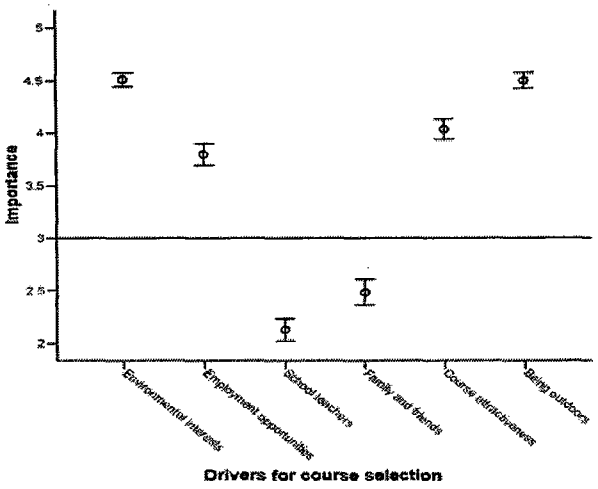

Figure 1: The Mean (± 1 S.E) Importance of Different Influences when Students are choosing an Environmental Science Course (combined data). Importance Scores were derived on a 1-5 Scale with 1 being Very Unimportant and 5 Being Very Important

Participants were also asked to provide details on how they found information on the courses they were interested in enrolling in. The main source of information was the VTAC guide (a publication on every University course in Victoria with very limited specific course information) with 77% of students using it. Another important source of information was the University web site (which contains more detailed course information) with 34% of students using this. The University open day (the most comprehensive form of course information) was only used as a source of information by 20% of students. Of least importance for finding information were family/friends, and high school teachers, being 10% and 4% respectively. These results indicate that students are largely selecting courses from information-poor sources (i.e. the VTAC guide), and not attending information-rich sources such as open days.

Preferred Learning Styles

The responses of students from the different courses were combined to explore what the preferred learning styles were among students. There were significant differences in the preference for various learning styles ($F=99.962$, $df=4,456$, $p<0.001$) (Figure 2). The strongest preference of learning styles was towards tutorials and hands-on practicals (including field work) (Tukey $P>0.05$). Also included in the highest group of learning style preferences was a mixed model of approaches combining all the learning styles. Formal lectures, while not in the high preference group of approaches to learning, did have support from the students (Tukey $p<0.05$). The lowest-scoring approach, with very low preference, was towards online learning (i.e. no face-to-face classes) (Tukey $p<0.05$).

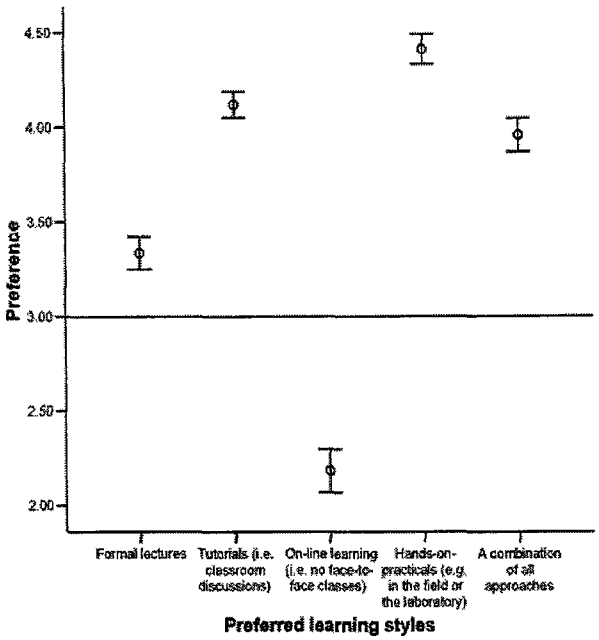

Figure 2: The Mean (± 1 S.E) Preference of Different Learning Styles of Students Enrolling into an Environmental Science Course (Combined Data). Preference Scores were derived on a 1-5 Scale with 1 being Least Preferred and 5 Being Most Preferred

Closely related to the preferred learning styles of students are their expectations of how the course will be taught. Participants were provided with a number of approaches that could be used to deliver information and asked to list the importance of these approaches. There were significant differences in the importance of different course aspects ($F=24.373$, $df=4,459$, $p<0.001$). The most important aspects of the course were field work and hands-on experience (Tukey $P>0.05$), followed by professional practice (Tukey $P>0.05$), with the lowest importance placed on progressive assessment and small group work (Tukey $P>0.05$) (Figure 3). Whilst there were significant differences between the different approaches to course development, all aspects achieved scores above 3.5, indicating positive support.

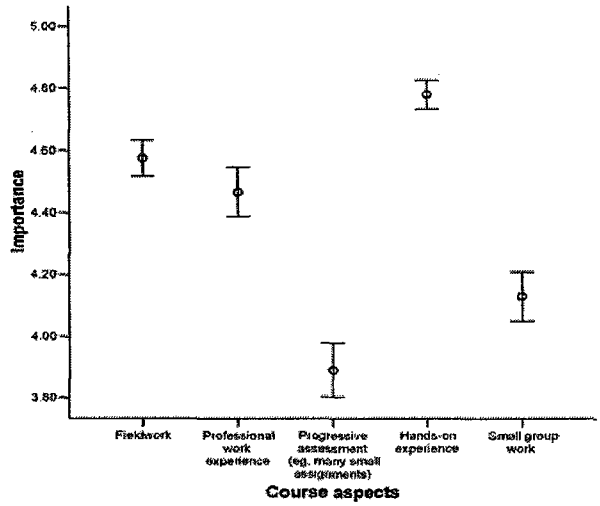

Figure 3: The Mean (± 1 S.E) Importance of Different Aspects of Environmental Science Courses (combined data). Importance Scores were derived on a 1-5 Scale with 1 being Very Unimportant and 5 Being Very Important

Fields of Study

The field of environmental science is extremely broad, and as such covers many different areas of study (Miller 2005). Students were provided with a list of areas associated with environmental science and asked to rank each area based on their level of interest. The level of interest in particular subject areas between the courses was tested using Analysis of Variance (Table 2). Overall, there were only significant differences in 10 of the 46 subject areas listed in the survey, highlighting a reasonable degree of similarity in the interest levels of students across the courses. Generally, the differences between students in different courses on subject interest were predictable; for example, students studying Wildlife & Conservation Biology showed a strong interest in wildlife and animal conservation.

Table 2: Responses of Students to Different Areas of Study. Students were asked to Rank their Interest in 46 Different Areas of Study on a Scale of 1-5 (5 being Very Interested). Students could Also Indicate they did not know what the Study Area was. Analysis of Variance was used to determine if there were Differences between Students in the Different Courses

Subject Area	Answered	I don't know what this is	W&CB	EM	M&FWB	Mean	F	df	P	Tukey
Wildlife	93	0	4.74	4.14	4.41	*4.48*	5.907	2,90	0.004*	EM=M&FWB<M&FWB=W&CB
Animal conservation	93	0	4.44	3.85	3.82	*4.37*	5.811	2,90	0.004*	EM=M&FWB<W&CB
National parks & marine parks	93	0	4.31	4.36	4.25	*4.30*	0.144	2,90	0.866	
Conservation	92	1	4.33	4.24	3.94	*4.17*	1.866	2,89	0.161	
Marine wildlife	92	1	4.05	4.05	4.38	*4.16*	1.525	2,89	0.223	
Animal biology	93	0	4.46	3.64	4.03	*4.12*	6.808	2,90	0.002*	EM=M&FWB<M&FWB=W&CB
Human impacts on environment	93	0	4.18	4.00	3.97	*4.06*	0.607	2,90	0.547	
Marine ecology	93	0	3.92	3.86	4.22	*4.01*	1.335	2,90	0.268	
Water conservation	93	0	3.87	4.05	4.12	*4.00*	0.799	2,90	0.453	
Biodiversity	92	1	3.72	3.94	3.45	*3.96*	3.158	2,89	0.047*	W&CB=M&FWB<W&CB=EM
Global environmental issues	93	0	3.92	4.18	3.81	*3.95*	1.035	2,90	0.360	
Park management	93	0	3.90	4.27	3.63	*3.89*	2.950	2,90	0.057	
Local environmental issues	93	0	3.95	3.73	3.91	*3.88*	0.514	2,90	0.600	
Pest species	93	0	3.97	3.68	3.88	*3.87*	0.761	2,90	0.470	
Aquatic ecosystems	93	0	3.62	4.14	3.94	*3.85*	3.163	2,90	0.047*	W&CB=M&FWB<M&FWB=EM

Biology	93	0	3.72	3.18	4.16	*3.74*	7.039	2,90	0.001*	W&CB=EM<W& CB=M&FWB
Freshwater ecology	93	0	3.62	3.86	3.78	*3.73*	0.548	2,90	0.580	
Environ monitoring techniques	91	2	3.63	4.05	3.48	*3.68*	2.922	2,88	0.059	
Natural disasters	93	0	3.69	3.55	3.75	*3.68*	0.287	2,90	0.751	
Fish	93	0	3.31	3.82	4.00	*3.67*	4.669	2,90	0.012*	W&CB=EM<EM=M&FWB
Forestry	93	0	3.64	4.00	3.44	*3.66*	2.424	2,90	0.094	
Environmental planning	91	2	3.51	4.09	3.50	*3.65*	3.33	2,88	0.040*	W&CB=M&FWB
Plants	93	0	3.59	3.73	3.66	*3.65*	0.129	2,90	0.879	
Aquaculture	91	2	3.42	3.81	3.78	*3.64*	1.605	2,88	0.207	
Pollution	93	0	3.54	3.82	3.63	*3.63*	0.686	2,90	0.506	
Oceanography	88	5	3.31	3.76	3.84	*3.60*	2.902	2,85	0.060	
Invertebrates	91	2	3.47	3.24	3.88	*3.56*	3.229	2,88	0.044*	W&CB=EM<W& CB=M&FWB
Fire	93	0	3.56	3.64	3.11	*3.53*	0.428	2,90	0.653	
Landscape ecology	91	2	3.47	3.48	3.47	*3.47*	0.001	2,88	0.999	
Disturbance	87	6	3.39	3.52	3.47	*3.45*	0.195	2,84	0.823	
GIS/GPS	62	31	3.28	3.54	3.54	*3.44*	0.403	2,59	0.670	
Natural history	93	0	3.67	3.45	3.06	*3.41*	3.239	2,90	0.44	
Environmental policy	91	2	3.11	3.91	3.19	*3.33*	4.801	2,88	0.010*	W&CB=M&FWB<EM
Landforms	93	0	3.26	3.32	3.41	*3.32*	0.207	2,90	0.813	
Ecotourisim	90	3	3.11	3.64	3.32	*3.31*	1.591	2,87	0.210	
Earth science	92	1	3.21	3.57	3.25	*3.30*	1.029	2,89	0.362	
Biogeography	86	7	3.32	3.41	3.07	*3.26*	0.971	2,83	0.383	
Geology	93	0	3.33	3.27	3.06	*3.23*	0.641	2,90	0.529	
Palaeontology	86	7	3.40	3.10	3.13	*3.23*	0.788	2,83	0.458	
Botany	93	0	3.08	3.27	3.25	*3.18*	0.375	2,90	0.688	
Conservation genetics	86	7	3.22	2.90	3.27	*3.16*	0.827	2,83	0.441	
Social science	93	0	2.87	3.27	3.41	*3.15*	2.003	2,90	0.141	
Population statistics / modelling	92	1	2.97	3.05	3.22	*3.08*	0.546	2,89	0.581	
Rocks and soils	93	0	3.00	3.18	3.03	*3.05*	0.204	2,90	0.816	

Agriculture	92	1	2.82	3.38	3.09	*3.04*	2.536	2,89	0.085	
Chemistry	93	0	2.21	2.23	2.47	*2.30*	0.534	2,90	0.588	
* indicates.....significant difference. W&CB = Wildlife & Conservation Biology, EM= Environmental Management, M&FW = Marine Biology and Freshwater Biology & Management										

The topics were then ranked according to the overall level of interest expressed by the students (Table 2). The top 10 areas of interest reflected a broad preference for subjects involving wildlife, marine ecology, parks and conservation. This is probably not surprising given the nature of the courses that the students were enrolling into. Students generally showed very broad levels of interest with 28 of the 46 areas of study receiving mean scores above 3.5 (i.e. they show positive interest). There were, however, 18 areas that scored below 3.5 for their level of interest (Table 2). These areas included some critical areas of study within the environmental science degree, such as population statistics, social sciences, Geographic Information Systems (GIS) and chemistry.

Employment Aspirations

The students were provided with a list of common employers in the environmental area in Victoria, Australia, and asked to think about where they hoped to gain employment on completion of their course. Overall, the most common responses were the major agencies associated with management of the environment, for example, the Department of Sustainability and Environment and Parks Victoria (Table 3). The responses for students in each course showed some variation, highlighting the interests of students in the course; for example, being a marine biologist was the favoured employment option for students in the marine and freshwater biology area. What is more surprising than the areas that students suggested they would like employment in are the areas that they did not highlight. Many graduates of these courses gain employment in local government and Catchment Management Authorities (CMA's), yet only 14% of commencing students saw these as desirable areas for employment (Table 3).

Table 3: Future Employment Preferences on Completion of Course. Values are reported as a Percentage. Students could respond to more than One Option so Values across a Course will add to over 100%. The Top Three Options for Each Course are highlighted by Bold Italic Numbers

Employment option	Wildlife & Conservation Biology	Environmental Management	Marine & Freshwater Biology	Total
Parks Victoria	*67*	*50*	28	49
Department of Sustainability and Environment	*44*	*64*	*34*	45
Zoos and Sanctuaries	*49*	27	28	37
Overseas (Travel / Employment)	36	36	*38*	37
Environmental consultant	31	*55*	22	33
Marine Biologist	23	18	*56*	33
Environmental Protection Authority	26	32	25	27
Research Institute / University	31	14	19	23
Higher Degree (e.g. PhD)	21	23	22	22
Aquaculture Industry	10	18	25	17
Teaching	15	27	13	17
Fisheries Department	13	18	16	15
Catchment Management Authorities	13	14	16	14
Local Government	18	27	0	14
Environmental office	13	18	9	13
Department of Primary Industries	3	23	0	6
Unsure	15	5	13	12

Discussion

The discipline of environmental science is a relatively new area of tertiary education compared to the more traditional science disciplines of biology, mathematics, chemistry and physics. Tertiary institutions are now beginning to recognise the necessity of environmental science (Millar 1996; Chick 2000). Ekborg (2005) argues that priority must be given in the curriculum to helping students develop a fundamental understanding of particular issues and develop the skills in decision-making on the basis of sound science.

The recognition of environmental science within tertiary institutions can be attributed to many factors, namely, society's increased understanding of the importance of environmental processes, increased fear for our future in regards to the state of the planet, government priorities and associated legislation, increased public knowledge and awareness and an increased interest among young people to work outdoors and make their own contribution to environmental protection.

With increased interest in environmental science comes increased student demand to undertake environmental science degrees at tertiary level. Although there has been a flatlining in enrolments in traditional environmental degrees in recent years (Sherren 2005), student demand for environmental science courses at Deakin University was considerably higher in 2006 than it has been in recent years.

This study has examined the expectations and interests of a new cohort of environmental science students at Deakin University, Victoria, Australia; and focused on students enrolling in a range of fields within environmental science. As such, we believe that the results will be applicable to environmental science students studying at other tertiary institutions globally.

The results show that, for this particular group of students, the most important reasons for course selection were their interests in the environment and being outdoors, followed by employment opportunities. These students also selected hands-on practicals and hands-on experience as their preferred learning styles and ranked key environmental terms such as wildlife, animal conservation, national and marine parks, conservation and marine wildlife as their preferred interest areas. This information is vital for educators, as it provides the basis for determining more clearly the mindset of students commencing an environmental science degree and can be used for course development and specific unit content. Through this knowledge, the environmental science courses at Deakin University are already incorporating more field-based activities into units and, where possible, using key interest areas in specific case-studies.

Of equal importance is knowledge about what the students do not perceive as areas of interest. Through this research we found that although the commencing students did respond positively to key words, in some cases they responded negatively to critical subject areas. The concerning aspect from an educational perspective is that many of these areas are essential areas of study for many environmental science students. Students in environmental science now need strong groundings in policy, social science and statistics (Jacobson and McDuff 1998; Sherren 2005) yet these all ranked in the lower end of the list. Depending on the avenue of study, students also need an understanding of landscape ecology, GPS / GIS, earth science, chemistry and genetics. These areas were also ranked comparatively low in the survey.

There are a number of potential ways to deal with these preferences. Firstly, the easy option would be to simply remove all non-interest areas of study from our courses and keep the students happy. This approach, however, is not an option as it would mean that students would not be provided with the key theoretical, analytical and social skills currently contained within these subject areas and, secondly, our graduates would not have the skills and knowledge required to meet employer demand.

The second potential option for addressing student perceptions is to consider different teaching approaches and methods. Given that commencing students have a preference for hands-on, practical experience, why not incorporate these methods into the subject areas where student perceptions are negative. Fusco (2001); Barnett *et al.* (2006) and Scott *et al.* (2006), found that fieldwork can be successfully used to help students understand theory, put reality into their teaching and teach subject specific skills. At Deakin University statistics is a core unit for environmental science students and is also one of the areas perceived negatively by commencing students. To address this negativity, and provide practical hands-on experience, this unit now contains a four day fieldtrip. Through incorporating this fieldtrip (camp) the students learn to apply statistics to 'real-life' situations and at the same time develop team building skills and experience the enjoyment of being with nature for a few days during the course. This view is consistent with Hill and Woodward (2002) who found that fieldwork allows students to view and experience theories in the wider environment and therefore better understand how such theories exist.

In units where camps or increased field work are not an option, perceived negativities can still be overcome through good teaching practices. For instance, unit content could be modified or teaching methods adjusted to increase student interest and enthusiasm. For example, if students perceive social sciences as uninteresting then core content material

could be delivered using current, highly controversial case-studies that students can relate to and usually have strong opinions on (Ballantyne and Uzzell 1995). For example, the topic of whaling could be incorporated into social sciences curricula to investigate the issues associated with human impacts on the environment. This approach is currently used for the second-year unit 'Society and Environment' – a core unit in the environmental science program at Deakin University.

With the knowledge that students perceive a particular subject area as uninteresting before they commence the unit can also be an advantage for the teaching staff involved in that particular unit, as this means that the staff are already aware that the unit needs special attention in terms of creating student interest and motivation in the first few classes of the unit. This prior knowledge allows the teaching staff to spend time in the first few classes ensuring that the unit is presented to the students in an enthusiastic way and the unit's importance is conveyed to the students in the first instance. For example, with the knowledge that students perceive chemistry negatively, chemistry teaching staff could begin a chemistry unit by creating the link between the importance of chemistry and areas perceived as 'high interest' such as wildlife or conservation. Through providing this link students can appreciate the importance of an understanding of chemistry and hence, increase their motivation towards the unit. Chemistry practicals could also incorporate high impact experiments whereby students can relate these directly back to high interest areas of study such as the impact of water quality on marine wildlife.

On-line teaching was one teaching style that environmental science students responded negatively too. This is understandable given that most students preferred learning styles with field-work based, hands-on experience. On-line learning is hard to sell to environmental science students as these students have a strong preference for nature-based outdoor learning, however, on-line learning is now perceived as a critical learning tool and many universities are now increasing their use of on-line technologies (Weigel 2002) and encouraging teaching staff to deliver subject materials online.

Deakin University's policy on on-line learning is that all undergraduate students must complete at least one wholly on-line subject during their course (Deakin University 2003). This gives students an opportunity to develop their computer skills and on-line communication skills which are essential skills in most, if not all, fields of environmental science. Even though these are important skills, the literature suggests that many students dislike wholly on-line learning (Smith 2005; Miller in press).

Our challenge, therefore, is to deliver highly relevant and interactive on-line units that the students can immerse themselves in and excel. This is an extremely difficult concept to achieve, as fully on-line units offer no face-to-face student-staff contact, as all contact must be undertaken on-line. To ensure that the students can appreciate the importance of on-line teaching it is vital that the on-line unit content is up-to-date, relevant and interactive. Developing interactive exercises whereby the students solve problems and actively participate has been found to be a successful educational exercise (Papapanagou *et al.* 2005). For example on-line units in environmental science can include interactive case studies whereby the students are required to manage the processes of a particular development from the initial planning stages to the post monitoring of the completed development. Through this type of case study the students can take ownership of the development, knowing that every decision that they make will have an impact on the surrounding environment.

On-line learning can also include on-line seminars or discussions from high profile environmental personalities. These high profile personalities can raise specific environmental scenarios and students can respond, in a debate-like forum to the various proposals. Activities such as these will involve the students in an interactive way and highlight the importance of written communication skills and modern computer technologies. The other main advantage of on-line learning is that students can complete the unit in their own time and in the comfort of their own home, an important aspect given the increasing number of students engaging in work and study at the same time (Wyn and Dwyer 2000).

The results of this research also highlighted that there are a number of key subject areas that students are unfamiliar with when they commence university studies. Examples of these subject areas include GPS / GIS, biogeography, palaeontology, conservation genetics and oceanography. This lack of understanding could be attributed to a lack of exposure in secondary school curriculum. This lack of understanding by commencing students is quickly overcome as these students commence study, however, knowledge that students do not necessarily know these terms is important in terms of course marketing and advertising targeted at potential students.

When students commence university studies, they usually have some potential employment aspirations associated with their specific course of study. Through this research we found that the majority of students commencing studies in environmental science aspire to work for one of Victoria's leading State Government environmental organizations (e.g. Department of Sustainability & Environment or Parks Victoria). Employment choices were, to some

degree, course specific, with those students enrolled in Marine Biology, for example, hoping to gain employment as a marine biologist and those enrolled in Environmental Management showing a strong preference to environmental consultancy.

Interestingly, two of our main employers (Local Government and Catchment Management Authorities) were not perceived by the commencing students as potential employment agencies. This lack of interest may also be attributed to lack of knowledge prior to course commencement. Students are exposed to both of these organizations regularly throughout their degree and often aspire to gain employment with one of these organizations on course completion. These career aspirations can only come with knowledge, and first hand experience with specific organizations and their core business areas.

Conclusions

Through this research we have gained a much greater insight into the expectations of our commencing first year environmental science students. This knowledge has important implications for course development and specific unit content, as well as course marketing and advertising. Overall, this research has found that environmental science students have specific course expectations and preferred learning styles. Environmental science students prefer outdoor, hands-on learning but are also very supportive of teaching that combines a range of approaches. Variety appears to be an extremely important factor in course selection and subsequent course interest and motivation. If units can be delivered in an interesting manner, incorporating the many different teaching mediums and keeping unit content relevant and interesting, then we are well on the way to meeting commencing students expectations. Given the high level of interest in a number of different potential subject areas of environmental science, it is also essential that we maintain flexibility in our course structures to ensure that students are given the opportunity to select electives in subject areas of interest to them.

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For further information on courses in environmental science offered at Deakin University, go to http://www.deakin.edu.au/scitech/les/

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