Student perceptions of graduate attributes in the Bachelor of Animal and Veterinary Bioscience

Melanie Collier, Sarah Jobbins and Rosanne Taylor, Faculty of Veterinary Science, The University of Sydney, Australia.
m.collier@usyd.edu.au, sjob3735@usyd.edu.au, rosannet@vetsci.usyd.edu.au

Abstract: While undergraduate degree programs are intended to ensure all students achieve core Graduate Attributes (GA), students do not always appreciate their importance or understand how they are developed. Students enrolled in the Bachelor of Animal and Veterinary Bioscience program were surveyed over a three year period and asked to report their perceived importance of the 31 graduate attributes of the degree. These attributes were clustered aroundfive5 themes, Research & Inquiry (RI); Information Literacy (IL); Personal and Intellectual Autonomy (PIA); Ethical, Social and Professional Understanding (EPSU); Communication (C). Their reported importance was higher for second year compared to first year students for all clusters, but fell among third year students slightly for all clusters except for C. Fourth year students, who were engaged in honours projects, reported an increase in importance of all clusters and when compared to first years were more likely to report all clusters as important particularly for the RI, IL and C clusters. This pattern of variation in perceptions across a program indicates that experience of tasks with a strong emphasis on GA and repeated assessment increases students understanding and appreciation of the value of GA development in their programs.

Introduction

Generic graduate attributes have been used to define, beyond discipline knowledge, the skills and qualities a student will possess upon graduation (Bowden, Hart, King, Trigwell & Watts, 2000). The generic graduate attributes of an institution should be achieved by all graduates irrespective of the field of study and are developed as a result of the learning experience within the curriculum. Universities have used these attributes as a way to differentiate their graduates and to increase their marketability to prospective employers because they are deemed work ready and capable of ongoing learning and development (Barrie, 2007). At The University of Sydney, Barrie (2004) developed a research based approach to graduate attribute policy. He defined three overarching generic graduate attributes of Scholarship, Global Citizenship and Lifelong Learning and below this he described translational attributes, that is the skills and abilities that would allow discipline specific knowledge to be made use of and applied, grouped around five clusters (Barrie, 2004).

In 2005 the Faculty of Veterinary Science introduced a new four year honours program Bachelor of Animal and Veterinary Bioscience with a broad scope of animal science and research skill development. A working party was convened to draft the graduate attributes of this new degree and input was sourced from academics and students within the Faculty as well as potential employers and external stakeholders. These attributes articulate to a very diverse audience of students, staff, potential employers, the community and careers advisors, the skills, abilities and domain knowledge a graduate will demonstrate on successfully completing the degree program. The 31 graduate attributes for the new degree were based around the same five clusters described by Barrie (2004), Research & Inquiry (eight attributes), Information Literacy (six), Professional & Intellectual Autonomy (five), Ethical, Social & Professional Understanding (seven) and Communication (five).

Graduate attributes were used by degree programmers as a driver for curriculum change to ensure their development takes place in a horizontally and vertically integrated manner. The development of these attributes was communicated to students through the intended learning outcomes (ILO) for units of study. The faculty conducted curriculum development workshops and staff development to develop specific unit of study learning outcomes which contribute to the breadth and depth of graduate attributes across the degree program. The link between GA and ILOs were explained in unit of study materials (website, handbook and in introductory classes). Each ILO is taught, practised and assessed, with use of grading descriptors which provide feedback to students on their progress. The value of tasks which develop these attributes signals their importance to students.

One area of concern in GA-driven curriculum design is fragmentation of the learning outcomes within units of study with the consequence that graduate attribute development is not evident or valued by students. Curriculum planning strategies took the big picture view of the role of learning and assessment tasks in GA development, with workshops to ensure tasks were planned across each year and vertically within the degree. One example is the assessable tasks used to develop critical writing within the degree (Taylor & Collier, 2008) which were part of the research-intensive focus of the degree. A number of well scaffolded writing tasks were implemented across all years of the degree, designed to bring students to the point of readiness for writing an honours thesis/paper in fourth year. However while a student progressing through the degree may understand that GAs are involved (e.g. communication or research and inquiry) they are frequently unaware of the contribution any one task plays in the "big picture" of attribute development. The consequence of this is likely to be a more superficial conception and less effective approaches to learning used, where students miss the significance of these learning experiences (Prosser & Trigwell, 1999*)*.

Leggett, Kinnear, Boyce and Bennett (2004) studied the student and staff perceptions of the importance of generic skills in science having identified that the voice of employers, universities and government had been clearly heard. The authors found significant year effects in the student reported importance of skills, with skills such as critical thinking, which the authors described as higher order, increasing in importance in the final year compared to first year. There was a strong link between the frequency of skills assessment and students' perception of the importance of that skill. Barrie (2007) has studied the understanding of academics of the teaching and learning of attributes and found considerable variation in conceptions and approaches, which are likely to have a profound impact on the quality of students' experiences in developing GA. Students' perspectives are still less well investigated. Since student learning is driven by students' perceptions of what is important (Prosser & Trigwell 1999), an understanding of student perceptions of the importance of graduate attributes will inform development of effective, inclusive learning activities that meet the needs of students from all backgrounds. These learning activities should allow a student to demonstrate the sequential mastery of these skills as they are developed, from a novice to a more experienced level by graduation.

The study

We investigated the importance students placed on the graduate attributes of the degree and changes during their enrolment. The study was approved by the Human Ethics committee of the University. In each of the years 2005-2007 students in all years of the degree were surveyed in week 8 or 9 of second semester. The survey required students to score the 31 attributes from 1 to 5 on a Likert scale (1=irrelevant and 5=of utmost importance). Students completed a questionnaire about their background and open-ended questions about their conceptions of the Graduate Attributes and how they were developed. A total of 118 individual students participated in the study, voluntarily completing the questionnaires at the end of a class. Some 35 students were surveyed more than once as they progressed through the degree, 23 students were surveyed on three occasions and 12 students on two occasions; their answers were included as a separate entry according to their academic year of enrolment when the survey was undertaken.

Results

The student cohort enrolled during the investigation was made up of 84% of students commencing study straight after completing high school, a maximum of 3 international students per academic year and an average of 80-85% female students. This distribution was stable over the 3 years of the study. Students' perceptions of the importance of the individual attributes that made up a cluster were rated on a Likert scale and summed to give a total for each cluster. Since less than 3% of responses were scored at 2 or below, scores of 1 and 2 were grouped with the scores of 3 (Figure 1).
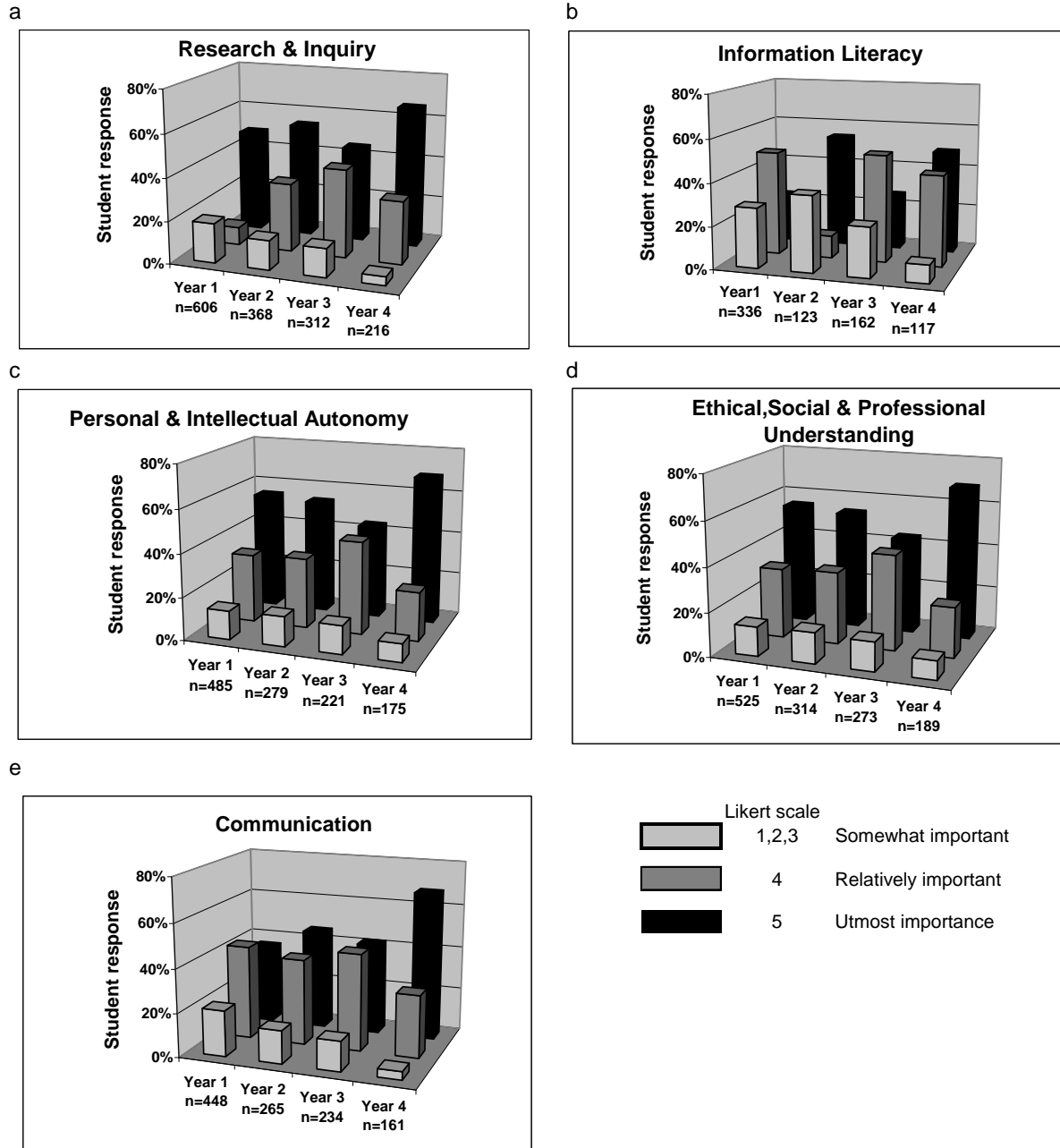
Figure 1: Student perceptions of the importance of the 5 clusters of GAs by year of enrolment. Students scored on a Likert scale from 1-5 the individual attributes within each cluster (a= 8 attributes, b=6, c=5,d=7 and e=5). Student scores of 1-3 were combined. The proportion of student responses in each of the 3 categories was calculated by year of enrolment.

The student responses to the clusters of individual attributes were analysed by univariable ordinal logistic regression models followed by multivariable generalised linear mixed analyses to determine differences in student responses over the four years of the degree. Adjustments were made for the students' background information provided (fixed effects in model) as well as taking into account multiple observations per student (by inclusion of a random student effect). All the analyses were conducted using SAS statistical software (version 9.2, © 2002-2003 by

SAS Institute Inc., Cary, NC, USA) and employing in-house built SAS macros (available at: http://elearn.vetsci.usyd.edu.au/magicmacros).

   The results showed students in all years of the degree scored all the attributes as important with only 15% of total responses scoring the attributes at 3 or below. Students in the first year of the degree accorded the highest importance to EPSU, followed by PIA, RI, C and IL (Figure 2). Within the degree, development of attributes in the first year focuses on IL, C and RI with students undertaking orientation to the library and its services (IL) and a short oral presentation on emerging animal industries (C and RI) as well as a short written piece that aims to identify those students with poor written communication skills.
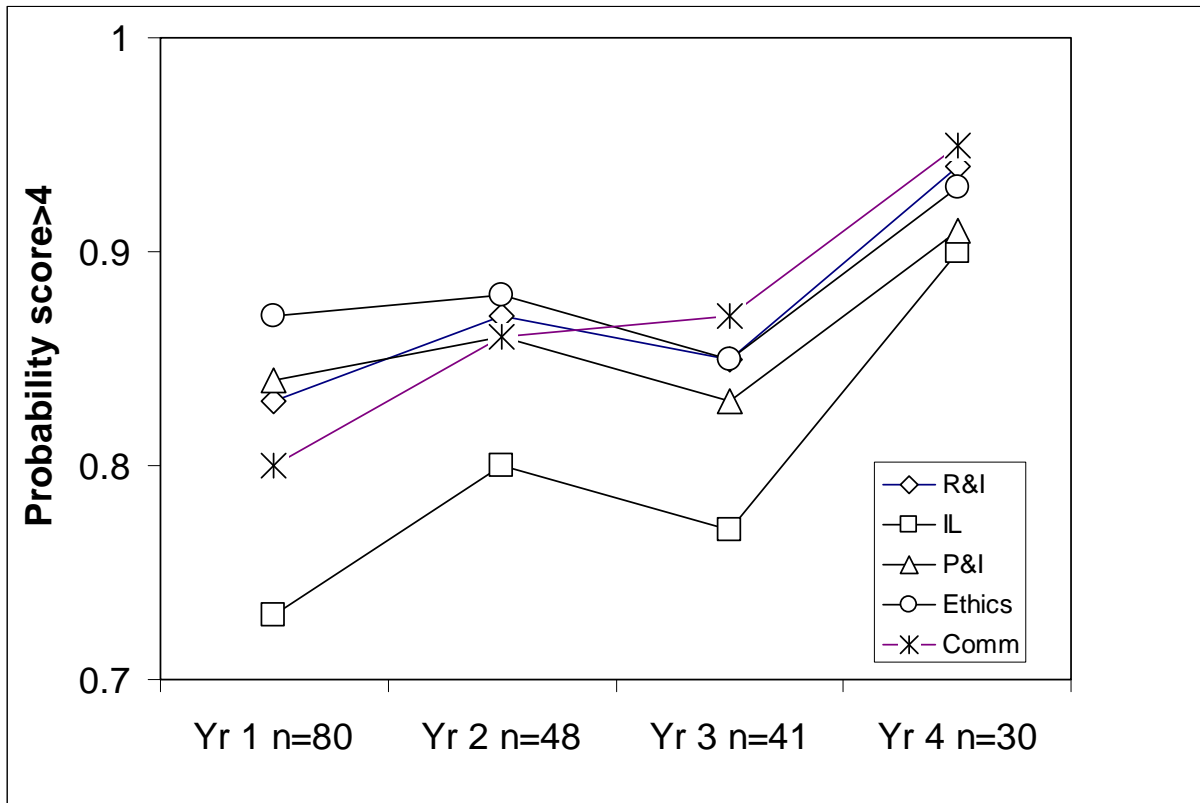

Figure 2: The probability of a student attributing a score on the Likert scale > 4 to the 5 clusters of graduate attributes by academic year. Student reported importance of the cluster of attributes were analysed using multivariable analysis. The increase in the probability of fourth year students reporting attributes as relatively important compared to first year students for the R&I, IL and Com clusters of attributes was significant (R&I, P <0.05, IL, P<0.006 and C, P<0.003)

   There was an increase in the reported importance in all attributes by second year students. During this year the focus of GA development is on further development of IL skills through a library program on using and searching databases, a group oral presentation on pain amelioration in animal husbandry procedures and an accompanying newspaper article (C, IL, RI) and a critical scientific writing assignment (IL,RI, C).

The third year students reported a further increase in Communication, whilst perceived importance of all other attributes fell slightly. There was a marked increase in students' perceptions of importance of all GAs in year 4. Year 4 students had the greatest probability of a score of >4 compared to all other years. This is not surprising, as in fourth year students complete a 24 credit point research project. This activity involves students preparing a research proposal and literature review, completing the practical component of the project and presenting the findings in a thesis (or publishable paper) as well as presenting their findings in an oral presentation to academic staff and their peers. Over the period of the study the fourth year cohort comprised less than 20 students. Fourth year students have rich and individualised learning experiences because they select from electives which have small class sizes and research topics of their own interest.

When comparing the scores of the students in the fourth year of the degree to that of students in first year, the fourth year students reported higher scores compared to the first year students for all the clusters and in the case of RI ($P < 0.05$), IL ($P < 0.006$) and C ($P < 0.003$) these scores were significantly different.

Students' perceptions of the development of these attributes are indicated by their responses to the open ended question 'Which of the attributes do you feel have been best developed during the curriculum?' (Table 1). Students in the first two years report that attributes around RI, IL and C had been best developed which reflects their experience of the tasks undertaken to develop these attributes. With third and fourth year students there were two main attributes identified, RI and C. The attributes of PIA and EPSU were identified by students in all years as not being developed and indeed were identified in an open ended question by students as being under developed (data not shown).

There were not many qualifying comments made by students when identifying which of the attributes they considered had been best developed, but those volunteered had a negative connotation:
3rd year, 2005 : "Poster. We did MANY. Database searching. MANY tedious sessions."
3rd year, 2006 : "My information literacy. I feel very, very competent at researching materials. About 5 library sessions on research skills would have been the reason!"
These comments from third year students indicate they felt there was an over emphasis on tasks to develop these attributes.

Results from the Student Course Experience Questionnaire (SCEQ) showed an increase in the broad agreement that generic skills are developed in the degree from 87% in 2005 to 95% in 2007. There were too few responses to this questionnaire to allow an analysis by year of enrolment.

	(n)	R&I (%)	IL (%)	EPSU (%)	PIA (%)	C (%)
Year 1	25	44	28	12	4	12
Year 2	33	58	21	3	6	12
Year 3	46	41	6.5	6.5	5	41
Year 4	20	50	5	0	5	40

Table 1: Student nominations of clusters of GAs identified as being best developed through the curriculum by year of study. The number of student nominations of a cluster of attributes R&I, IL, EPSU, PIA or C in response to an open ended question "Which of the attributes do you feel have been best developed during the curriculum?" was expressed as a percentage of the total student responses to the question (n) in each year.

Discussion

By the end of fourth year students consider all five clusters of graduate attributes as relatively important and this represents an increase from the starting point in first year. It is noteworthy that the GAs that have significantly improved in importance, RI, IL and C, are those that students identified as being best developed during the curriculum and reinforces the impact of tasks, with its linked assessment, to the development of GAs. Leggett et al. (2004) similarly suggested a link between science students' perceived importance of specific skills and assessment, since student open ended responses, as in the present study, mirrored the assessment tasks. The authors also questioned whether students' perceptions changed because they were absorbing the culture of the school as they identified increasing alignment of student perceptions of importance of specific skills as they progressed through the degree with those of their lecturers, a finding also found in the present study (results not shown). In the final year of the Bachelor of Animal and Veterinary Bioscience with small student:staff ratio this close interaction with staff in supervised research project work would more easily foster an inculcation of the values and skills of research in what is a research intensive Faculty.

By retrospectively analysing the importance of GAs as students progress through the curriculum the impact of those tasks on students' perception of GA development can be tracked. In a climate of limited resources this is essential. By removing ineffective assessment tasks the time can be constructively spent on activities that will have an impact on student learning and more authentic activities can be developed to ensure student engagement in the development of the attributes.

The mapping of graduate attributes through a curriculum is used to ensure there is a sequential development of the skills and attributes in a horizontal and vertical manner. Articulation of this ordered development of attributes to students (and staff) is a challenge requiring constant attention. It is clear that understanding of GA development is not widespread, yet would help students to make some sense of seemingly endless assessments and help them to see how mastery of one skill forms one link in the chain of development of an attribute across the degree program. If this is not clearly done through the ILO, and particularly the grade descriptors then, as demonstrated in the open ended responses of students in the present study, students are unable to judge the sequential development of attributes but see these tasks as more of the same.

First year students scored the clusters of attributes of EPSU and PIA highest even though there was no emphasis on development of these attributes. The Ethics cluster of attributes could be classed as value focused and thus represents the individuals personal philosophy. There was little change in the student perceptions of importance of this cluster until the fourth year. The tasks undertaken in third year to develop GAs of EPSU and PIA have had little impact and require further review.

Whilst the importance of assessable tasks to development of attributes has been discussed, Haigh and Kilmartin (1999) reported final year geography students recognised they developed or practised more attributes than those on which they were assessed. This could also be the case in the fourth year students in the present study. To successfully complete their honours thesis students would need to use many of the attributes they have developed over the preceeding three years without necessarily obtaining direct or explicit marks for their demonstration.

Students in the final year of study are coming to the end of one journey but they are also looking forward to the next stage, that of further study or employment. Thus as they begin to apply for positions the graduate attributes may develop a more important currency than held in previous years as students come to value the attributes that can potentially win them jobs. Appreciating and presenting them to prospective employers as a measure of their employability may be a strong driver of their perceived importance to the fourth year students.

Conclusion

The five clusters of graduate attributes for the Bachelor of Animal and Veterinary Bioscience are all reported to be important by the time students reach the final year of the degree. There is an increase in the perception of importance of all attributes as students progress from first to second year but there is a stagnation in reported importance by third year students. This may result from poor articulation to students through ILO and grade descriptors of the sequential development of attributes from novice to more experienced. It is important this should be clarified for students by staff since staff and student time and resources may be being spent unwisely in an effort to develop attributes. By attempting to increase the impact of authentic assessment activities on the sequential development of GAs, student perceptions of their importance may also be increased.

References
Barrie, S. C. (2004). A research-based approach to generic graduate attributes policy. *Higher Education Research & Development*, *23*(3), 261-275.

Barrie,S. C. (2007). A conceptual framework for the teaching and learning of generic graduate attributes. *Studies in Higher Education*, *32*(4), 439-458.

Bowden, J., Hart, G., King, B., Trigwell, K. & Watts, O. (2000). *Generic capabilities of ATN university graduates* Retrieved June 13, 2009 from http:/www.clt.uts.edu.au/ATN.grad.cap.project.index.html

Haigh, M. J. & Kilmartin, M. P. (1999). Student perceptions of the development of personal transferable skills. *Journal of Geography in Higher Education*, *23*(2) 195-206

Leggett, M., Kinnear, A., Boyce, M. & Bennett, I. (2004). Student and staff perceptions of the importance of generic skills in science. *Higher Education Research and Development*,*23*(3),295-312.

Prosser, M. & Trigwell, K. (1999). *Understanding learning and teaching.* Buckingham: SRHE and Open University
    Press.

Taylor, R.M & Collier, M. (2008). *Writing critically about science: a curriculum structure for animal scientists.* Paper
    presented at 2008 Uniserve Science Symposium. Retrieved June 13 2009 from
    http://science.uniserve.edu.au/pubs/procs/2008/207.pdf