Effects of field of study on university students' attitudes towards animal issues

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Abstract

The field of study of university students may influence their attitudes towards animals, which in turn may influence their behaviour. Attitudes to animals in university students in eleven countries were obtained by survey, and the influence of field of study was evaluated after correcting for other influential factors. Students of agriculture were most accepting of killing animals, unnatural practices on animals, animal experimentation and animal rights issues, whereas humanities and arts students were less accepting of unnatural practices on animals and animal experimentation than students of other disciplines. Nevertheless, agriculture students had one of the highest proportions involved in animal protection organisations. It is suggested that regular contact with animals inures agriculture students to animal issues, whereas students in the humanities and arts, that have less contact with farm animals, have greater concern.

Keywords: *animal rights, animals, animal welfare, students, study area, university*

Introduction

Attitudes play a central role in determining people's intention to perform specific behaviours (Azjen 2005). They derive principally from people's beliefs regarding the consequences of actions, normative beliefs concerning behaviours expected by others, and control beliefs regarding the feasibility of behaviours (Azjen 2005). Attitudes towards animals are affected by many psychosocial factors that have been described in detail, often with tertiary students as questionnaire respondents, eg gender, pet-keeping behaviour and culture (Izmirli & Phillips 2011; Phillips *et al* 2011, 2012).

Students' subject of study is one factor that has rarely been explored, but is likely to be related through both the students' selection of topics that match their interests and behaviour and also the influence that their study has on their attitudes. Torkar *et al* (2012) found a correlation in university students of education (biology or primary) between a positive attitude towards biology and that towards animals. Hagelin *et al* (2000) reported that agriculture, pharmacy, biomedicine and physician students were more likely than nursing students to approve of xenotransplantation, a contentious use of animals to donate body parts to humans. However, Pearce *et al* (2006) reported no difference between arts and science students in their support for the practice.

The research described in this paper was part of a cross-cultural study into attitudes towards animals in Eurasian students (Izmirli & Phillips 2011; Phillips *et al* 2011, 2012). The objective of this part of the study was to determine the extent to which students' area of study influenced their attitude to animal welfare and rights, and whether this related to concern for other social issues.

Materials and methods

The survey method utilised responses from 3,462 students from approximately 103 universities in eleven Eurasian countries. Survey method and responses concerning food avoidance (Izmirli & Phillips 2011), nation and ethnic group (Phillips *et al* 2012), differences between male and female respondents (Phillips *et al* 2011) and extent of support for animal protection organisations (Phillips & Izmirli 2012) have been documented previously. In brief, a call was distributed through relevant organisations, eg the International Society for Applied Ethology, for volunteer academic collaborators to organise a survey of students' attitudes to social issues, in particular animal management, in their country. Suitable collaborators volunteered in 21 countries worldwide, but those in nine countries dropped out over the course of the project, leaving 12 countries as a convenience sample. Subsequently, one country, Portugal, was also excluded because of low response rates. Those remaining represented a broad spectrum of cultures and geographical regions of Europe and Asia (China, Czech Republic, Iran, Ireland, South Korea, Macedonia, Norway, Serbia, Spain, Sweden and United Kingdom). In all cases except Norway and Sweden, where access by e-mail to the entire student populations in the selected universities was possible, collaborators organised a team of student volunteers to recruit respondents in a sample of universities in their country. Where possible, the universities were selected at random, but in some countries a convenience sample was used. The target number of respondents in each country was related to the population, and results were weighted to correct for

variation from this target. If they agreed, students were asked to give their e-mail address to the volunteer, in order that a weblink to the survey could be sent at a later date.

Student volunteers approached students at a central location in the university (not related to any subject area) and asked them if they would take part in a social survey. This phraseology was anticipated to avoid the potential bias of students interested in animals being more likely to complete a survey on animals if asked to do so. A pilot survey informed the development of the survey (Phillips *et al* 2012). The majority of responses were received from students in 103 universities in the main survey, providing a broad spread of the tertiary education sector.

The survey format and content were discussed and agreed by all collaborators, and the survey was then translated by the collaborators into the native language, since these people were most familiar with the animal welfare terminology used. Where possible, the translated versions were translated back into English and changes made in the case of discrepancies, and in all cases the survey meaning and translation were checked by a third party for accuracy and consistency of meaning, in conjunction with the collaborator.

Students were asked questions about the acceptability of animal and world issues using a five-point scale, from 1, extremely unacceptable to 5, extremely acceptable, with an alternative option of indicating that they were not familiar enough with the issue described to decide. Least square mean 'unacceptability values' for each student were derived from these responses. The 43 animal issues were based on the major human concerns about our use of animals and were designed to be culturally neutral, with approximately five questions for each (Table 1). Thirteen questions were asked concerning major world social issues (Table 2), with students asked to give their opinion about how important each was to them, on a scale of 1, not important, to 7, extremely important or to indicate that they were not familiar enough with the issue to decide (Meng 2009).

Students were also asked to state their major subject of study, from: Agriculture, forestry and fishery; Architecture and building; Arts; Business and administration; Computing; Engineering and engineering trades; Environmental protection; Health; Humanities; Journalism and information; Law; Life sciences; Manufacturing and processing; Mathematics and statistics; Personal services; Physical sciences; Security services; Social and behavioural science; Social services; Teacher training and education science; Transport services; Veterinary; and Other. Clarification of the breakdown of subjects was given according to International Standard Classification of Education (ISCED 1997), developed by the United Nations Educational, Scientific and Cultural Organisation. The classifications were aggregated into nine overarching categories recognised by ISCED: Agriculture (agriculture, forestry, fishery and veterinary); Education (teacher training and education science); Engineering, Manufacturing and Construction (engineering, manufacturing, processing, architecture and building); Health and Welfare (including

medicine, medical services, nursing, dentistry, social care and social work); Humanities and Arts (religion, theology, languages, linguistics, history, archaeology, philosophy, fine and performing arts); Science (life and physical sciences, mathematics, statistics, computing); Service (personal, transport and security services, environmental protection); Social Science, Business and Law (social and behavioural science, psychology, geography, economics, journalism, finance, accounting, management, real estate). This classification was included in the analysis of variance model, along with other factors previously reported upon.

Students indicated which year of undergraduate study they were in (Undergraduate year 1–5+), Master's, PhD or other. This classification, when included in the model, did not significantly ($P > 0.05$) influence attitudinal scale results, and is therefore not reported. Students were also asked whether they lived in a rural, urban or metropolitan region, which also did not influence attitudinal scale results and is not reported.

Students were asked whether they had ever supported animal protection organisations (with two examples of support given: by being a member and donating money). The options were: 1) never; 2) sometimes; 3) very often; and 4) I am a key member of an animal protection organisation.

Statistical analysis

Data were initially cleaned and examined for potential sources of bias (Meng 2009; Phillips & Izmirli 2012). Principal Component Analysis of this data, with Varimax rotation, was used to identify indices for attitudes that represented concerns for animal welfare, rights, unnatural practices on animals, killing animals, animals in experiments, wildlife, using animals as spiritual symbols (Meng 2009). The formulae for creating the index scores from the 1–5 rating by each respondent for the acceptability of each issue (see Table 1 for text) are presented in Table 3 (listing the issues in declining order of importance for each index). Coefficients indicate weights given to each issue and R^2 indicates the proportion of total variation attributed to the index. Once the components of the indices had been determined by PCA, the coefficients were determined by linear regression, with removal of Issues with a small sum of squares. The final model used had a normal distribution of residuals.

Models with different numbers of factors from 1 to 43 were tested and a model with six factors was chosen. The six factor model was also chosen because more factors created unacceptable overlap in the indices and had just one or two issues with high loadings. All indices had Eigen-values greater than one, a commonly accepted criterion for when to stop extracting factors, and included issues with loadings ≥ 0.20. In addition, removal of animal issues from the regression equation determined as described above proceeded until the residuals approximated 80%.

The Animal Rights index was comprised predominantly of questions about the uses and integrity of animals, with one question about killing of young animals. The Animal

Table 1 The forty-three animal issues, A1-A43, listed by the eight major concerns identified, with their contribution to indices[†‡].

1 Use of animals	A1 Keeping animals for the production of food or clothing (**AR**, *KA, AE*)
	A2 Keeping animals as pets (*AR*, AW, *UP, W*, **SS**)
	A3 Keeping animals for the education of the public in zoos, wildlife parks, etc (**AR**, UP)
	A4 Using animals for work (AR, **KA**)
	A5 Using animals for entertainment or sports (AR, *AW*)
2 Animal integrity	A6 Operations on animals to improve their health (**SS**)
	A7 Decoration of animals, such as dying or cutting their hair for aesthetic reasons (*AR*, UP)
	A8 Desexing by hormone implants (**AR**, UP, KA, AE)
	A9 Removal of a body part, such as tail docking, or declawing (*AR, AW, W*, SS)
	A10 Marking animals by branding or ear-notching (AR, *UP*)
	A11 Removal of dead tissue, such as hair/wool removal or foot trimming (**KA**)
3. Killing animals	A12 Killing young animals that are dependent on their parents (**AR**, AW, *UP, KA*)
	A13 Allowing animals to experience pain during slaughter (**AW**)
	A14 Using animals for products after their natural death (**KA**, W)
	A15 Killing animals when they are seriously injured or ill (KA)
	A16 Euthanising healthy and unwanted pets because of overpopulation (W)
4 Animal welfare	A17 Depriving animals of their needs for food and water (**AW**)
	A18 Depriving animals of an appropriate environment to rest, including shelter (**AW**, *AE*)
	A19 Inflicting pain, injury or disease on animals
	A20 Not providing sufficient space, proper facilities and company needed for animals (*KA, W*)
	A21 Subjecting animals to conditions and treatment which cause mental suffering
5. Experimentation on animals	A22 Observing animal behaviour in an experiment (**KA, W**)
	A23 Experiments to improve animal welfare or health (**AE**, SS)
	A24 Medical experiments using animals to improve human health (AE)
	A25 Testing cosmetics or household products on animals (*W*)
	A26 Operating on living animals for the benefits of human medicine research (**AE**)
6 Changes in animals' genotypes	A27 Increasing animals' reproductive or productive capabilities by genetic changes, eg cows producing more milk (**UP**)
	A28 Increasing animals' health or disease resistance by genetic changes (**UP**, *SS*)
	A29 Creating farm animals that feel happy with little stimulation and have little desire to be active (SS)
	A30 Genetic selection of pet animals, such as dogs and cats, to increase their rarity, potential for showing or pedigree value (**UP**, **AE**)
	A31 Genetic modification of crops grown for animal foods (**UP**)
7 Animals and environment	A32 Killing animals because they are not native to the area in which they live (KA)
	A33 Killing wild animals to stop the spread of diseases that could affect humans (*AE*, **W**)
	A34 Controlling wildlife populations by killing (**W**)
	A35 Controlling animal populations by sterilisation (*SS*)
	A36 Destroying the habitat of endangered animal species (UP, KA, **AE**, **W**)
	A37 Destroying the habitat of non-endangered animal species to develop and promote urbanisation or crops to feed humans (AE, **W**)
8 Societal attitudes towards animals	A38 Sacrifice of animals in religious rites (*SS*)
	A39 Considering some animal species as sacred or good luck symbols or totems (**SS**)
	A40 Considering some animal species as evil or bad luck (**SS**)
	A41 Parents displaying cruel treatment of animals in front of their children
	A42 Inflicting pain or injury on animals as part of cultural traditions (SS)
	A43 Cloning animals for human benefit (AE)

[†] AR = Animal rights; AW = Animal welfare; UP = Unnatural practices; KA = Killing animals; AE = Animals in experimentation; W = Wildlife; SS = Spiritual symbols. [‡] Top four, middle four and bottom three contributing issues are given as bold, normal and italic font, respectively.

Table 2   Short descriptions of major world social issues included in the survey, with their contribution to the World Issues index[†].

W1 Animal protection
W2 Professional ethics
W3 Capital punishment
W4 Environmental protection
W5 Racial equality
W6 Genetic engineering
W7 Equality for lesbian, gay, bisexual and transgender
W8 Human cloning
W9 Human euthanasia
W10 Reducing poverty
W11 Sustainable development
W12 Women's rights
W13 Peace and security

[†] Top five, middle five and bottom four contributing issues are given as bold, normal and italic font, respectively.

Welfare index was drawn from questions in the animal welfare and killing animals sections, as well as removal of body parts, The Unnatural Practices on Animals was mainly drawn from questions in the 'Changes in animals' genotypes' section. The Killing Animals index was less clear than the previous indices, but had animal death as its most common theme. The Animals in Experimentation index had questions from the 'Experimentation on animals' section as most important. The Wildlife index had questions from the 'Animals and the environment' section in the top four contributors, then a variety of related questions. A similar factor analysis was conducted for the World issues that summarised attitudes to these issues in one value, containing the issues listed in Table 3, in order of declining importance.

Logistic regression, ANOVA and Chi-squared analyses were compared in terms of their effectiveness for modelling the data. Both logistic regression and ANOVA gave similar and more discriminating results than Chi-squared and the residuals either approximated or could be manipulated to a normal distribution, hence ANOVA was selected for its flexibility for modelling the data. ANOVA included nation, ethnic group (nested within nation), gender, level of education, area of study, place of residence, religious affiliation, food avoidance and reasons why food was avoided and animal protection organisation participation in the model. The residual data distribution was examined and where necessary the data was transformed to approximate a normal distribution in the residuals. This was only required for one variable, the Animal Welfare index, and a squared function gave the necessary approximately normal distribu-tion of residuals. The dependent variables entered into the model included level of support for animal protection organisations, area of study, level of education, nation, ethnic group (nested within nation), gender, place of residence, religious affiliation, food avoidance and reasons why food was avoided. When ANOVA revealed a signifi-cant difference in the area of study, then 2×2 comparisons were run with Student's t-test.

Results

The largest number of students studied Agriculture, then Social science/business/law and Science (Table 4). Engineering and related fields, Humanities/arts and Health/welfare had intermediate numbers of students. The smallest numbers were in Service and Education. As expected, the gender distribution varied with study area, with female to male ratio being particularly high for Education, and to a lesser extent Health/welfare and Humanities/Arts, and low for Engineering and related subjects. There were no significant interactions between the effects of gender and field of study ($P > 0.05$), and gender did not influence field of study results, as the statis-tical model included both of these as factors. There were no significant effects of place of residence or level of education on the indices ($P > 0.05$).

Attitudes to animal welfare were not influenced by subject of study (Table 5), using values that were squared to achieve normal distribution of residuals. However, students of Agriculture and to a lesser extent Science found animal rights issues more acceptable than students of Education and Other disciplines. Similarly, Agriculture students found unnatural practices on animals more acceptable than other students, with students of Humanities/Arts finding these least acceptable. Killing animals was also most accepted by students of Agriculture, and least accepted by students in Social Science/Business/Law. Animal experimentation was most accepted by students of Agriculture, Science and Service, and least accepted by Humanities/Arts students. Field of study did not affect attitudes towards wildlife or using animals as spiritual symbols. World issues of concern were considered most important by students of Engineering, Manufacturing and Construction, then Health/Welfare, Agriculture and Social Science/Business/Law.

Participation in Animal Protection Organisations was highest in students in the Service study area, then Agriculture (Table 6).

Discussion

The study found that agriculture students were most accepting of killing animals, unnatural practices on animals, animal experimentation and animal rights issues, but there was no effect of subject of study on the scores for the indices relating to animal welfare, wildlife or use of animals as spiritual symbols. Conversely, humanities and arts students were less accepting of unnatural practices on animals and animal experimentation than students of other disciplines.

The titles of the indices for this study were subjectively chosen, but clear differentiation between the indices is

Table 3   Animal indices and the corresponding animal issues from which they were formulated, and the World Issues index, with the corresponding world issues from which it was formulated.

Index title	Equation	R^2
Animal rights	$104 - 2.6\,A8 - 2.4\,A1 - 1.9\,A12 - 1.8\,A3 - 1.6\,A13 - 1.6\,A10 - 1.6\,A5 - 1.5\,A4 - 1.2\,A9 - 1.1\,A7 - 0.8\,A.2$	16.9
Animal welfare	$98.8 - 6.2\,A18 - 5.2\,A13 - 4.3\,A17 - 2.7\,A12 + 2.5\,A2 - 1.6\,A9 - 0.5\,A5$	15.9
Unnatural practices on animals	$116 - 4.0\,A28 - 3.9\,A30 - 3.4\,A27 - 3.0\,A31 - 2.5\,A3 - 2.2\,A7 - 2.3\,A36 - 1.9\,A8 + 1.9\,A12 + 1.9\,A10 - 1.7\,A2$	10.1
Killing animals	$107 - 3.6\,A14 - 3.4\,A22 - 3.1\,A11 - 3.1\,A4 - 2.8\,A15 + 2.6\,A36 - 2.3\,A32 - 2.2\,A8 - 2.0\,A1 - 2.0\,A12 + 2.0\,A20$	9.3
Animals in experimentation	$115 - 5.2\,A24 - 4.0\,A26 - 3.5\,A23 + 3.3\,A36 + 2.2\,A8 + 2.2\,A30 + 1.9\,A37 - 1.9\,A43 - 1.8\,A33 - 1.8\,A1 + 1.7\,A18$	6.7
Wildlife	$92 - 4.9\,A37 - 4.4\,A33 - 4.1\,A36 - 3.2\,A34 + 2.7\,A22 - 2.6\,A16 + 2.2\,A14 - 2.0\,A20 + 1.9\,A25 - 1.8\,A2 - 1.8\,A9$	6.2
Animals as spiritual symbols	$108 - 6.5\,A39 - 5.6\,A40 - 4.9\,A2 - 3.1\,A6 - 2.3\,A42 - 2.2\,A9 - 1.8\,A23 + 1.8\,A29 - 1.8\,A38 + 1.5\,A35 - 1.3\,A28$	4.0
World issues	$0.17\,W4 + 0.16\,W10 + 0.16\,W11 + 0.16\,W12 + 0.16\,W5 + 0.15\,W13 + 0.15\,W1 + 0.15\,W2 + 0.1\,W7 + 0.09\,W3 + 0.09\,W6 + 0.08\,W9 + 0.04\,W8$	7.9

Coefficients indicate weights given to each issue and R^2 indicates the proportion of variability attributed to the index.

evident from a brief perusal of the contributing issues, listed in Tables 1 and 3. In particular, although there may be concern that the Animal Rights index does not necessarily indicate concern for animal rights, the Issues included in this index represented the following: all of the Uses of animals, as well as damaging their integrity and arguably the most potentially offensive of the Killing animals Issues, that of killing young animals that are dependent on their parents. Before deciding on the term Animal Rights, Meng (2009) studied the meaning of the term according to a wide variety of organisations and experts, including WSPA, RSPCA, RSPCA-AU, PETA, Australian Animal Welfare Strategy, Tom Regan, Peter Singer and Gary Francione. The mathematical derivation of the indices indicates that they are precise constructs used by the students in their responses, but the exact concepts in the students' minds remains open to further definition.

One reason for the apparent increased acceptability of animal rights issues by Agriculture students may be because they have most involvement with production animals and are likely to have to distance themselves from ethical issues, even though Torkar *et al* (2012) found that regular contact with animals, particularly those considered pleasant, improved attitudes towards animals in education students. Conceivably, the type of involvement of Agriculture students, including engaging in harmful practices, such as tail docking or teeth clipping, is more challenging to their personal ethics than the experiences of the students of education. When practising in the agricultural industries, frequent exposure may inure students to animal issues. Students therefore become accepting of animal suffering to ensure their survival in the industry. Other studies have found that students that aspire or elect to work with livestock have less sympathetic attitudes towards profit and pest animals than students electing to work with other types of animals (Levine *et al* 2005; Hazel *et al* 2011). The lack

Table 4   Number and gender of students for each field of study.

Area of study	Female	Male	Total	Chi-square	*P*-value
Health/welfare	236	123	359		
Science	298	297	595		
Service	87	93	180		
Education	94	20	114		
SBL[†]	389	262	651	142.6	< 0.001
EMC[‡]	158	273	431		
Humanities/Arts	198	120	318		
Agriculture	377	294	671		
Other	66	46	112		
All	**1,903**	**1,528**	**3,431**		

[†] Social science, business and law; [‡] Engineering, manufacturing, construction.

of effect of year of study in this survey suggests that attitudes were established before entering university and were not changed by the teaching programme.

Another possibility to explain the increased acceptability of animal rights issues by Agriculture students is that these students working with animals have a better understanding of the issues, have thought them through more deeply and decided to accept the animal rights implications. Involvement in any kind of animal-related activity is associated with better knowledge of the species engaged (Serpell 2004). However, in companion animals, increased experience produces more positive attitudes towards the animals (Fidler *et al* 1996; Fidler 2003; Daly & Morton 2009), and it is not clear if this trend would be maintained with farm animals.

Table 5   The effects of university students' area of study on mean unacceptability values for indices relating to Animal Welfare, Animal rights, Unnatural practices on animals, Killing animals, Animals in experiments, Wildlife, Using animals as spiritual symbols and on mean importance values for World issues.

Area of study	Animal welfare issues	(Animal welfare issues)^2*	Animal rights issues	Unnatural practices on animals	Killing animals	Animals in experiments	Wildlife	Using animals as spiritual symbols	World issues
Agriculture	82.1	6,811	59.9[d]	59.6[c]	44.5[d]	67.9[c]	56.4	53.5	9.4[ab]
Education	82.9	6,902	64.6[ab]	67.6[b]	53.4[ab]	71.3[bc]	57.6	53.5	9.0[cd]
EMC[†]	82.3	6,865	64.0[bc]	67.4[b]	50.8[bc]	73.7[ab]	57.0	52.5	9.5[a]
Health/welfare	82.0	6,761	63.0[bc]	65.9[b]	49.4[bc]	68.9[c]	58.6	55.9	9.4[ab]
Humanities/arts	81.9	6,776	64.3[b]	70.4[a]	50.9[bc]	75.1[a]	59.2	51.4	9.3[b]
Science	81.7	6,786	62.7[c]	66.2[b]	49.9[bc]	69.3[c]	58.3	52.1	9.0[cd]
Service	82.9	6,969	63.0[bc]	68.8[ab]	48.9[c]	69.1[c]	60.5	50.8	9.1[c]
SBL[‡]	80.8	6,636	62.5[c]	66.3[b]	51.3[b]	71.4[bc]	57.1	50.7	9.4[ab]
Other	80.4	6,566	65.9[a]	71.4[a]	54.1[a]	72.1[b]	60.1	56.2	8.9[d]
SED	–	27.6	0.68	1.21	0.98	1.01	0.94	1.05	0.08
P-value	–	0.82	0.009	< 0.001	0.001	< 0.001	0.46	0.06	< 0.001

High values indicate low levels of acceptance and, in the case of World issues, high levels of importance (means with different superscripts are significantly different, $P < 0.05$, by Student's *t*-test).
* Squared values of scores on the Animal welfare index, to provide normally distributed residuals.
[‡] Social science, business and law.
[†] Engineering, manufacturing, construction.

Table 6   Participation of students for each field in animal protection organisations.

Area of study	Never	Sometimes	Very often	Key member	Total	Chi-square	*P*-value
Health/welfare	202	133	23	1	359		
Science	316	227	35	17	595		
Service	83	66	19	12	180		
Education	57	47	9	1	114		
SBL	406	214	21	10	651	77.4	< 0.001
EMC	245	154	26	6	431		
Humanities/Arts	169	125	19	6	319		
Agriculture	365	221	55	30	671		
Other	60	45	7	0	112		
All	**1,903**	**1,232**	**214**	**83**	**3,432**		

Agriculture students had one of the highest levels of involvement in animal protection organisations. Significant involvement of Services students in APO was expected as these students are involved in caring professions. The major involvement of Agriculture students suggests that they welcomed involvement with animals, and it is expediency, rather than planned behaviour, that leads to less concern for animal rights. Modern animal production systems require large numbers of animals to be managed by few people, with little opportunity for them to care for individual animals in a way that they might care for companion animals, for example. Internal disagreement, or dissonance, may lead a person to engage in damage reduction measures, one of which is to deny the existence of challenges to animal rights by management practices (Prunty & Apple 2013). Such modification of attitude is necessary to avoid accusations, internal or external, of hypocrisy. Accountability is an important self-motivating factor.

The absence of effects on the animal welfare index suggests that students of agriculture do not deny that welfare is

adversely affected by some modern farming systems, but they justify such suffering in their own minds, probably as essential for large quantities of food production or maintenance of affordable food. Thereby, students are able to maintain their own self-belief in concepts of honesty and ethics, whilst either denying that animal rights issues exist, or that they are responsible (Bandura 2002).

Overcoming cognitive dissonance appears sometimes to be more important in relation to animal suffering than that relating to human suffering. Whereas a greater knowledge of animal management appears to inure agriculture students to any suffering, a greater understanding of the perspectives of rape and domestic violence victims increases empathy towards their plight (Intons-Peterson *et al* 1989). Conceivably, this is because by far the majority of agriculture respondents are necessarily participants in animal suffering, in learning and practising some of the more harmful but necessary management techniques in modern animal husbandry systems and even as consumers of animal products, rather than innocent bystanders, as in the case of rape victims and victims of domestic violence.

The ISCED classification of the subject areas combined students of agriculture and veterinary science. This may hide significant differences between these two related study fields. Hazel *et al* (2011) found that an animal welfare course improved attitudes of veterinary students towards animals, but not animal science students.

Future research

Although the geographical definition of the respondents was clearly defined and wide-ranging, further research could usefully identify which family environment they come from and, in particular, whether their parents were farmers or not. Some demographic factors that were considered likely to be driving attitudes in this socioeconomic sector of the population, place of residence, ethnicity and religious affiliation, had no effect on the indices, allowing inclusion of other factors in future studies. Differences in attitudes towards different animal groups (eg animals for food, companionship, sport) might also be expected and could be explored. Further use of these indices will determine their long-term value and allow them to be refined to be of use to populations outside the student groups studied. The survey was deliberately and necessarily limited to this influential sector of the population, but it is important to find means to survey opinions outside this sector.

Animal welfare implications and conclusion

Agriculture students were most accepting and Humanities/Arts students least accepting of animal issues that commonly cause concern to people. This may relate to their behaviour when they enter the workforce, with former agriculture students sometimes engaging in behaviour towards animals that is not supported by former humanities/arts students. This occurs due to the need to overcome cognitive dissonance when students are regularly faced with animal suffering. Agriculture students also engaged in animal protection organisations more than students from most other disciplines, demonstrating that there is a desire on the part of some students to be involved in animal advocacy.

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