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# Internationalization of the animal science undergraduate curriculum: A survey of its current status, barriers to its implementation and its value<sup>1</sup>

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**ABSTRACT:** The goal of this project was to identify the current level at which internationalization has been adopted as a theme in the North American animal science curriculum and to identify its value and the barriers to its implementation. We surveyed animal, dairy, and poultry science departments across Canada and the United States. One hundred twenty-four surveys were mailed and 60% were returned. Associations between aspects of internationalization and student outcomes (admission to veterinary and graduate schools and starting salaries) were examined. Although administrators strongly believed internationalization had value, implementation was limited. The most common practices included international content in core animal science classes, advising, international internships, and participation of faculty in international scholarly activities. Few departments have incorporated internationalization into their mission statements or developed a specific international-themed class, scholarships de-

voted to international activities, or roles for international students. Few departments reported participation of students in international programs. Barriers included finances and limited commitment from higher administration. Student outcomes were positively associated with faculty size, percentage of international faculty, the ratio of international students to the total student population, international content in core animal science classes, a specific international-themed class, availability of international internships, and exchange of class material internationally via the Internet. Departments that did not offer international opportunities had a negative association ( $r = -0.79$ ) with starting salary, but these relationships may not be causal. Alternatively, progressive departments may attract and retain exceptional students. The analysis indicated an awareness of the value of international programs, positive impacts in student outcomes, and financial barriers to implementation.

Key Words: Agriculture, Curriculum, Globalization, Science Education, Surveys

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## Introduction

The traditional animal science curriculum has provided technical skills and theoretical knowledge relating to livestock production within the context of general university requirements. The former provides skills relating to the academic major, whereas the latter is relied upon to provide “general education.” Students, with

assistance from mentors, are expected to make links between these two educational contexts and thereby develop the ability to apply their major to societal needs.

Within the last decade, changes in society have placed the animal science curriculum at the forefront of many of society’s contemporary challenges. Animal science students now need training not only in animal biology and management, but also an understanding of the implications of livestock production to the environment, to animal rights, to genetic manipulation, to exotic, previously unknown diseases, to xenobiology, and to issues relating to industrialization of livestock production. The World Trade Organization and North American Free Trade Agreement have provided impetus for shifting of U.S. and Canadian agriculture to countries with lower costs of production. Prominent writers (e.g., Thurow, 2000) have observed that the United States has passed through its agricultural and industrial phases, is presently in a technological phase, and is evolving into a knowledge-based economy. Many now

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question the future of U.S. agriculture. And consequently, we must also ask, "How should the animal science undergraduate curriculum be designed to prepare students adequately for rapid changes that will present themselves during their careers?"

Among the need to modernize the undergraduate curriculum, "internationalization" and "global competence" are facets of education that have often been overlooked in undergraduate programs (Slater, 1998). In the last decade, several reports have encouraged this process (AIEA, 1995; ACE, 1998; Scott, 2000; Hayward and Siaya, 2001). A study (Carlson et al., 1990) on the impacts of study abroad programs reported that there are life-long meaningful impacts of such programs. For example, students who had completed study abroad programs were more likely to complete graduate educations than students who did not participate in study abroad programs. Despite these encouraging results, colleges of agriculture are near the bottom of participation rates in international programs (Open Doors, 2001). Causes for this are not clear.

No studies have evaluated the relevance of internationalization to agriculture-based programs. Yet, internationalization is important to our students' futures. All of the emerging issues that are challenging American agriculture include an international dimension. It is the authors' thesis, therefore, that internationalization of the undergraduate curriculum has merit and is deserving of consideration within animal science departments. To test this hypothesis, to evaluate the barriers that prevent students from participating in international experiences, and to identify perceptions and impacts of internationalization of animal science curricula, an international survey (Canada and United States) was completed. Our goal was to establish a baseline for the process of internationalization in the North American animal science curriculum and to determine if this aspect of the undergraduate curriculum has merit.

## Materials and Methods

A four-page survey (available at <http://oregonstate.edu/dept/animal-sciences/anscisurvey.doc>) was constructed with the assistance of Oregon State University's Survey Research Center. Approval of the survey was obtained from Oregon State University's Human Subjects Review Committee prior to its dissemination. The survey was divided into four sections (Parts A to D). Part A collected demographic information on the recipients' universities and departments (Questions 1 to 7) and information on international activities available within undergraduate programs of each department (Part A, Question 8a to 8i). Part B surveyed perceptions of internationalization. Embedded were questions designed to ascertain the barriers to internationalization (Questions 3 to 11). Part C of the survey collected information that allowed evaluation of relationships between the internationalization and

outcomes. Associations between internationalization and three student outcomes (acceptance to veterinary school, entry into graduate school, and starting salary) were evaluated. Part D of the survey allowed for open-ended responses from the recipients. The survey was mailed to all department heads and chairs of animal, dairy and poultry science departments across Canada and the United States ( $n = 124$ ) in January 2001. After 6 wk, a reminder was mailed to all recipients who had not responded to the first query. Surveys were returned by May 2001, after which data compilation and statistical analysis were completed.

Descriptive statistics were calculated with the use of SAS (SAS Inst., Inc., Cary, NC). Mean responses and SD for Part A, Questions 1 to 5 were calculated. Proportions of respondents replying to Part A, Questions 6 and 7 (a, b, or c) were calculated as were the number of respondents that offered the various forms of internationalization as outlined in Question 8 ("a" through "i"). The mean and median responses to all questions in Parts B and C also were tabulated.

Measures of association between all responses in Part A and student outcomes were completed (Bailey, 1994). Because Questions 1 to 5 (Part A) were continuous variables, associations were estimated by Pearson correlation coefficients. Because Questions 6 to 8 were binomial variables, associations were estimated by phi coefficients (Bailey et al., 1994). Measures of association were also assessed in Part B. Because responses to Part B are ordinal variables, associations were estimated by gamma or Yule's  $Q$  (Bailey, 1994).

Associations were evaluated (by using correlation coefficients) among various aspects of departmental international programs with student outcomes (acceptance to veterinary or graduate school, starting salary) within the entire data set and also within medium to large (>15,000 students) universities. Conducting analysis on this cohort of universities allowed us to focus on the most common university model. Statistical significance was inferred when  $P < 0.05$  or when associations were  $>0.5$  or  $<-0.5$ . Analyses were completed by SAS.

## Results

Responses to Part A, Questions 1 to 5 are given in Table 1. Mean faculty size of animal, dairy, or poultry science departments was 18.7 faculty, of which an average of 0.9 faculty (4.8%) were not Canadian or U.S. citizens. The average university size was 17,554 students with 287 students in the undergraduate major. Within the animal science major, the average enrollment of international students was 8.7 students (1.2%). Nineteen percent of departments required internships and 12% required a senior thesis. Seventy-seven percent of departments offered some aspect of internationalization. "Internationalization" was included in 24% of the departments' mission statements. Thirty-seven percent of departments offered international content in core classes. Nineteen percent of departments offered

**Table 1.** Numbers of faculty, numbers of international faculty, student numbers in university, student numbers in major, and international student numbers in Canada and U.S. universities

Item	Mean	SD	Maximum	Minimum	Responded, No.
Faculty size	18.69	12.19	50	1	74
International faculty	0.9	1.2	5	0	73
Students, total	17,554	12,342	52,000	800	75
Students in major	287.32	204.09	1043	20	75
International students in major	8.67	11.2	50	0	68

an international-themed class. Seventy-two percent heightened student awareness of international opportunities through advising. Forty-four percent offered international internships. Twenty-six percent offered scholarships for international activities of students. Thirteen percent provided roles for international students. Five percent either received or delivered Web-based classes internationally. Finally, fifteen percent of departments offered other forms of international opportunities (Part A, Question 8i). These included international exchange programs ( $n = 4$ ), workshops ( $n = 1$ ), offering courses at overseas locations ( $n = 1$ ), accepting summer foreign students into research laboratories ( $n = 1$ ), and development of an international understanding class as part of an agriculture core curriculum ( $n = 1$ ).

Respondents agreed (score = 1.78) that internationalization was an important aspect of the undergraduate curriculum and agreed (score = 1.79) that demand for graduates who understand international issues is increasing (Table 2). Only one and two respondents, respectively, disagreed with these premises. Respondents agreed (score = 1.76) that the presence of foreign students in the undergraduate program contributed to the personality and intellectual development of domestic students and also agreed (score = 1.59) that interna-

tional experiences enhanced maturity and other personal attributes of undergraduate students. Here, only a small number of respondents (two in each case) disagreed or strongly disagreed with these statements.

Barriers to implementation of internationalization were also evaluated (Table 2). Respondents were neutral (score = 2.89) when asked whether their universities offered adequate opportunities to internationalize and neutral (score = 2.93) concerning the knowledge level of advisors. Respondents mildly supported the premise that their faculty supported internationalization of the major (score = 2.44), but there did not appear to be strong incentive for internationalization from central university administration (score = 2.79). Respondents disagreed slightly (score = 3.40) when asked whether a second language was required to study abroad, but agreed (score = 1.93) that limited finances were a significant barrier to studying abroad. Respondents disagreed (score = 4.06) that university funds to support international involvement of students were adequate. They were neutral (score = 3.03) when asked whether the structure of the major was either so organized or demanding to prevent study abroad. And finally, respondents disagreed (score = 3.90) with the supposition that traveling abroad is not safe.

**Table 2.** Perceptions of the value of internationalization and barriers to its implementation in departments of animal science<sup>a</sup>

Response	Question												
	1	2	3	4	5	6	7	8	9	10	11	12	13
Answer "1"	26	28	6	4	7	10	3	31	1	3	0	27	38
Answer "2"	39	37	22	19	31	17	11	27	0	24	7	35	30
Answer "3"	8	8	21	32	30	25	17	9	12	20	9	7	4
Answer "4"	1	2	23	18	3	16	29	7	39	24	41	1	2
Answer "5"	0	0	1	2	1	3	6	1	19	4	16	1	0
Answer "N"	1	0	1	0	2	3	10	0	3	0	2	2	0
No response or wrong	3	3	4	3	4	4	3	3	4	3	3	5	4
Median	2	2	3	3	2	3	4	2	4	3	4	2	1
Mean	1.78	1.79	2.89	2.93	2.44	2.79	3.40	1.93	4.06	3.03	3.90	1.76	1.59

<sup>1</sup>Responses of 1, 2, 3, 4, 5, and N correspond to strongly agree, agree, neutral, disagree, strongly disagree and not sure/no opinion, respectively. The median and mean responses and numbers of "no responses" are also provided. Detailed questions are available: <http://oregonstate.edu/dept/animal-sciences/research.htm>. Question 1: Internationalization (INT) is an important aspect of the curriculum. Question 2: Demands for graduates with INT understanding is increasing. Question 3: University offers adequate opportunities for INT. Question 4: Advisors are knowledgeable about INT opportunities. Question 5: Faculty support INT. Question 6: Institutional support exists for INT. Question 7: A second language is required for SAB. Question 8: Limited finances are a barrier to SAB. Question 9: University funds to support INT are adequate. Question 10: Curriculum is too demanding/structured to permit INT. Question 11: Traveling abroad is not safe. Question 12: Foreign students contribute to personality and intellectual development of domestic students. Question 13: INT experiences enhance maturity and other personal attributes of our students.

**Table 3.** Student and faculty participation and outcomes<sup>a</sup>

Response	Question					
	1	2	3	4	5	6
Answer "a"	27	15	49	19	9	6
Answer "b"	16	13	18	21	24	36
Answer "c"	31	9	7	11	11	20
Answer "d"	—	10	—	8	20	4
Answer "e"	—	7	—	6	5	0
Answer "f"	—	7	—	3	1	8
Answer "g"	—	13	—	3	1	—
Answer "h"	—	1	—	4	4	—
Median	4	3	4	3	3	4
No. of responses	74	75	74	75	75	74

<sup>a</sup>Detailed questions are available: <http://oregonstate.edu/dept/animal-sciences/research.htm>. Question 1: Employment internationally by graduates in past 3 yr (a = yes, b = no, c = do not know [DK]). Question 2: Percentage of faculty engaged internationally in past 3 yr (a = 0 to 10%, b = 11 to 20%, c = 21 to 30%, d = 31 to 40%, e = 41 to 50%, f = 51 to 60%, g = >60%, h = DK). Question 3: Were any undergraduates engaged internationally in past 3 yr (a = yes, b = no, c = DK). Question 4: Percentage entering veterinary school (a = 0 to 5%, b = 6 to 10%, c = 11 to 15%, d = 16 to 20%, e = 21 to 25%, f = 26 to 30%, g = 31 to 35%, h = DK). Question 5: Percentage of seniors entering graduate school (codes are same for veterinary school entry rates). Question 6: Starting salaries (a = \$20,000 to \$25,000, b = \$25,001 to \$30,000, c = \$30,001 to \$35,000, d = \$35,001 to \$40,000, e = \$40,001 to \$45,000, f = DK).

Respondents were uncertain of the numbers of graduates who were employed internationally (Table 3). Forty-two percent of respondents did not know if any of their graduates were employed internationally in the past 3 yr. Of the remaining respondents, 36% indicated that their graduates were employed internationally during the past 3 yr and 22% indicated that none were employed internationally in the past 3 yr. Departments reported a wide range of international activities by faculty. Participation ranged from 0 to over 60% with 0 to 10% faculty participation representing the mode (20% of respondents). Sixty-six percent of departments reported that undergraduates were engaged internationally during the past 3 yr and 24% reported no participation of their students internationally during the past 3 yr (Table 3).

Acceptance to veterinary or graduate schools and starting salaries are three quantifiable outcomes of the "success" of an undergraduate experience. Sixty-six percent of departments indicated a veterinary school admission rate of 0 to 15%. Higher rates of admission were reported in 23% of departments. The most common acceptance rate into graduate schools ranged from 6 to 20%. Seventy-four percent of respondents indicated these graduate acceptance rates (Table 3). Finally, starting salary (expressed in Canadian or U.S. dollars) was near \$30,000. Forty-nine percent of respondents indicated a starting salary of \$25,001 to \$30,000, whereas 27% indicated a starting salary of \$30,001 to \$35,000. Eleven percent of respondents did not know the average starting salary of their undergraduate students.

Responses to all questions within Part A of the survey showed no significant measures of association (i.e., all  $r$  values were <0.5). Within Section B, however, significant associations were detected. The response to Question 1 was significantly associated with Questions 2, 5,

10, 12, and 13 ( $r = 0.74, 0.56, -0.53, 0.53,$  and  $0.55$ , respectively). Question 2 was significantly associated with responses to Questions 12 and 13 ( $r = 0.63$  and  $0.65$ , respectively). The response to Question 4 was significantly associated with the response to Question 5 ( $r = 0.57$ ). Finally, the response to Question 5 was significantly associated with the response to Question 6 ( $r = 0.51$ ). None of the responses within Part C were significantly associated.

Forty-four of seventy-five responses (59%) came from universities with 15,000 or more students. Among the larger universities (>15,000 students), those with more departmental faculty, those with an international-themed animal science class, those that offered international scholarships, and those that offered or received Web classes internationally were significantly associated with a higher acceptance rate into veterinary schools (Table 4). Departments with larger proportions of non-U.S. or -Canadian faculty, international content in core animal science classes, with larger proportional enrollments of international students (either in the university or department), and with participation of undergraduates in international study or research (Part C, Question 3) were significantly associated with a higher entry rate into graduate school. Departments that required internships or that participated in international Web classes or that had students participating in international study were significantly associated with higher starting salaries. Departments that offered no international opportunities for students (Question A8) had a highly negative association with starting salary. Within the full data set (i.e., all universities irrespective of size; Table 4) significant associations were also detected. These associations were fewer than those detected in the data set, which focused only on mid-sized and large universities. Of interest, all associations detected within the full data set were also detected within

**Table 4.** Associations (correlation coefficients) between various aspects of departmental programs and student outcomes<sup>a</sup>

Question	Veterinary school		Graduate school		Starting salary	
	All universities	Enrollment >15,000	All universities	Enrollment >15,000	All universities	Enrollment >15,000
A1	0.53*	0.51*	0.40	0.44	0.35	0.40
A2	0.44	0.38	0.50*	0.51*	0.32	0.32
A3	0.33	0.22	0.33	0.26	0.23	0.24
A4	0.37	0.41	0.26	0.33	0.27	0.33
A5	0.19	0.20	0.43	0.47	0.28	0.49
A6	-0.047	0.054	0.068	0.086	0.227	0.559*
A7	0.048	-0.125	0.086	0.094	0.156	0.339
A8	-0.370	-0.382	-0.211	-0.265	-0.410	-0.793*
A8a	-0.080	-0.177	0.046	0.067	-0.101	-0.264
A8b	0.275	0.440	0.310	0.539*	0.174	0.322
A8c	0.475	0.816*	0.121	0.294	-0.025	0.387
A8d	-0.196	0.105	0.262	-0.088	0.038	-0.222
A8e	0.514*	0.719*	0.403	0.258	0.221	0.435
A8f	-0.093	-0.158	-0.050	-0.317	-0.221	-0.486
A8g	0.024	0.029	-0.218	-0.337	-0.015	-0.159
A8h	0.124	0.517*	0.325	0.333	0.829*	0.905*
C1	0.058	-0.080	-0.142	-0.059	-0.247	-0.277
C2	0.122	0.0342	0.277	0.154	-0.322	0.201
C3	-0.365	-0.421	-0.216	-0.241	-0.047	-0.058
A5:A3	0.220	0.272	0.279	0.530*	0.117	0.353
A4:A3	0.214	0.270	0.530*	0.621*	0.291	0.264

<sup>a</sup>Values are given for the entire data set ( $n = 75$ ) and for universities in excess of 15,000 students ( $n = 44$ ). Departmental programs and parameters were tested against three measures of student outcomes: acceptance into veterinary school, acceptance into graduate school, and starting salary. Questions A1 to A8 refer to number of faculty in department, noncitizen faculty, total university enrollment, major enrollment, international (INT) student enrollment, requirement for internships and requirement for senior thesis/project, respectively. Questions A8a to A8h refer to INT in mission statement, INT content in core classes, existence of an INT-themed animal science class, INT advising, INT internships, INT scholarships, a role for INT students, and INT Internet instruction, respectively. Questions C1 through C3 refer to INT employment by graduates in past 3 yr, INT engagement by faculty in past 3 yr, and INT activities of students in past 3 yr, respectively. A5:A3 is the ratio of INT students to the total university enrollment. A4:A3 is the ratio of INT students to the students enrolled in the major.

\*Indicates a significant association ( $P < 0.05$ ;  $r > 0.5$  or  $r < -0.5$ ).

the data set that focused on the mid-sized and larger universities.

Section D, Question 1 requested information on unique programs for internationalization. Responses included a global agriculture core class, an international certificate and international studies minor, unique exchange programs, and promotion of study abroad programs and travel tours. Section D, Question 2 asked how departments might enhance their international missions. Responses included provision of faculty incentives, establishment of sister universities, promotion of student exchange, shared funding for international travel ( $\frac{1}{3}$  college,  $\frac{1}{3}$  department, and  $\frac{1}{3}$  individual), encouragement of international sabbaticals, diversification of the graduate profile, and development of funding for programs. Question 3 determined personal characteristics of students returning from abroad. This question attracted the most uniform and strongest responses. Twenty-three responses were received and no negative comments were recorded. Instead, a series of superlatives, many repeated, were given. Students returning from an international experience were perceived to have “better analytical skills, to be more ma-

ture, more open-minded, more independent, to have a broader perspective, to be more self-confident and energized, with a changed outlook of the world and life and with a greater appreciation for world agriculture, of other cultures and of their own culture.” These responses are almost identical to a survey on the merits of study abroad programs by Hayward and Siaya (2001).

## Discussion

Internationalization of the curriculum within U.S.-based universities has been identified as critical to the nation’s future (Slater, 1998). Several publications have focused on the importance of this process and have provided detailed rationales (e.g., ACE, 1998). And, by many criteria, the process of internationalization is moving forward. Numbers of international students attending U.S. institutions are presently at the highest level ever (3.9% of total enrollment) and continue to increase (Open Doors, 2001). The numbers of U.S. students who are participating in study abroad programs are increasing rapidly. Since 1985, participation in study abroad programs has increased threefold to a

current level of 143,590 students per year (Open Doors, 2001). The past 4 yr have seen 11, 15, 14, and 11% increases in numbers of U.S. students who are studying abroad. And, whereas most students who study abroad do so in Europe, the proportion examining more diverse cultures is increasing more rapidly.

Within the agricultural sector, there is a similar imperative to internationalize the higher education experience (NASULGC, 1997; 2000). In one report, NASULGC (1997) identified the external and internal factors (i.e., relative to universities) that underlie the need for internationalization. External factors include “globalization of trade in food, growing competitiveness in world agricultural markets, demand by employers for prepared graduates, decreased federal funding for international agriculture programs which are focused on federal assistance, advances in communications technologies, population growth in developing countries, implementation of government policies and decisions which impact at national and international levels and, finally, requirements for international cooperation in order for stakeholders to have access to benefits of global scientific expertise, genetic resources and agricultural environments.” Internal factors that underlie the importance of internationalization include “growing recognition among faculty of the need for global engagement for benefits of both stakeholders and their careers, increased numbers of students seeking study abroad programs, recognition that graduates must be conscious of and able to contribute to the development and evaluation of government policy, reduced capacity of international agriculture offices to offer support because of reduced federal funding, efforts to redefine the mission of higher education in the 21st Century within a global context, erosion of faculty strength in international agriculture and, finally, increased emphasis on efforts to create a university environment in which cultural diversity is valued as an important part of the fabric of the community.” Similar, but more general goals, have also been developed in NASULGC’s other position paper, titled “Expanding the International Scope of Universities” (NASULGC, 2000).

Goals of this survey were to establish the baseline for internationalization in the current North American animal science undergraduate curriculum and to evaluate impacts of internationalization on student outcomes. The latter goal is important because analyses of the impacts (or values) of internationalization are lacking in the international education field (Slater, 1998). The current status of internationalization might best be described as “modest.” There are acknowledgements that it is important, but few departments have made major steps to facilitate the process. The most common forms of internationalization included the addition of international content to core classes (37%), advising (72%), and international internships (44%). Few departments (13%) report international employment of at least one graduate in the past 3 yr, and many respondents did not know if any of their graduates were

employed internationally. Animal sciences faculty were engaged internationally with reported rates of engagement ranging evenly from 0 to >60%. Two-thirds of departments reported participation of undergraduate students in overseas programs during the past 3 yr.

Advising on international opportunities was the most common form of internationalization identified by department leaders. But, respondents were “neutral” when asked about the effectiveness of the advising function. This implies that effectiveness of the international advising could be strengthened.

Leaders of departments valued international education, the presence of international students, and the effects that international experiences have on undergraduate students. Departmental leaders also perceived that demand for graduates with international expertise was increasing. The barriers these individuals perceived in the process of internationalization included financial (both student and institutional) and commitment from higher administration. Lack of a second language, safety, and undergraduate program structure were not perceived as barriers to internationalization. These barriers were similar to those identified in a survey by Hayward and Siaya (2001). In their survey, financial costs, distraction from career goals, inability to pursue the major, anxiety, interference with social and extracurricular activities, and lack of information (in decreasing order of significance) were identified as reasons for not studying abroad. However, the most important reason their subjects chose not to study abroad, a reason not considered in our survey, was that students had “no interest or didn’t want to leave the United States.” Thirty-four percent of their subjects provided this reason for not participating in study abroad programs. Nevertheless, 48% of students polled in the same survey indicated interest in study abroad programs. Hayward and Siaya (2001) concluded that “while institutional factors—such as too few places at some colleges, faculty indifference or advice against it, rigid requirements for some majors and limited funding opportunities—no doubt inhibit some students from study abroad programs, these data strongly suggest that this new generation of college-bound students is more interested in study abroad programs than its predecessors.”

Data that support the supposition that internationalization positively impacts students are limited (Slater, 1998). This study is one of the first to document significant associations between internationalization and student outcomes. It is important to emphasize that these associations are not necessarily causal. It is possible that departments that are progressive or innovative have increased likelihood of providing success to their students. Another possibility is that such departments attract and retain students who are more likely to continue into postgraduate programs or who are, for whatever reason, paid more after graduation.

One other study has evaluated impact of study abroad programs in a similar manner (Carlson et al., 1990).

Students who participated in study abroad programs were more likely to enter and complete postgraduate education than were those who did not study abroad. These results were consistent with our findings. Students completing study abroad programs were classified either as “maximizers” (i.e., “those who incorporated their European study abroad and other significant transnational experiences into their career values and employment practices); or minimizers (i.e., those who did not). Fifty-eight and sixty percent of the men and women, respectively, were classified as “maximizers.” Of interest, men tended to cluster into the maximizer category at a younger age (25 to 34 yr old), whereas females were identified as maximizers at an older age (35 to 44 yr old). Maximizers were found to be predominantly engaged in professional and technical occupations.

In summary, a rapidly changing world has created the imperative of considering internationalization within all curricula. Leading agricultural entities (NASULGC, 1997; 2000) have commented on the importance of this process. Agricultural students currently constitute low proportions of students (1.5%) who engage in international activities (Open Doors, 2001). However, it is easily argued that an understanding of international issues is important to agricultural students. This survey is the first to quantify the degree of internationalization that exists within the curricula of ANIMAL SCIENCE departments across Canada and the United States. It points to many associations with internationalization and highlights mechanisms departments might consider in developing strategies to internationalize their curricula. We expect to repeat this survey 10 yr hence in order to quantify the process of internationalization within the animal sciences.

### Implications

An awareness of the importance of internationalization exists among leaders of animal, dairy, and poultry

science departments across North America. Despite this awareness, implementation is limited. Significant outcomes were associated with international programs, although cause and effect could not be established. Departments might evaluate their undergraduate curricula in the context of these results to determine whether internationalization has merit.

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