Motivation of Undergraduate Animal Sciences Students[1]

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Abstract

The purpose of this study was two-fold: 1) identify motivational constructs in animal sciences students and the association with demographic variables; and 2) consider self-reported satisfaction within the major and decisions to persist. Motivational constructs included themes of affect, self-efficacy, academic and career outcomes. Findings indicated strong positive academic affect and intrinsic career motivation (4.39 ± 0.03 and 4.56 ± 0.02, respectively on a 5-point scale), which did not differ among rank, cumulative point-hour ratio (CPHR), transfer status, or community association. Both intrinsic and extrinsic measures were important to achieve positive academic outcomes. Self-efficacy emerged as the leading construct associated with demographic variables and CPHR. Rank 1 students, out-of-state and regional, agricultural technical transfer students and students with CPHR less than 3.00 reported reduced values for self-efficacy ($P < 0.01$). Seventy-nine percent of respondents reported with certainty that they would graduate within the Animal Sciences major, but 23.7% of students reported that they were too far along in the degree to change majors. Collectively, measurements of motivational constructs and decisions to persist reported herein provide a framework for understanding student attitudes and orientation to the academic environment. A basis for future research to strengthen academic achievement and major persistence through academic approaches that foster self-efficacy is established.

Introduction

Learning success is reliant on motivation (Donker et al., 2014). However, factors that influence motivation are complex. When one perceives confidence in their skills and a positive ability to accomplish a task, greater achievement occurs as a result of increased effort and persistence (Lent et al., 1984, 2008). Greater self-efficacy as a motivating factor can predict positive outcomes across unrelated events, including cognitive learning abilities (Sherer et al.,1982). Greatest success is achieved when individuals demonstrate self-efficacy and underlying intrinsic motivation toward the task.

In learning, intrinsic motivation reflects a desire to learn due to curiosity, a need to be challenged, or a need to master a concept. Intrinsic motivation reflects self-improvement (Bye at. al., 2007). In contrast, extrinsic motivation is reflected by seeking of approval or external signs of worth. In the classroom, students driven by extrinsic motivation are more inclined to ask procedural questions instead of content enhancing questions (Bye et al.,2007). Grades or other rewards of performance have greater value than the knowledge itself.

While intrinsic motivation promotes learning from interest, not all learning activities will be inherently interesting and extrinsic motivation becomes of greater value. Indeed, intrinsic motivation decreases with advancing education, which promotes breadth across disciplines (Ryan and Deci, 2000). It is well established that intrinsic and extrinsic motivation are interactive, with each contributing to overall learning (Lin et al., 2001). Extrinsic motivation progresses from dimensions of external regulation to self-integration, which reflects decisions made on the basis of compliance toward autonomous commitment to personal accomplishment (Ryan and Deci, 2000). Each dimension is underscored by reward, but students driven predominantly by external regulation are less likely to persist in academic activities (Vallerand and Bissonnette,1992); thus, dominance of this form of extrinsic motivation may undermine career success (Benabou and Tirole, 2003) and contribute to long-term, negative outcomes. Both intrinsic and extrinsic motivation are fostered through positive affect, which promotes self-regulated behaviors in the extrinsically motivated (Reeve and Cole, 1987; Isen and Reeves (2005). Indeed, persons that demonstrate positive affect are more likely to complete tasks even when not intrinsically motivated to do so.

Studies of motivational factors in undergraduate education are not new, but information concerning motivation of animal sciences students is lacking. The study herein provides evidence of motivational factors among this population of students and considers decisions to persist in the major. A greater understanding of motivat-

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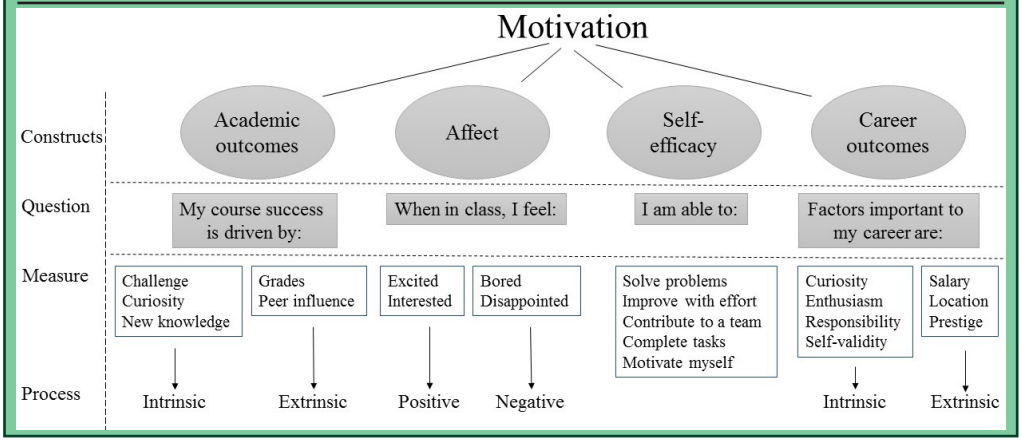
ing factors shapes pedagogical strategies to move students toward more successful learners with long-term positive outcomes.

Figure 1. Conceptual framework for assessing motivational constructs. Multiple measures were queried for each construct and associated processes using Likert-scale, multiple-choice, multiple-select, and dichotomous type questions.



Methods

Instrument

A self-report survey instrument was developed to collect demographic variables (gender, academic rank, enrollment status, cumulative points-hour ratio (CPHR), race/ethnicity, domestic data, and work/education commitments), determine self-regulated learning activities, assess constructs of motivation and examine the likelihood to persist to graduation. Motivational constructs were defined according to the social-cognitive theory of motivation (Pintrich and Schunk, 1996) and included the constructs of outcome (academic and career), affect and academic self-efficacy. Outcome included the subscales of intrinsic and extrinsic and affect included the subscales of positive and negative (Figure 1). Multiple measures were queried for each construct and associated processes. The instrument was modeled according to motivational scales reported in the literature (Pintrich et al., 1993; Sherer and Maddux, 1982), but with questions applicative to the target student population. Questions were mixed-format requiring Likert-scale (n=46), multiple-choice (n=17), multiple-select (n=4), and dichotomous (n=4) responses. Non-response options were included when appropriate. Likert scale response questions were on a fixed 5-point scale, and scales were defined progressing from negative to positive statements of agreement.

Participants

The survey was administered spring term 2014 following review and exemption by The Ohio State University Institutional Review Board. Online survey software and questionnaire applications (SurveyMonkey) were used to deliver the survey. Students with a declared program in Animal Sciences according to enrollment census data (n=697) were invited to participate in the survey using email notification. The survey invite included the targeted audience, the purpose of the survey, an estimate of the length of time needed to complete the survey, incentives offered in completing the survey, the beginning and end dates for completion of the survey, and a direct link to the on-line survey through a SSL encrypted URL. The survey was open for three weeks and a reminder email including the original survey invite information was sent weekly. Participation in the survey was voluntary. Participants accessing the URL were required to provide consent prior to beginning the survey and were entered into a drawing to receive

Table 1: Profile of survey respondents.

Variable	Number	Percent
Gender (n=235)		
Female	200	85.1
Male	33	14.0
Not Reported	2	0.85
Program of study (n=235)[x]		
Animal Biosciences	144	61.3
Animal Industries	71	30.2
Animal Nutrition	14	5.96
Veterinary Technology	6	2.55
Academic rank (n=235)[y]		
Rank 1	30	12.8
Rank 2	51	21.7
Rank 3	65	27.7
Rank 4	87	37.0
Degree holding	2	0.85
Transfer status (n=228)		
Not applicable	145	63.6
Interdepartmental	4	1.75
OSU affiliated institution	43	18.9
Agricultural Technical Institute	(12)	(5.26)
OSU regional campus	(31)	(13.4)
In-state	22	9.65
Out-of-state	14	6.14
Enrollment status (n=235)[z]		
Full-time	223	94.9
¾-time	5	2.13
½-time	4	1.70
Part-time	3	1.28
Cumulative points hour ratio (n=236)		
Less than 2.00	4	1.69
2.00 to 2.49	14	5.93
2.50 to 2.99	45	19.07
3.00 to 3.49	87	36.86
3.50 to 4.00	81	34.32
Not determined	5	2.12

[x]Animal Sciences programs of study include: Animal Biosciences and Animal Industries that lead to a B.S. in Agriculture, Animal Nutrition that leads to a B.S. in Nutrition, and Veterinary Technology that is a joint program with Columbus State Community College and leads to an A.A.S. in Veterinary Technology and B.S. in Agriculture.

[y]Academic rank in accordance with university policy is defined as 30 credits or less for Rank 1, 30.5 to 60 credits for Rank 2, 60.5 to 90 credits for Rank 3, and 90.5 or above credits for Rank 4. Definitions based on

[z]Full-time enrollment status in accordance with university policy is defined as a minimum of 12 credits, 9 to 11 credits define ¾-time enrollment, 6 to 8 credits defines ½-time enrollment, and 5 or less credits defines part-time enrollment.

a reward as incentive for participation. Survey participation was kept confidential and confidentiality of survey response was maintained by collecting, retrieving and storing data without any personal identifiers (personal names, ID, email and IP addresses).

Figure 2. Post-secondary financial sources. Participants were directed to select all options that applied, and data is presented as a percent of total respondents (n=235).

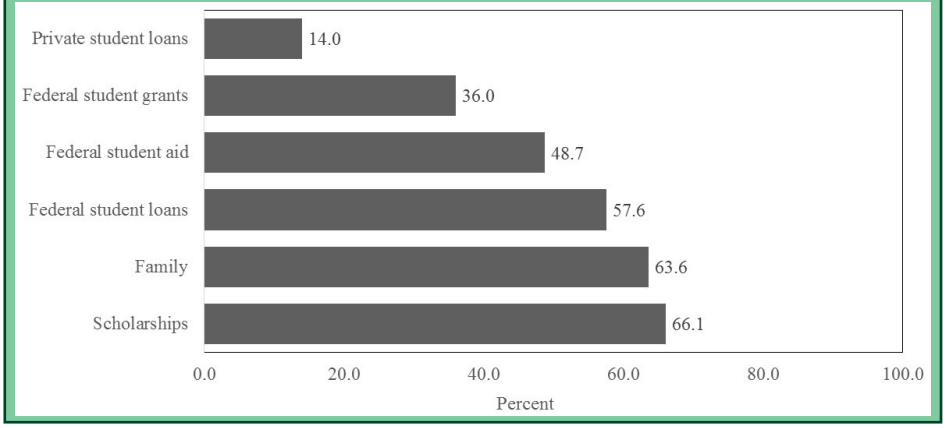
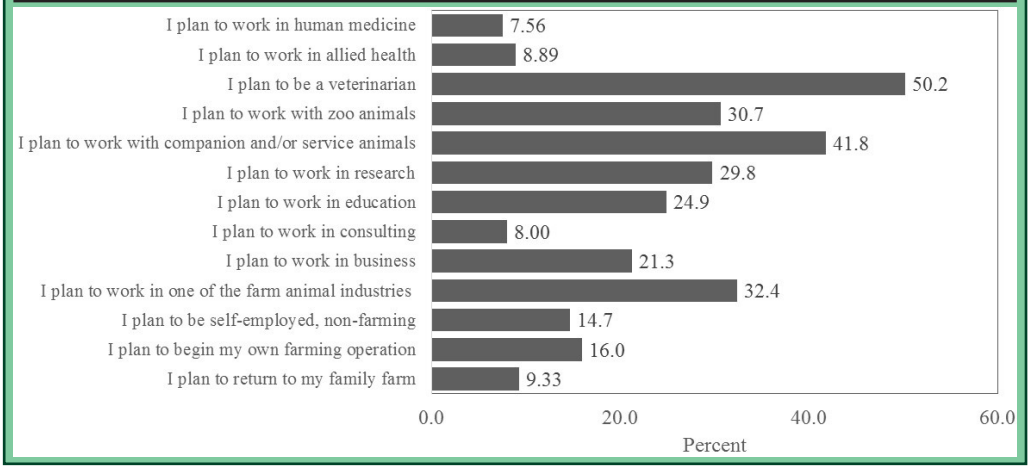


Figure 3. Post-secondary financial sources. Participants were directed to select all options that applied, and data is presented as a percent of total respondents (n=235).



Data Analyses

Statistical analyses were performed using SAS (version 9.3; SAS, Cary, NC). The Cochran-Mantel-Haenszel test was used to control for student and report demographic data using the PROC FREQ procedures. Factorial analysis (PROC FACTOR) was used to examine the latent factor structure of surveyed elements of motivation. The minimum data for factor analysis was satisfied (Santos, 1998). Examination of scree plots identified five factors with varimax rotation. Eigenvalues showed that the five factors explained 54.2, 19.1, 11.3, 8.81 and 6.59% of the proportional variance. Variables within a factor shared commonality with the targeted motivational themes: positive affect, negative affect, academic self-efficacy, intrinsic career motivation and extrinsic career motivation. Internal consistency among the set of variables for a given construct or subscale was calculated using Cronbach's alpha. Composite scores were calculated for each of the five factors from the variables loaded onto each factor. Measures of intrinsic and extrinsic academic values did not load onto a factor and were analyzed individually. Additional items that did not load onto a factor and did not increase Cronbach's alpha for a given construct or subscale were removed from analysis. Descriptive statistics were calculated using PROC MEANS and mean responses compared by ANOVA and confirmed by Tukey's post-hoc analysis. Multiple response survey data were analyzed as dichotomous variables using PROC FREQ procedures. Data are presented as means ± SEM with $P \leq 0.05$ considered significant.

Results

Demographics

Survey response rate was 33.7%. The majority of responses, 34.7, 12.7 and 16.9%, occurred within 24 hours of the original survey invite, the first reminder, or the second reminder, respectively. Respondents were primarily female with a declared Animal Biosciences program (Table 1). Race/ethnicity of respondents was 86.0% white, 2.97% Asian, Asian American, or Pacific Islander, 2.12% Black or African American, 2.12% Hispanic or Latin American, 1.69% Multiracial, 1.27% Mexican or Mexican American, 0.85% Puerto Rican, 0.42% American Indian or other Native American and 2.45% other. Ninety-three percent of respondents identified as traditional students, defined as continuous education from secondary or high-school to post-secondary or university. The majority of respondents were non-transfer students (63.6%) and enrolled full-time (94.9%). Scholarships (66.1%), family (63.6%) and federal loans (57.6%) were the primary financial resources for funding ones education (Figure 2). Veterinary medicine (50.2%) and careers in the companion and/or service animal industries (41.8%) were the two leading long-term career objectives of respondents (Figure 3). Respondents were distributed among all ranks (Table 1) and 71.1% reported a CPHR of 3.00 or above on a 4.00 scale (Table 1). Students of rank 1 status and transfer students from the regional, agricultural technical institute were more likely to report CPHR below 3.00 when compared to rank 4 and non-transfer students (73.3% of rank 1 students and 81.9% of transfer students, compared to 30.4% of rank 4 students and 14.0% of non-transfer students). Due to limited sample size, respondents with a CPHR of less than 2.00 were omitted from further data analysis and reporting.

Approximately 33% of respondents were first-generation college students as defined by neither parent having received a degree from a four-year institution. Of first generation students, 45.6% of parents were associate degree holders and 54.4% percent held high-school degrees only (Figure 4). The majority of students identified as suburban (42.7%) followed by rural farming association (18.8%). While urban identified students represented the smallest population of respondents, 48.1% of these students were first-generation (Figure 4). The choice of major was determined during ones early child education for 37.0% of respondents, whereas 21.6% of respondents did not decide on a major in animal sciences until college. Personal experience (98.2%) and family (62.8%) were the primary factors influencing the choice of an animal sciences major (Figure 5). When asked about certainty in choosing the major, 83.9% of respondents reported that they were certain or very certain that the degree in animal sciences was the best fit major. Major courses, courses in natural sciences and math, and professional experiences contributed to certainty in major selection (Table 2).

The majority of students participated in co-curricular (56.2%), extra-curricular (79.2%), or volunteer (63.3%) activities, with most students committing less than 5 hours per week to these activities (Figure 6). Nearly 40% of students worked 5 hours or less weekly for pay (Figure 7A). There was no association between the number of hours committed to co-curricular, extra-curricular, or volunteer activities or hours worked for pay and the time committed to preparing for class. However, hours worked for pay and time committed to preparing for class were associated with CPHR. Overall, students with greater CPHR spent less time working for pay. Whereas only 30.9% students with a 3.50 or greater CPHR worked 15 hours or more per week, this value increased to 71.5% for students with less than a 2.50 CPHR (Figure 7B). The majority of students (46.6%) spent 10 hours or less preparing for class weekly (Figure 8A); however, there was a tendency (P=0.07) for students with a 3.00 CPHR or greater to dedicate more time preparing for class and 9.62% of these students spent more than 25 hours per week preparing for class each week (Figure 8B). When asked about class preparation, only 22.8% of students reported that they always prepare for class by completing readings, assignments, or review of notes prior to attendance. However, 87.4 and 90.9% of respondents agreed or strongly agreed to statements of taking detailed notes during class and using notes to prepare for graded course assessments, respectively.

Table 2. Confidence in fit of major and contribution of academic fields to fit of major.

	Response, %					
Variable	1	2	3	4	5	Mean ± SE[x]
Confidence[z]	1.79	4.02	10.3	26.8	57.1	4.33 ± 0.06
Academic fields[y]						
Humanities	29.3	25.8	28.0	13.3	3.56	2.35 ±0.08[a]
Social Sciences	11.6	20.0	36.0	22.7	9.78	2.98 ± 0.08[b]
Natural Sciences and Math	1.33	3.56	14.7	31.6	48.9	4.22 ±0.06[c]
Major Courses	0.44	0.0	1.78	16.0	81.8	4.79 ±0.03[d]
Professional Experiences	1.33	0.89	7.56	18.2	72.0	4.60 ±0.05[e]

[z]Respondents (n=) used a five-point response scale rating system progressing from not at all certain (1) to very certain (5).

[y]Respondents (n=) used a five-point response scale rating system progressing from not important (1) to very important (5).

[x]Values are means ± SE, n = 231. Labeled means within a column with super-scripts without a common letter differ, *P < 0.01.*

Figure 4. The percent of students identifying as a first-generation college student (A) and community association prior to entering university (B). Community association is presented as total respondents for each classification (n=231) and summation of first- and non first-generation students as a percentage for each classification. For the purpose of this study, urban was defined as a population dense area, i.e. city, and suburban was defined as an urban outlying residential area.

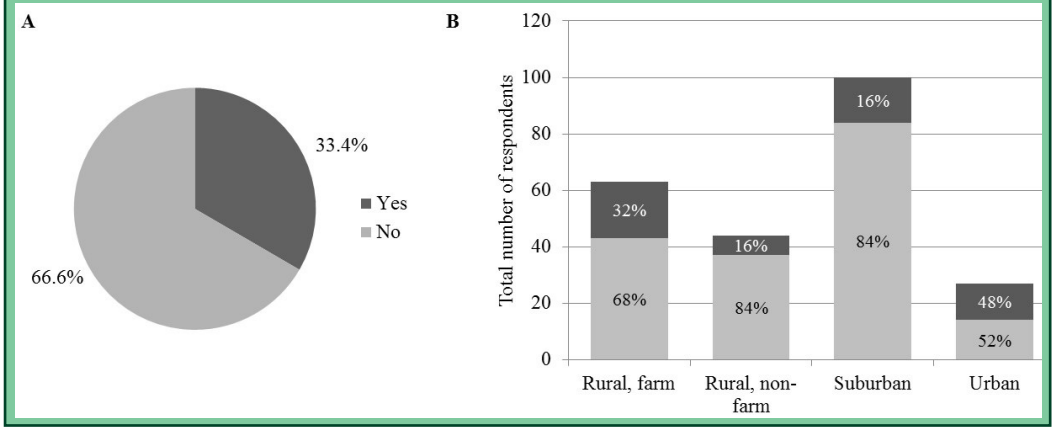


Figure 5. The percent of students by time decision was made to pursue animal sciences degree (A) and the factors influencing the choice to study animal sciences (B). Data is presented as a percent of total respondents (n=231). For individuals influencing the choice of study, participants were directed to select all options that applied.

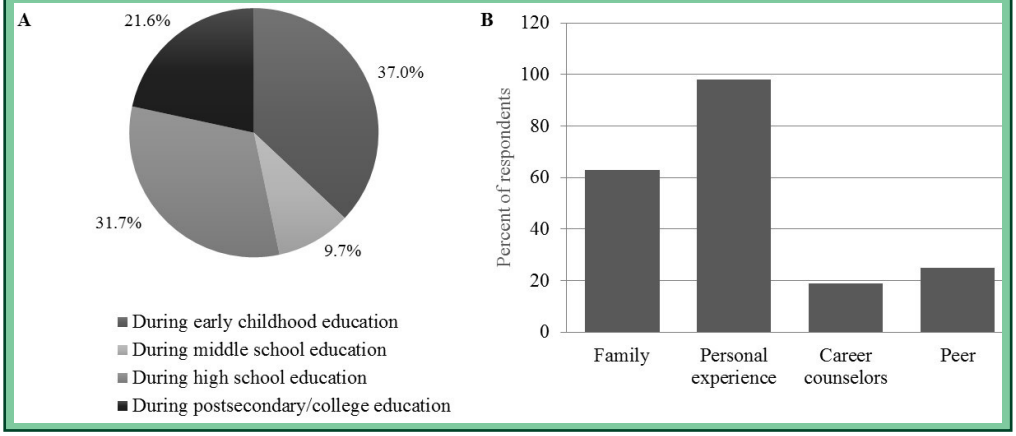


Figure 6. Distribution of students by weekly commitment to co-curricular (A), extra-curricular (B), and volunteer (C) activities. Data is presented as a percent of total respondents (n=231). Co-curricular activities were defined as mentoring, student teaching, judging teams, and research. Extra-curricular activities were defined as student organizations, athletics, band, vocals, orchestra, and similar.

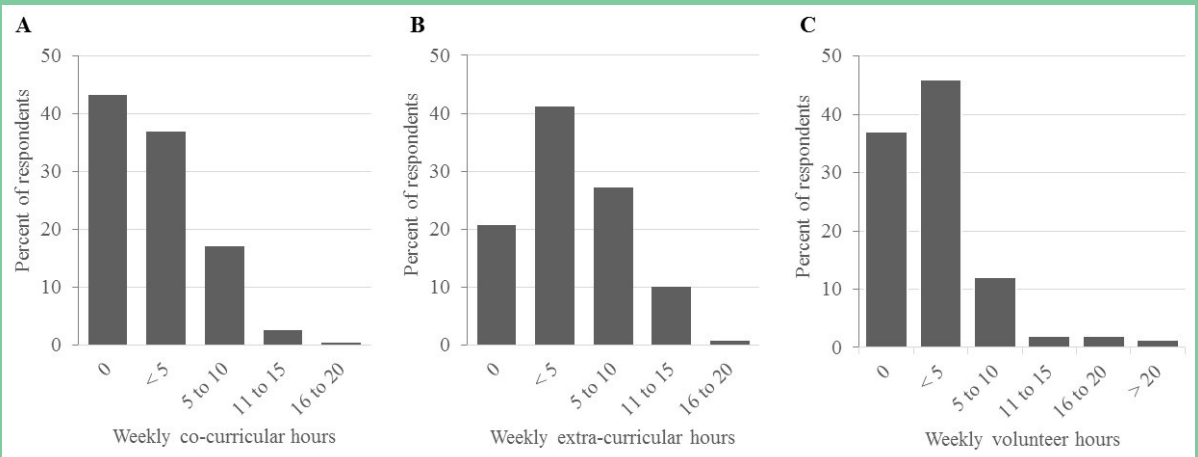


Table 3: Scale reliability and mean composite scores of motivational factors.

Variable	Cronbach's alpha	Mean[z]	SE
Affect			
Positive affect	0.80	4.39[a]	0.03
Negative affect	0.72	4.07[b]	0.06
Academic self-efficacy	0.73	3.84[c]	0.03
Career outcomes			
Intrinsic factors	0.75	4.56[d]	0.02
Extrinsic factors	0.69	3.89[c]	0.02

[z]Values are means ± SE, n = 231. Labeled means within a column with superscripts without a common letter differ, *P < 0.01*.

Figure 7. Percent of student respondents (n=231) by the number of weekly hours worked for pay (A), and by weekly hours worked for pay and CPHR (B). Cochran-Mantel–Haenszel analysis for distribution of weekly hours worked for pay by CPHR P =0.02.

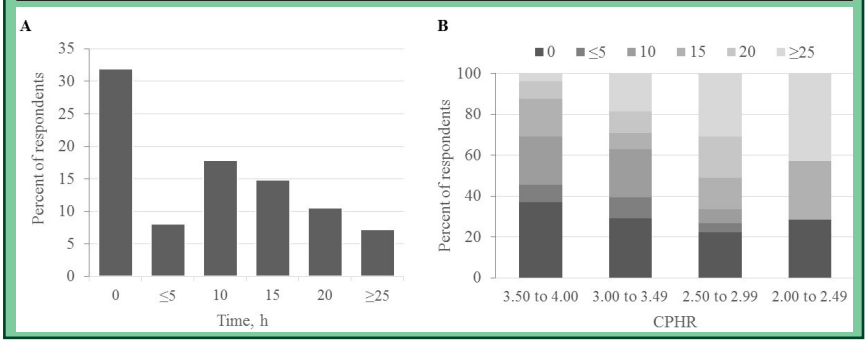
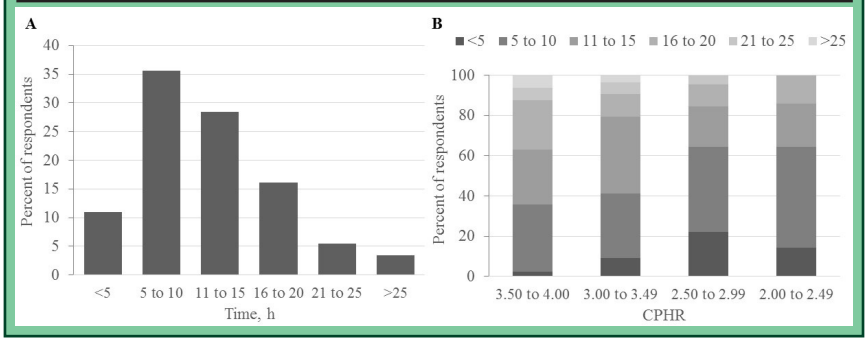


Figure 8. Percent of student respondents (n=231) by the number of hours spent preparing for class weekly (A), and by total hours spent preparing for class and earned CPHR and (B). Cochran-Mantel–Haenszel analysis for distribution of weekly hours worked for pay by CPHR P =0.07.



Motivation

Reliability of motivational constructs and subscales for items of affect, academic self-efficacy and career outcomes ranged from 0.80 to 0.69 (Table 3). Mean Likert-scale composite scores showed that respondents perceived greater positive academic affect compared to negative affect, 4.39 ± 0.02 versus 4.07 ± 0.06, respectively (P< 0.01; Table 3). Students perceived only moderate self-efficacy (3.84 ± 0.03) in their academic abilities. When asked which factors were important toward their intended career, mean scores were greater for intrinsic career factors compared to extrinsic career factors, 4.56 ± 0.02 versus 3.89 ± 0.02, respectively (P< 0.01; Table 3). There were no differences among rank, CPHR, transfer status, or community association for measures of affect or career outcomes; however, differences were noted among these variables for self-efficacy. Mean composite scores for self-efficacy were least in rank 1 students and students with CPHR less than 2.50 (Table 4). Non-transfer students and students who transferred to OSU from a non-OSU affiliated school within Ohio reported greater self-efficacy than the regional, agricultural technical students and out-of-state transfer students (Table 4). Lastly, students of suburban community association reported greater self-efficacy than urban and non-farm, rural students. There were no differences in self-efficacy between suburban and farm, rural students (Table 4).

The intrinsic motivator with the greatest influence on academic outcomes was curiosity (4.56 ± 0.04; P < 0.01), followed by gain in new knowledge (4.25 ± 0.05; P < 0.01; Table 5). Peer comparison was the greatest extrinsic motivator of academic outcomes (4.15 ± 0.06; P < 0.01); Table 5). Academic outcomes were further influenced by rank and CPHR. The need to be challenged was greatest in rank 4 students and least in rank 1 students (3.71 ± 0.11 and 3.33 ± 0.18, P < 0.01), whereas, extra-credit was a more important motivator in rank 1 relative to rank 4 students (4.20 ± 0.18 and 3.76 ± 0.12, P

Table 4: Distribution of responses and composite mean scores for self-efficacy by rank, CPHR, transfer and community status.

	Response, %[z]					Mean ± SE[y]
	1	2	3	4	5	
Rank						
Rank 1	4.67	12.0	30.7	34.7	18.0	3.59 ± 0.09[a]
Rank 2	4.18	12.6	15.5	39.3	28.5	3.89 ±0.06[b]
Rank 3	2.49	7.48	24.0	34.3	31.8	3.94 ±0.05[b]
Rank 4	4.72	7.78	19.1	38.7	29.7	3.83 ±0.05[b]
CPHR						
2.00 to 2.49	5.71	8.57	28.6	38.6	18.6	3.44 ±0.12[a]
2.50 to 2.99	6.22	12.9	32.4	32.0	16.4	3.40±0.07[a]
3.00 to 3.49	1.71	8.56	19.6	39.4	30.8	3.97 ±0.05[b]
3.50 to 4.00	3.29	5.82	15.2	38.0	37.7	4.11 ±0.04[b]
Transfer						
None	3.57	8.43	20.0	39.1	28.9	3.91 ±0.04[a]
Interdepartmental	6.67	0	20.0	46.7	26.7	3.73 ±0.30[ab]
ATI	13.3	6.67	21.7	21.7	36.7	3.50 ±0.18[b]
OSU Regional	1.94	10.3	23.2	40.0	24.5	3.73 ± 0.08[ab]
Ohio	3.08	9.23	15.4	30.8	41.5	4.01 ± 0.13[a]
Out-of-state	5.08	20.34	32.2	27.1	15.3	3.40 ± 0.15[b]
Community						
Farm, rural	1.43	7.14	24.3	41.1	26.1	3.85 ±0.05[ab]
Nonfarm, rural	8.42	8.95	21.6	34.2	26.8	3.67 ±0.08[a]
Suburban	2.42	9.47	18.5	35.2	34.4	3.94 ±0.05[b]
Urban	9.47	10.5	15.8	40.0	24.2	3.70 ±0.10[a]

[z]Respondents (n=231) used a five-point response scale rating system progressing from not at all confident (1) to very confident (5).

[y]Values are means ± SE. Labeled means within a column with superscripts without a common letter differ, *P < 0.01.*

Table 5: Intrinsic and extrinsic measures contributing to academic outcomes.

Variable	Mean[z]	SE
Intrinsic measures		
Challenge	3.51[a]	0.07
Curiosity	4.56[b]	0.04
New knowledge	4.25[c]	0.05
Extrinsic measures		
Grade earned	3.48[a]	0.07
Extra-credit	3.98[d]	0.07
Peer comparison	4.15[c]	0.06

[z]Values are means ± SE, n = 231. Labeled means within a column with superscripts without a common letter differ, *P < 0.01.*

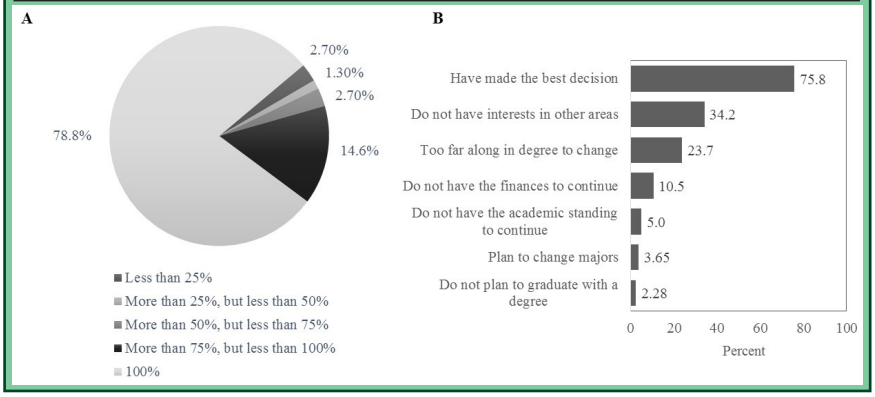
Table 6: Distribution of responses and composite mean scores for intrinsic and extrinsic measures of academic outcome by CPHR.

	Response, %[z]					Mean ± SE[y]
Variable	1	2	3	4	5	
Curiosity						
2.00 to 2.49	0.00	0.00	0.00	35.7	64.3	4.64 ± 0.13[ab]
2.50 to 2.99	0.00	0.00	8.89	37.8	53.3	4.44 ± 0.10[a]
3.00 to 3.49	0.00	2.47	4.94	27.2	65.4	4.56 ± 0.08[ab]
3.50 to 4.00	0.00	2.56	1.28	19.2	76.9	4.71 ± 0.07[b]
Challenge						
2.00 to 2.49	0.0	7.14	42.9	21.4	28.6	3.71 ± 0.27
2.50 to 2.99	4.26	12.8	36.2	34.0	12.8	3.36 ± 0.15
3.00 to 3.49	3.80	10.1	25.3	44.3	16.5	3.59 ± 0.11
3.50 to 4.00	6.41	15.4	16.7	37.2	24.4	3.58 ± 0.14
Knowledge						
2.00 to 2.49	0.0	7.14	21.4	42.9	28.6	3.93 ± 0.25[a]
2.50 to 2.99	2.22	2.22	22.2	37.8	35.6	4.02 ± 0.14[ab]
3.00 to 3.49	0.00	1.23	14.8	39.5	44.4	4.27 ± 0.08[b]
3.50 to 4.00	0.00	1.27	8.86	30.4	59.5	4.50 ± 0.08[c]
Grade earned						
2.00 to 2.49	0.00	21.4	35.7	14.3	28.6	3.50 ± 0.31[ab]
2.50 to 2.99	2.22	13.3	37.8	33.3	13.3	3.42 ± 0.14[ab]
3.00 to 3.49	4.94	19.8	27.2	34.6	13.6	3.32 ± 0.12[a]
3.50 to 4.00	1.25	12.8	29.5	30.8	25.6	3.67 ± 0.11[b]
Extra-credit						
2.00 to 2.49	7.14	0.00	14.3	21.4	57.1	4.21 ± 0.31
2.50 to 2.99	0.00	4.44	17.8	28.9	48.9	4.22 ± 0.13
3.00 to 3.49	1.23	8.64	24.7	30.9	34.6	3.89 ± 0.11
3.50 to 4.00	3.90	7.79	26.0	23.4	39.0	3.83 ± 0.13
Peer comparison						
2.00 to 2.49	7.14	0.0	0.0	50.0	42.9	4.21 ± 0.28
2.50 to 2.99	2.22	2.22	17.8	44.4	33.3	4.04 ± 0.13
3.00 to 3.49	2.47	3.70	18.5	32.1	43.2	4.10 ± 0.11
3.50 to 4.00	1.28	2.56	11.5	32.1	52.6	4.33 ± 0.10

[z]Respondents (n=231) used a five-point response scale rating system progressing from this is not at all me (1) to this is exactly me (5).

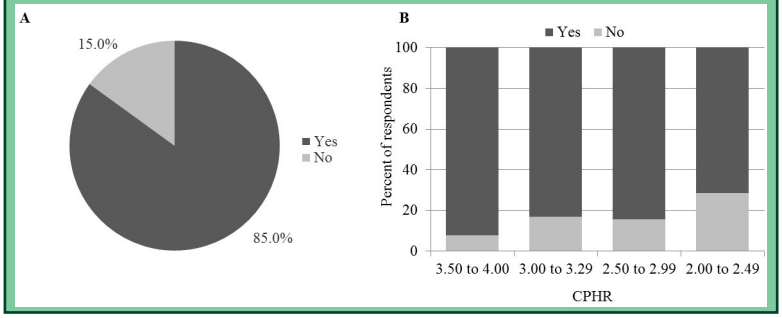
[y]Values are means ± SE. Labeled means for a given variable within a column with superscripts without a common letter differ, *P < 0.05.*

Figure 9. Distribution of students by likelihood to persist in major (A) and factors contributing to the decision to persist or not persist with the Animal Sciences major (B). For decisions to persist, participants were directed to select all options that applied. Data is presented as a percent of total respondents (n=226).



<0.01). Students reporting a 3.50 or above CPHR reported numerically greater mean scores for the intrinsic factors of curiosity and new knowledge (Table 6). Nearly 77% of students with a 3.50 CPHR or above were in strong agreement that curiosity was an important course factor, and as the desire to gain new knowledge increased, CPHR increased and was greatest among students with a 3.50 or above CPHR (4.50 ± 0.08; P< 0.05). Differences were also noted with the value of grade earned between the two highest CPHR categories (Table 6). Accordingly, students reporting a CPHR of 3.50 or above reported greater value of grade earned (3.67 ± 0.11) when compared to students reporting a CPHR of 3.00 to 3.49 (3.32 ± 0.12; P< 0.05).

Figure 10. Student response (n=226) to the question "If you could start over, would you pursue the same major?" (A) and student response by CPHR (B). Cochran-Mantel–Haenszel analysis for distribution of choice to pursue the same major by CPHR P =0.04.



Persistence

Three percent of respondents reported that the decision to earn a college education was the decision of their parents or legal guardian. When asked of the likelihood to persist to graduation,

78.8% of respondents reported 100% certainty that they would graduate with a B.S. degree with the Animal Sciences major (Figure 9A). For decisions to persist in the degree, 23.7% of students reported that they were too far along in the degree to change majors. Factors contributing to the decision to not persist in the degree included financial limitations (10.5%), academic standing (5%), plans to change majors (3.7%) and intent to not complete a four-year degree (2.3%) (Figure 9B). Eighty-five percent of students indicated that they would choose the same major again if given the choice (Figure 10A). The choice of selecting the same degree was associated with CPHR (P = 0.04) and 28.6% of students with less than a 2.50 CPHR indicated they would not choose the same degree whereas only 7.79% of students with 3.50 CPHR or above indicated they would not choose the same degree (Figure 10B).

Discussion

Motivation is a predictor of postsecondary success (Allen and Robbins, 2010). The theories of motivation in learning are complex and there are many constructs postulated to underscore motivational learning processes. Ryan and Deci (2000) classify motivation through regulatory styles, including extrinsic and intrinsic motivation. Intrinsic motivation is driven by the inherent satisfaction that occurs with completion of a task, whereas extrinsic motivation occurs by reward (Ryan and Deci, 2000). Both forms of motivation play a role in student achievement and persistence to degree attainment. In the postsecondary learning environment, these motivating realms are influenced by self-regulation, whereby an individual assumes control of his or her learning strategies (Bembenutty, 2011). Self-regulation, in turn, is subject to self-efficacy or confidence, which is promoted through positive affect (Bandura, 1997). Due to the influence of these interconnected factors on academic performance, numerous conceptual models have been proposed to understand the processes crucial to student success. Current literature is based primarily in social science disciplines and often is confined to single-course populations (Bye at al., 2007). To this end, the conceptual framework of the current study (Figure 1) examined academic and career outcomes and underlying intrinsic and extrinsic motivating factors, self-efficacy and affect in animal sciences majors and captured influences of sociodemographics as well.

It is well documented that a shift in traditional animal sciences student demographics has occurred, where an increased number of students are female and classify as non-rural with career interests in companion animals and/or veterinary medicine (Edwards, 1986; Reiling, 2003; Reese et al., 1987). The current population under study was representative of this shift. The lack of racial and ethnic diversity is in agreement with previous studies and suggests limited growth in diversity, which has persisted for the field for nearly two-decades (Beck and Swanson, 2003). The majority of respondents were female. While this study only captured one-third of the students enrolled in the major, enrollment census data is in agreement and confirms the female gender bias of the major, which closely parallels gender distribution in veterinary medical colleges (Brown and Silverman, 1999). This study further suggested increased interests in zoo professions when compared to course enrollment data of others (Reiling, 2003). Career interests were not surprising. Only 26.9% of students identified as farm rural, thus the majority of students would likely not have farm animal experience. Students with minimal to no farm animal experience are more likely to indicate study interests in companion and zoo animals (Reiling, 2003). Interests support career choice goals (Lent et al.,1994), which are strengthened by interest-major congruence (Allen and Robbins, 2010). Indeed, 86.0% of students reported that the major was mostly or exactly the best fit for enhancing their career values. Furthermore, students reported greater intrinsic career motivation. Thus, while a demographic shift as occurred in animal sciences students and their career intentions, data of the current study supports the value of the major toward continuing to meet the educational and career objectives of its students.

The majority of students reported that the decision to major in animal sciences occurred prior to high-school entrance. Prior experiences are considered one of the most influential factors in major selection (Wildman and Torres, 2001) and was true of students in the current study. Reese and colleagues (1987) further identified parents as a primary determinant of major selection. In the current study, 62.8 % of students identified family as a factor influencing major selection. While this study did not differentiate among family associations, the data suggests that the influence of family is less than that reported nearly three decades ago (Reese et al.,1987). The finding is surprising considering generational shifts in the parent-child relationship in which parents today are considered more active in the educational decisions of their offspring (Elam et al., 2007).

Engagement in academic, extra-curricular, and volunteer activities are reflective of the current generation of college students who are defined with the ability to multi-task and prioritize schedules toward appropriate academic achievement (Elam et al., 2007). The number of students working for pay is in agreement with national data (Pike et al., 2008). An association between hours working for pay and hours spent preparing for class was not found. Others have reported a negative association between work load and forms of academic engagement (Furr and Elling, 2000; Pike et al., 2008). Of students who worked for pay, 48.1% reported moderate work load hours, ranging from 10 to 15 hours per week. An association between hours working for pay and academic outcome is suggested, but a consistent relationship between the two has yet to be defined (Furr and Elling, 2000; Pike et al., 2008). While employment which promotes work place skills is considered a positive affector to academic success, there is a non-linear relationship whereby working more than 20 hours per week reduces

students' academic efforts and decreases CPHR (Pike et al., 2008). Indeed, students who worked substantially (> 25 hours per week) were more likely to report a lower CPHR. Students with substantial workloads are more likely to report greater financial stress, negative impacts of work on academic performance and are at greater risk for not persisting in their education (Furr and Elling, 2000; Pike et al., 2008). In the current study, 10.5% of students reported finances as a reason for not persisting in the major.

Only 22.8% of students reported attending class prepared, which is in agreement with student data from like fields reported by the National Survey of Student Engagement (NSSE, 2014). However, students in the current study reported spending less time preparing for class weekly when compared to the national average (NSSE, 2014). Whereas nearly 49% of students in Biology, Agriculture and Natural Resource fields spent 15 or more hours preparing for class weekly, only 25.0% of students from the current study reported spending more than 15 hours per week preparing for class. While course expectations and rigor are expected to increase study time, self-reported hours spent preparing for class are situational and may not be a valid predictor of academic performance (Devadoss and Foltz, 1996; Dollinger et al., 2008). Alternatively, study time is negatively associated with deliberate practice, or engagement with explicit study goals (Plant et al., 2005). Deliberate practice is also argued to underscore the association of study time and grade outcomes. Specifically, it is the quality of study, not time, that has greatest value in academic achievement. In the current study, there was a tendency for students with greater CPHR to report greater time devoted to preparing for class. Deliberate practice requires active planning and time management and is supported by self-regulated learning. Thus the lesser time spent preparing for class and the albeit weak association between class preparation time and CPHR may reflect improved quality study practices of the current student population relative to national findings.

Intrinsic and extrinsic motivation is underscored by multiple constructs that differentiate into defined realms of motivation (Pelletier et al., 1995; Ryan and Deci, 2000). Thus, single scales of intrinsic motivation in learning are unlikely to produce satisfactory factor models, as occurred with this study. Accordingly, individual scales of academic motivation were analyzed. Self-reported measures of new knowledge were equivalently weighted to measures of peer comparison, reflecting value in intrinsic and extrinsic motivators, respectively. It was not surprising that one's academic values were influenced by both intrinsic and extrinsic motivators. Orientation to the environment determines the motivator, and intrinsic motivation can only occur in light of intrinsic interests. For the student that holds no intrinsic interests to a specific task, the replacement with extrinsic interests provides another means to achieve the outcome. (Ryan and Deci, 2000). In an academic setting where not all experiences will be inherently interesting to all persons, the ability to respond to extrinsic motivation is a successful learning strategy toward academic achievement. However, it is unknown if peer comparison altered learning behaviors to this end.

Positive affect has been shown to increase interest and enjoyment of an activity. Persons in positive affect experience increased intrinsic motivation, surprisingly, persons of positive affect also respond to extrinsic motivation (Isen and Reeve, 2005). Thus, positive affect can influence outcome regardless of the motivation type. Despite positive affect being greater than negative affect, the interval estimate of negative affect was relatively strong. Kort et al. (2001) proposed a four dimensions model of learning that involves both positive and negative affect. Both behavioral dimensions occur with constructive learning, and both behavioral dimensions can occur during the process of unlearning in which knowledge is challenged and misconceptions dispelled. The states of effect on the model are cyclical and students move between the behavioral dimensions as a natural state of the learning process (Kort et al., 2001).

Surprisingly, reports of self-efficacy were moderate. While studies suggest a relationship between self-efficacy, positive affect and intrinsic value, the nature of the relationship remains uncertain (Bye et al., 2007; Komarraju et al., 2013; Lent et al., 2008). Thus, self-efficacy does not always predicate other motivational factors, or vice-versa. Indeed, self-efficacy was less for rank 1 students, out-of-state transfer students, and transfer students from the regional, agricultural technical institute; yet positive affect and career intrinsic value did not differ among these populations. Self-efficacy is cultivated through the experience of success, positive encouragement and feedback, appropriate role models and ability to manage emotions (Bandura 1997). Lack of awareness for the educational expectations and requirements of the program may contribute to depressed self-efficacy views, and rank 1 students may further lack the social maturity to promote self-efficacy within. Students from the regional, agricultural technical institute were anticipated to report greater views of self-efficacy. Although a limited number of respondents, these students would have prior program success to meet the requirements for transfer. Further, as these students originate from an agricultural program they are likely to encounter like role models. The lack of self-efficacy noted may reflect external stressors associated with the transition to an urban campus with larger class sizes. Hackett and colleagues (1992) concluded that perceived self-efficacy is reduced among students in a stressed state. Studies show that self-efficacy is a positive determinant of CPHR, with increased self-efficacy predicting increased CPHR. This was true of the current study as well. Both rank 4 and non-transfer students were more likely to report greater CPHR and overall, students reporting CPHR in the upper two brackets reported better views of self-efficacy.

Summary

The present study considered motivational constructs across animal sciences students who differed in academic rank, CPHR, transfer status and community association. The influence of academic and external commitments was considered and the intent to persist in the major examined. Both intrinsic and extrinsic motivators are of operational value to achieving successful academic outcomes; however, academic self-efficacy may be the greatest factor contributing to academic performance. Further studies are needed to determine the factors or experiences that foster self-efficacy in animal sciences students. In light of the associations of self-efficacy and CPHR, and the impact of CPHR on major satisfaction, the findings herein provide context for future academic strategies to improve student success.

Literature Cited

Allen, J. and S. Robbins. 2010. Effects of interest-major congruence, motivation, and academic performance on timely degree attainment. Journal of Counseling Psychology 57(1): 23-35.

Bandura, A. 1997. Self-efficacy: The exercise of control. New York: W.H. Freeman.

Beck, M.M. and J.C. Swanson. 2003. Value-added animal agriculture: Inclusion of race and gender in the professional formula. Journal of Animal Science 81: 2895-2903.

Bembenutty, H. 2011. Introduction: Self-regulation of learning in postsecondary education. New Directions for Teaching and Learning. SU2011(126): 3-8.

Benabou, R. and J. Tirole. 2003. Intrinsic and extrinsic motivation. The Review of Economic Studies 70(3): 489-520.

Brown, J.P. and J.D. Silverman. 1999. The current and future market for veterinarians and veterinary medical services in the United States: Executive summary. Journal of American Veterinary Medical Association 215: 161-183.

Bye, D., D. Pushkar and M. Conway. 2007. Motivation, interest, and positive affect in traditional and nontraditional undergraduate students. Adult Education. Quarterly 57: 141-158.

Devadoss, S. and J. Foltz.1996. Evaluation of factors influencing student class attendance and performance. American Journal of Agricultural Economics 78(3): 499-507.

Dollinger, S.J., A.M. Matyja and J.L. Huber. 2008. Which factors best account for academic success: Those which college students can control or those they cannot? Journal of Counseling Psychology 42(4): 872-885.

Donker, A.S., H. deBoer, D. Kostons, C.C. Dignath van Ewijk and M.P.C. van der Werf. 2014. Effectiveness of learning strategy instruction on academic performance: A meta-analysis. Educational Research Review 11: 1-26.

Edwards, R.L. 1986. Background, career objectives and performance of students in introductory animal science. NACTA Journal 30(1): 35-37.

Elam, C., T. Stratton and D.D. Gibson. 2007. Welcoming a new generation to college: The millennial students. Journal of College Admission 195: 20-25.

Furr, S.R. and T.W. Elling. 2000. The influence of work on college student development. NASPA Journal 37(2): 454-470.

Hackett, G., N.E. Betz, J.M. Casas and I.A. Rocha-Singh. 1992. Gender, ethnicity, and social cognitive factors predicting the academic achievement of students in engineering. Journal of Counseling Psychology 39(4): 527–538.

Isen, A.M. and J. Reeve. 2005. The influence of positive affect on intrinsic and extrinsic motivation: Facilitating enjoyment of play, responsible work behavior, and self-control. Motivation and Emotion 29(4): 297-325.

Komarraju, M., J. Swanson and D. Nadler. 2014. Increased career self-efficacy predicts college students' motivation, and course and major satisfaction. Journal of Career Assessment 22(3): 420-432.

Kort, B., R. Reilly and R.W. Picard. 2001. An affective model of interplay between emotions and learning: Reengineering educational pedagogy-building a learning companion. In icalt. IEEE Vol. 1: 43-47.

Lent. R.W., S.D. Brown and K.C. Larkin. 1984. Relation of self-efficacy expectations to academic achievement and persistence. Journal of Counseling Psychology 31: 356-362.

Lent, R.W., S.D. Brown and G. Hackett. 1994. Toward a unifying social cognitive theory of career and academic interest, choice, and performance. Journal of Vocational Behavior 45: 79-122.

Lent, R.W., H-B. Sheu, D. Singley, J.A. Schmidt, L.C. Schmidt and C.S. Gloster. 2008. Longitudinal relations of self-efficacy to outcome expectations, interests, and major choice goals in engineering students. Journal of Vocational Behavior 73: 328-335.

Lin, Y.G., W.J. McKeachie and Y.C. Kim. 2001. College student intrinsic and/or extrinsic motivation and learning. Learning and Individual Differences 13(3): 251-258.

National Survey of Student Engagement. 2014. The NSSE 2014 report: National benchmarks of effective educational practices. Bloomington, IN: Indiana University Center for Postsecondary Research and Planning.

Pelletier, L.G., M.S. Fortier, R.J. Vallerand, K.M. Tuson, N.M. Briere and M.R. Blais. 1995. Toward a new measure of intrinsic motivation, extrinsic motivation, and a motivation in sports: The Sport Motivation Scale (SMS). Journal of Sport and Exercise Psychology 17: 35-35.

Pike, G.R., G.D. Kuh and R.C. Massa-McKinley. 2008. First-year students' employment, engagement, and academic achievement: Untangling the relationship between work and grades. Journal of Student Affairs Research and Practice 45(4): 1012-1034.

Pintrich, P.R. and D.H. Schunk. 1996. Motivation in education: Theory, research, and applications. Englewood Cliffs, NJ: Merrill/Prentice Hall.

Pintrich, P.R., D.A. Smith, T. García and W.J. McKeachie. 1993. Reliability and predictive validity of the Motivated Strategies for Learning Questionnaire (MSLQ). Educational and Psychological Measurement 53(3): 801-813.

Plant, E.A., K.A. Ericsson, L. Hill and K. Asberg. 2005. Why study time does not predict grade point average across college students: Implications of deliberate practice for academic performance. Contemporary Educational Psychology 30(1): 96-116.

Reiling, B.A., T.T. Marshall, J.H. Brendemuhl, J.A. McQuagge and J.E. Umphrey. 2003. Experiential learning in the animal sciences: Development of a multispecies large-animal management and production practicum. Journal of Animal Science 81: 3203-3210.

Reese, D.E, D.E. Burson, K.E. Gilster, J.E. Kinder, F.G. Owen and D.R. Brink. 1987. Demographics of animal science students and factors influencing choice of major. NACTA Journal 31(2): 23-25.

Reeve, J. and S.G. Cole. 1987. Integration of affect and cognition in intrinsic motivation. Journal of Psychology 121(5): 441-449.

Ryan, R.M. and E.L. Deci. 2000. Intrinsic and extrinsic motivations: Classic definitions and new directions. Contemporary Educational Psychology 25: 54-67.

Santos, J. R. A., L. Lippke and P. Pope. 1998. PROC FACTOR: A tool for extracting hidden gems from a mountain of variables. In Proceedings of the 23rd Annual SAS Users Group International Conference. Cary, NC: SAS Institute Inc.

Sherer, M and J.E. Maddux. 1982. The self-efficacy scale: Construction and validation. Psychological Reports 51: 663-671.

Vallerand, R.J. and R. Bissonnette. 1992. Intrinsic, extrinsic, and amotivational styles as predictors of behavior: A prospective study. Journal of Personality 60(3): 599-620.

Wildman, M. and R.M. Torres. 2001. Factors identified when selecting a major in agriculture. Journal of Agricultural Education 42(2): 46-55.