DOES SENSE OF BELONGING PREDICT STUDENT RETENTION IN A COLLEGE OF AGRICULTURE?

Christopher M. Estepp[1], Will Doss[1], Sarah F. James[2], and Donald M. Johnson[1]

[1]Agricultural Education, Communications, and Technology Department, University of Arkansas
[2]Jacksonville High School, Jacksonville, Texas

Author Note

Funding Source: No funding associated with this study
Conflict of Interest: Authors declare no conflicts of interest associated with this project.
Correspondence regarding this article should be addressed to Christopher M. Estepp, Agricultural Education, Communications, and Technology Department, University of Arkansas, 1120 W. Maple St., Fayetteville, AR 72701. Email: estepp@uark.edu

Abstract

To meet the increasing demand for a highly qualified workforce, colleges of agriculture have been tasked with increasing the supply of graduates. This can be accomplished by increasing the retention of agricultural college students from freshman year to graduation. Many factors contributing to retention have been identified including precollegiate and collegiate experiences, students' sense of belonging while in college, and various personal characteristics. Using Model of College Students' Sense of Belonging and the Collegiate Outcomes Model, this study investigated the relationship between freshmen to sophomore retention, students' perceived sense of belonging, students' precollegiate and collegiate experiences, and sociodemographic variables in a college of agriculture. Data from 233 freshman students were collected and matched a year later with sophomore retention data. For predicting retention at the University of Arkansas, high school GPA was the only significant predictor of retention. On the college level, athletic event attendance, major within the college, and intent to switch to a major outside of the college were significant predictors of retention. Recommendations included identifying why students with Human Environmental Sciences majors are more likely to leave the college, improving college events to emphasize retention, and conducting a follow up study with students who changed to a major outside of the college but remained at the university to identify reasons for the move.

Keywords: student belonging, student retention, college of agriculture

Scholars have predicted an imminent shortage of qualified workers for the agricultural industry (Alston et al., 2019; Fernandez et al., 2020), and considering emergent agricultural issues, such as population growth, climate change, and ever-shifting consumer perceptions of agriculture (National Research Council, 2009), the need for a highly qualified agricultural workforce has been exacerbated. Consequently, colleges of agriculture have been tasked with increasing the supply of graduates to meet the industry's needs. To produce the necessary graduates, however, retention rates among agricultural undergraduate students must be improved (Alston et al., 2019) as student attrition from colleges of agriculture has affected the pipeline of available agricultural graduates (Codallo, 2019). Previous retention studies have shown anywhere from two-thirds to three-quarters of students retain in colleges of agriculture from their freshman to sophomore year, while just over 60% graduate with an agricultural degree (Estepp et al., 2023; Johnson et al., 2018). Codallo (2019) cited literature suggesting colleges of agriculture improve retention by recruiting students with previous agricultural experience. However, fewer students are finishing high school with agricultural experience, thus limiting the recruitment pool, and prior agricultural experience has not been shown to influence students' decisions to pursue an agricultural degree (Foreman, et al., 2018; Rayfield et al., 2013). Accordingly, examining strategies to improve student retention in colleges of agriculture is critical.

Literature Review

Various institutional and student factors have contributed to undergraduate student retention (Huang et al., 2017; Millea et al., 2018; Reason & Braxton, 2023; Sass et al., 2018; Seidman, 2012; Smathers et al., 2022). Institutional characteristics, such as the size and type of institution, institutional mission and programming, student-faculty ratios, availability of learning communities, and offering of designated first-year courses have all predicted whether a student will persist (Dunn et al., 2013; Millea et al., 2018; Seidman, 2012), particularly when the institutional characteristics impact a student's college experience (Reason & Braxton, 2023). De los Rios and Oseguera (2023) suggested that institutional policies, practices, norms, and procedures can all affect the quality of the student collegiate experience, and Means and Kniess (2023) proffered, "there are larger or macro-level systems of higher education including institutional context, policies, and practices that support or hinder student persistence and retention" (p.113). The intersection of institutional factors and student experience is an important determinant for student retention. Tinto (2003) concluded student retention is individual and contextual based upon the institution of enrollment and the student's experience at the institution.

Individual student factors including sociodemographic characteristics and academic preparation have also tended to impact student success and perseverance in college (Means & Kniess, 2023; Millea et al., 2018; Pedler et al., 2022). Means and Kniess (2023) reported finances, first-generation college student status, and race/ethnicity were major sociodemographic characteristics related to student retention; lower-income students, first-generation college students, and Black, Indigenous, and People of Color (BIPOC) students all tend to have higher attrition rates. Financial concerns have been deemed a multifaceted determinant of student retention (Means & Kniess, 2023). With the total cost of attendance at public, four-year institutions increasing by 11% over the last 10 years after adjusting for inflation (Smathers et al., 2022), students' reliance on varying types of financial aid has grown, and Millea et al. (2018) found retention of low-income students was affected by the type of financial aid received, with grant recipients more likely to persist than loan recipients. Financial issues have been particularly difficult for low-income students as research has shown these students typically have more family and work responsibilities, which can manifest in poor study behaviors and more academic, social, and emotional challenges (Means & Kniess, 2023). While research has been unclear whether first-generation student status directly impacts retention, first-generation college students typically do not possess the support systems and knowledge to be able to navigate the social and academic challenges associated with attending college, which can lead to attrition (Pratt et al., 2019). Lastly, BIPOC students have typically departed college at higher rates than non-minoritized students (Means & Kniess, 2023). While the challenges for various racial and ethnic groups differ (Porter, 2020), unwelcoming campus environments have fostered feelings of not belonging among BIPOC students (Means & Kniess, 2023).

Precollegiate academic preparation has been another student factor shown to affect student retention (Sommerfeld, 2011). Variables such as high school grade point average (GPA), standardized test scores, and high school rank have historically been the standard for determining college readiness. Empirical data have shown that college-bound students who score higher on standardized exams, such as the ACT and SAT, as well as those with higher high school GPAs were more likely to experience success in college (Barbera et al., 2020). However, research has indicated the aforementioned academic measures create educational disparities for BIPOC students, first-generation college students, non-traditional aged students, and students with learning disabilities (Means & Kniess, 2023; Sommerfeld, 2011).

Within colleges of agriculture, researchers (Estepp et al., 2020; Garton et al., 2000; Garton et al., 2002; Koon et al., 2009) have found similar results regarding academic variables and student retention. However, some have found that while higher-achieving agricultural students were more likely to retain at the university, they were more likely to leave colleges of agriculture (Dyer et al., 2002; Johnson et al., 2018; Shoulders et al., 2019). Codallo (2019) found students who intended to leave a college of agriculture had trouble integrating academically and socially at the university and college level and had career goals inconsistent with agricultural majors. Many of Codallo's respondents reported feelings of not belonging in classroom settings and within student organizations due to their lack of agricultural knowledge and experience. Codallo recommended colleges of agriculture be more intentional to not make students with less agricultural experience feel excluded, and to ensure that all students understand the plethora of career opportunities in the agricultural industry.

While a variety of institutional, sociodemographic, academic, and cognitive factors have been shown to predict student retention (Huang et al., 2017; Reason & Braxton, 2023; Sass et al., 2018; Seidman, 2012; Smathers et al., 2022), Sommerfeld (2011) suggested researchers also focus on students' motivational and non-academic factors. One such factor includes students' sense of belonging, which prior research has shown to be related to increased undergraduate student retention (Bentrim & Henning, 2022; Hausmann et al., 2007; Pedler et al., 2022; Rhee, 2008; Strayhorn, 2018). As previously noted, the interaction between student and institutional factors can be important for retention (Tinto, 2003) and likely influences students' sense of belonging. This study specifically examined the role undergraduate students' sense of belonging played in retention, where retention was defined as students returning to the same institution and college of agriculture from their freshman to sophomore fall semesters.

Strayhorn (2018) defined college students' sense of belonging as students' "perceived social support on campus, a feeling or sensation of connectedness, the experience of mattering or feeling cared about, accepted, respected, valued by, and important to the group (e.g., campus community) or others on campus (e.g., faculty, peers)" (p. 29). Fixed student characteristics, such as

sociodemographics, academic history, and parental college experience, as well as variables faculty members can influence, such as caring about student learning, facilitating peer-to-peer contact, well-designed instruction, professor/student rapport, and encouraging student participation have been associated with students' sense of belonging (Alston et al., 2019; Dunn et al., 2013; Estepp et al., 2023; Freeman et al., 2007). Moreover, sense of belonging has been connected with increased academic engagement, confidence, motivation, and enjoyment among other positive behaviors and emotions (Freeman et al., 2007; Pedler et al., 2022). Factors affecting sense of belonging, such as student-faculty interactions, student-advisor interactions, and extracurricular involvement, have also been shown to increase academic achievement and retention (Dunn et al., 2013; Xiao et al., 2019). Pedler et al., (2022) found students with a low sense of belonging had more thoughts of dropping out of college before degree completion, while Bentrim and Henning (2022) found relationships between increased students' sense of belonging and continued commitment to the institution and higher likelihood of persistence.

Theoretical/Conceptual Framework

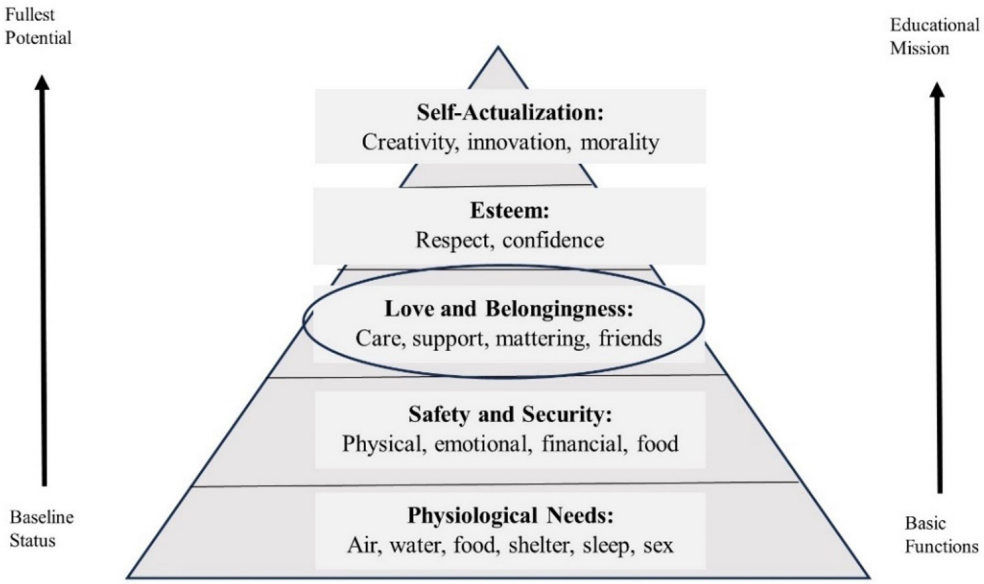
The theoretical framework for this study was Maslow's (1954) Hierarchy of Needs motivational theory. According to Maslow (1954), human motivation is contingent upon certain needs being met. Maslow (1970) posited human needs can be divided into deficiency needs, cognitive needs, and aesthetic needs. Deficiency needs have been characterized by an individual's motivation to decrease a deficiency in a certain area, including biological and physiological needs, safety needs, love and belonging needs, and esteem needs. Cognitive and aesthetic needs are higher level needs focusing on learning, knowledge, and an appreciation of beauty (Maslow, 1970). While Maslow (1954) originally hypothesized lower-level needs must be met before an individual can be motivated to pursue behaviors related to higher level needs, he later (Maslow, 1987) suggested motivational "behavior tends to be determined by several or all of the basic needs simultaneously rather than by only one of them" (p. 71). For this study, we specifically examined belonging needs in the context of freshmen to sophomore retention of undergraduate students in a college of agriculture.

Two conceptual frameworks guided this study: Strayhorn's (2018) Model of College Students' Sense of Belonging and Foreman et al.'s (2018) Collegiate Outcomes Model. Strayhorn's framework (Figure 1), rooted in Maslow's (1954) hierarchy of needs, posits sense of belonging is an essential human need and motivator. Strayhorn's model suggests the presence of sense of belonging motivates an individual to pursue higher-order needs such as knowledge-seeking and self-actualization, which in the context of higher education could connect to academic success. Accordingly, belonging is a precursor for students to meet their full academic potential and the institution to achieve its educational mission.

The second conceptual framework, the Collegiate Outcomes Model (Foreman et al., 2018), which was grounded in Astin's (1993) Input-Environmental-Output (E-I-O) model, suggests students' precollegiate characteristics and experiences independently and in unison with students' collegiate experiences influence academic outcomes. Precollegiate characteristics and experiences consist of sociodemographic traits, academic preparation, academic performance, and personal experiences (Foreman et al., 2018). Collegiate experiences consist of students' individual experiences with peers and faculty in and out of the classroom (Foreman et al., 2018). According to the literature (Alston et al., 2019; Dunn et al., 2013; Estepp et al., 2023; Freeman et al., 2007), many of the variables influencing sense of belonging fit into the precollegiate and college experience categories. Consequently, we adapted Foreman

Figure 1

Model of College Students' Sense of Belonging (Strayhorn, 2018)



et al.'s model to include students' sense of belonging as a variable stemming from students' precollegiate and college experiences (Figure 2).

Purpose

Undergraduate students' sense of belonging has been related to increased student retention; however, little research has been conducted examining sense of belonging and student retention within colleges of agriculture. Therefore, the purpose of this study was to investigate the relationship between freshmen to sophomore retention, students' perceived sense of belonging, students' precollegiate and collegiate experiences, and sociodemographic variables in a college of agriculture. The specific objectives guiding this study were:

1. Describe freshmen students' perceived sense of belonging to the University of Arkansas and College of Agricultural Food and Life Sciences (AFLS).
2. Determine the relationships among students' perceived sense of belonging to the University of Arkansas and AFLS, sociodemographic variables, precollegiate and collegiate experiences, and freshmen to sophomore retention.
3. Determine if a linear combination of students' perceived sense of belonging to the University of Arkansas and AFLS, precollegiate and collegiate experiences, and sociodemographic variables can predict freshmen to sophomore retention.

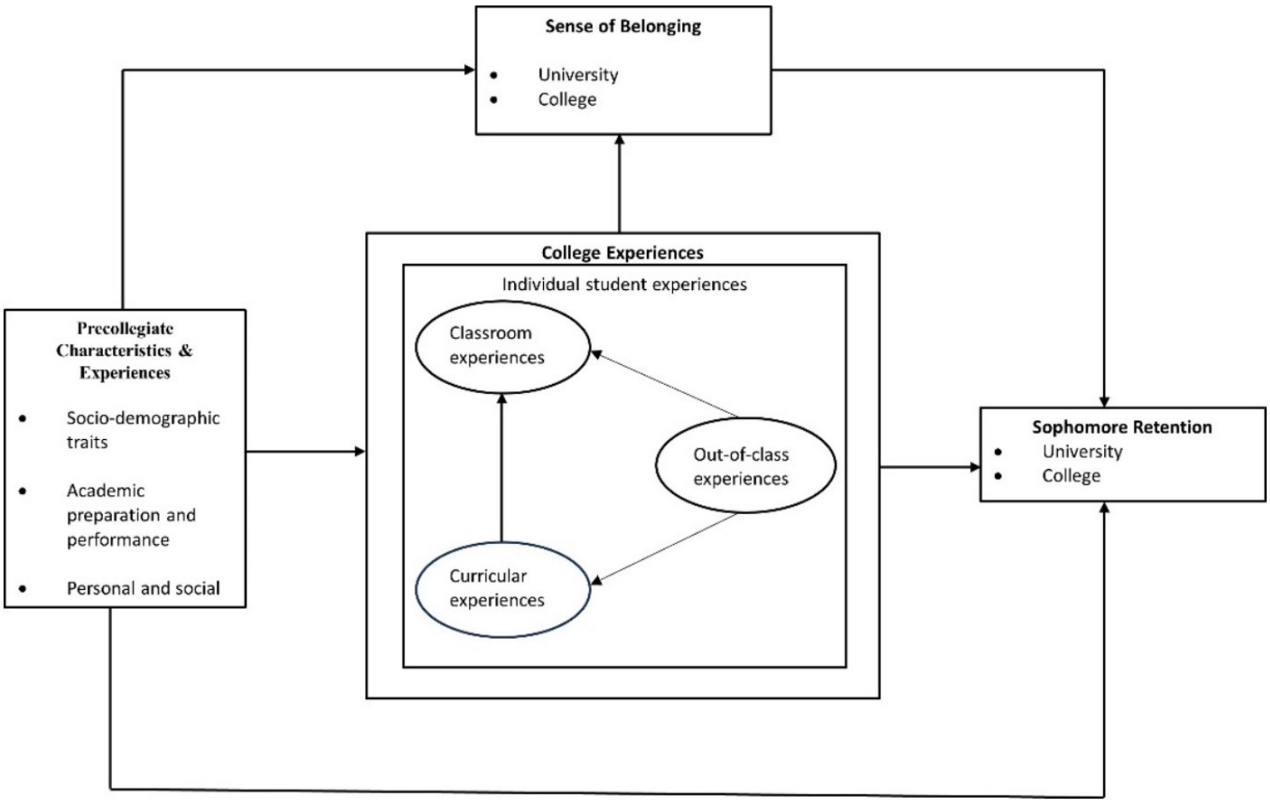
Methods

All freshmen students within AFLS at the University of Arkansas during the fall 2022 semester (N = 503) were considered the population of interest for this study. After receiving IRB approval, an invitation email was sent to the instructors of all AFLS course sections of UNIV 1001 (required of all freshmen students), *University Perspectives*, requesting student participation in an in-person survey administration. All instructors agreed to allow time for students to complete the survey during class and provided the QR code and URL to the Microsoft Forms survey instrument for students attending class during the seventh week of the semester. This timing for administration of the instrument was chosen, as the UNIV 1001 course is an eight-week course. A response rate of 46.3% (n = 233) was achieved. Due to the low response rate, results of this study should not be generalized beyond respondents. However, "Studies yielding valid results of interest to the profession from a specific groups [sic] of respondents, regardless of their generalizability, can add to the body of knowledge and assist researchers as they design and conduct research" (Johnson & Shoulders, 2017, pp. 310-311).

Two scales, each comprised of 5 Likert-type items (Hurtado & Carter, 1997), which were part of a larger 32-item instrument were used to measure students' sense of belonging to the AFLS (α = .91) community and to the University of Arkansas (α = .90) community. A sample item measuring students' sense of belonging was, "I see myself as part of the University of Arkansas (or AFLS) community"

Figure 2

Collegiate Outcomes Model (adapted from Foreman et al., 2018)



and was rated on a scale of 1 = strongly disagree to 5 = strongly agree. An additional 16 items measured student precollegiate and collegiate experiences and participant demographics. Precollegiate characteristics assessed included high school GPA and highest level of education earned by parents. Collegiate experiences included participation in student organization meetings, attending university athletic events, attending the AFLS welcome event, location of student residence, major, and frequency of travel to parents' home. To track freshmen to sophomore retention, fall 2023 enrollment data was requested from the University of Arkansas Office of Strategic Analytics and Insights and matched with the data collected in UNIV 1001 during fall 2022. Data were analyzed using SAS v.9.4 and analyses for objective one utilized descriptive statistics including frequencies and summated means. Data for objectives two and three utilized phi and point biserial correlations and logistic regression, respectively.

Results

Of the 229 usable responses, 79.0% of participants were White, 7.5% were Hispanic, 5.3% were Black, 4.4% were of two or more ethnicities, 3.1% declined to respond, and 1.0% were Asian. Most students identified as female (75.1%), were majoring in agriculture (59.6%), as opposed to Human Environmental Sciences (HESC), were living in an on-campus dorm (77.7%) and reported high school GPAs of 3.50 or higher (83.4%). Fewer than one in five (18.3%) were first-generation college students. Based on ZIP code data, the median distance from the students' home communities to campus was 236.00 miles (*IQR* = 263.50), with a range of 0.00 to 2,078.00 miles. A majority (81.2%) of students reported traveling home at least two times each month. Students reported participating in a variety of campus events; a majority (60.7%) had attended at least one meeting of a campus student organization, attended a University of Arkansas athletic event (82.5%), and participated in the annual AFLS welcome event (76.0%).

Shown in Table 1, most students felt a high or very high sense of belonging to the university and AFLS at 91.7% and 88.6%, respectively. Students' mean sense of belonging to the university was slightly higher than for AFLS.

Each student responded to a single Likert-type item asking the likelihood (1 = very unlikely and 5 = very likely) they would transfer to a major outside AFLS. Of the 228 responding students, 40.4% were very unlikely, 25.9% were unlikely, 19.3% were uncertain, 9.6% were likely, and 4.8% were very likely to change to a major outside AFLS. Approximately one-third of respondents were not strongly committed to their major within AFLS.

As shown in Table 2, 85.6% of freshmen were retained as sophomores at the university, while 74.2% were retained as sophomores in AFLS. Thus, out-of-college transfers accounted for 44.1% of freshmen who did not return to AFLS as sophomores. Of the 26 students who changed to majors outside of AFLS, 12 students transferred to the College of Arts and Sciences, six transferred to the College of Education and Health Professions, four transferred to the College of Business, and three transferred to the College of Engineering.

Table 2

Freshmen-to-Sophomore Retention at the University of Arkansas and in AFLS

	Retained		*Not Retained*	
Unit	*f*	%	*f*	%
University	196	85.6	33	14.4
AFLS	170	74.2	59	25.8

Based on the levels of measurement, appropriate bivariate measures of association (phi coefficients and point biserial correlations) were calculated between selected sociodemographic variables (measured on nominal and interval scales) and the dichotomous categorical variables of freshman-to-sophomore retention in the university and AFLS (1 = retained and 0 = not retained). As shown in Table 3, major (HESC = 0 and agriculture = 1), high school GPA, and sense of belonging at the university had significant, low (Davis, 1971), positive correlations with retention at the university. Attendance at athletic and college welcome events, gender, major, and sense of belonging to AFLS had low, positive correlations with sophomore retention in AFLS. Conversely, intent to transfer to a major outside AFLS had a low, negative correlation with sophomore retention in AFLS.

Two logistic regression models were estimated. The first model predicted sophomore retention in the university. The second model predicted retention in AFLS for students (*n* = 196) who returned to the university as sophomores. Residuals statistics for each model were examined and no violations of the assumptions for logistic regression were

Table 1

Students' Sense of Belonging at the University of Arkansas and in AFLS

Unit	*n*	Very Low (%)	Low (%)	Neutral (%)	High (%)	Very High (%)	*M*	*SD*
University	229	0.4	0.9	7.0	37.1	54.6	4.44	0.60
AFLS	228	0.4	1.8	9.2	45.6	43.0	4.30	0.68

Note. Percentages are based on real limits (Lindner & Lindner, 2024) of 1.00 -1.50 = very low, 1.51 – 2.50 = low, 2.51 – 3.50 = neutral, 3.51 – 4.50 = high, and 4.51 – 5.00 = very high.

Table 3

Relationships Between Precollegiate/Collegiate, Sociodemographic, and Belonging Variables with Sophomore Retention within the University of Arkansas and AFLS

	Retention[g]	
Variable	**University**	**AFLS**
Attended one or more student club meetings[a]	.12	.08
Attended an athletic event[a]	.07	.19**
Attended AFLS welcome event[a]	.07	.15*
First-generation college student[a]	.10	.03
Ethnicity[b]	.10	-.05
Gender[c]	.04	.15*
Live on-campus[a]	.12	.03
Major[d]	.16*	.23**
Distance (miles) from campus to home	-.07	-.05
High school GPA[e]	.23*	.13
Sense of belonging to the university[f]	.14*	.00
Sense of belonging to AFLS[f]	.06	.16*
Likelihood of changing to major outside AFLS[f]	.11	-.20**

Note. [a]no = 0, yes = 1. [b]minority = 0, non-minority = 1. [c]female = 0, male = 1. [d]HESC = 0, agriculture = 1. [e]1 = 2.50 – 2.99 to 5 = >4.00. [f]Summated scale where 1 = very low and 5 = very high. [g]not retained = 0, retained = 1. *$p < .05$. **$p < .01$.

identified (Field & Miles, 2012).

For the university retention model, the three statistically significant bivariate variables (major, high school GPA, and sense of belonging to the university) were used as potential predictors. The resulting model was statistically significant, $\chi^2(3) = 13.33$, $p < .01$, max-rescaled $R^2 = .10$. High school GPA was the only statistically significant predictor (Table 4) of returning to the university as a sophomore. The odds ratio of 1.64 indicated each one-point categorical increase in GPA was associated with a 64% increase in the odds of returning to the university as a sophomore. Sense of belonging at the university and major were not significant predictors of sophomore retention.

Six variables (attendance at athletic and AFLS welcome events, gender, major, sense of belonging to AFLS, and likelihood of changing to a major outside of AFLS) had statistically significant bivariate correlations with sophomore retention in AFLS and were used as potential predictors of returning to AFLS as sophomores. The resulting model was statistically significant, $\chi^2(6) = 34.69$, $p < .001$, max-rescaled $R^2 = .30$. Major and attendance at an athletic event had significant, positive regression coefficients, while intent to switch to a major outside of AFLS had a significant, negative regression coefficient. The regression coefficients

Table 4

Logistic Regression Model Predicting Freshman-to-Sophomore Retention at the University of Arkansas

				CI_{95} for Odds Ratio	
	β	***SE***	**Odds Ratio**	**L. Limit**	**U. Limit**
Intercept	-1.74	1.35	--	--	--
Majora	-0.36	0.23	0.70	0.45	1.09
High school GPA[b]	0.50*	0.20	1.64	1.10	2.45
University sense of belonging	0.50	0.24	1.65	0.96	2.85

Note. [a]HESC = 0, agriculture = 1. [b] Coded as 1 = 2.50 – 2.99, 2 = 3.00 – 3.49, 3 = 3.50 – 3.99, 4 = 4.00, and 5 > 4.00. *$p < .05$.

Table 5

Logistic Regression Model Predicting AFLS Retention for Students Returning to the University of Arkansas as Sophomores.

				CI_{95} for Odds Ratio	
	β	***SE***	**Odds Ratio**	**L. Limit**	**U. Limit**
Intercept	-0.23	1.73	--	--	--
Athletic event attendance[a]	2.11***	0.64	8.24	2.35	28.92
AFLS welcome event attendance[a]	0.98	0.53	2.68	0.94	7.62
Gender[b]	1.30	0.86	3.67	0.68	19.85
Major[c]	1.42*	0.60	4.16	1.28	13.53
AFLS sense of belonging[d]	0.06	0.35	1.06	0.54	2.08
Intent to switch to major outside of AFLS[d]	-0.59**	0.23	0.55	0.35	0.86

Note. [a]no = 0, yes =1. [b]female = 0, male = 1. [c]HESC = 0, agriculture = 1. [d]Measured on a 1 (very low) to 5 (very high) scale and converted to *z* scores. *$p < .05$. **$p < .01$. ***$p < .001$.

for attendance at the AFLS welcome event, gender, and sense of belonging in AFLS were not statistically significant (Table 5).

Based on odds ratios (OR), returning sophomores majoring in agriculture as freshmen were four times (*OR* = 4.16) more likely to be retained in AFLS than returning sophomores majoring in HESC as freshmen. Students who reported attending a University of Arkansas athletic event were also approximately eight times (*OR* = 8.24) more likely to be retained in majors within AFLS. Males were over three times (*OR* = 3.67) more likely to be retained in the college compared to females. Finally, each one standard deviation increase in intent to change majors outside AFLS was associated with a 45% (*OR* = 0.55) increase in the likelihood a returning student would transfer outside of AFLS.

Conclusions/Discussion/Implications/ Recommendations

Based on the results, respondents had a high perceived sense of belonging to the university and AFLS with almost two-thirds indicating they were unlikely to switch majors outside of AFLS. Freshmen-to-sophomore retention was slightly higher at the university level when compared to the college level, however approximately three-fourths of students were retained in the college from fall 2022 to fall 2023 reflecting previous findings on student retention in colleges of agriculture (Johnson et al., 2018). Approximately one in four students left AFLS, mostly HESC students. HESC degree programs include apparel merchandising, human nutrition, and other non-traditional agriculture programs, which could mean these students were less connected to AFLS. Additionally, nearly half of the students who remained at the University of Arkansas but transferred out of AFLS went to the College of Arts and Sciences. While this college has majors such as Biology, Chemistry, Advertising, and Communication, which are similar to majors within AFLS, perhaps students who transferred did not feel integrated with agriculture and pursued majors outside of the college to align with their career goals, similar to Codallo's (2019) respondents.

When examining relationships between precollegiate/ collegiate, sociodemographic, and belonging variables as related to retention, the magnitude and direction of correlations differed depending on if retention was at the college or university level. Major, high school GPA, and sense of belonging at the university had low, positive correlations with retention at the university. Additionally, students with an agriculture major rather than an HESC major retained better at the university level. An increased high school GPA was also associated with retention at the university level, supporting previous findings related to precollegiate variables (Sommerfeld, 2011). Sense of belonging at the university was also positively associated with retention at the university level, congruent with previous studies (Bentrim & Henning, 2022; Hausmann et al., 2007; Pedler et al., 2022; Rhee, 2008; Strayhorn, 2018). Attending athletic events, attending the AFLS welcome event, identifying as male, having a higher sense of belonging to AFLS, and having an agricultural major rather than HESC major were all variables related to retention at the college level, similar to previous findings (Bentrim & Henning, 2022; Freeman et al., 2007; Pedler et al., 2022; Xiao et al., 2019). As might be expected, those who had a lower intent to transfer to a major outside AFLS were more likely to be retained.

While correlation coefficients were small and only a few of the student variables were significantly related to retention, an examination of the correlation coefficients showed some positive findings. The lack of relationships showed that first-generation and BIPOC students did not leave the college or university at significant levels, which differs from previous research (Means & Kniess, 2023). Relationships also revealed that students who were more involved with campus activities tended to retain better, especially at the college level. Potentially, these students' college experience was positive, which can lead to better retention (Tinto, 2003).

Precollegiate/Collegiate, sociodemographic, and belonging variables having statistically significant correlations with retention were used to develop a model to predict retention at both the university and college levels; however, not all variables anticipated from the literature emerged as predictors. For predicting retention at the university level, high school GPA was the only significant predictor of retention, which was congruent with previous findings (Sommerfeld, 2011). Major and university sense of belonging were not significant predictors of retention at the university level. The inability of university sense of belonging to predict student retention differed from previous reports (Bentrim & Henning, 2022; Hausmann et al., 2007; Pedler et al., 2022; Rhee, 2008; Strayhorn, 2018).

When predicting retention on the college level, athletic event attendance, major, and intent to switch to a major outside of AFLS were the only significant predictors. Students who attended an athletic event were eight times more likely to be retained in AFLS from freshman to sophomore year. The reasons for this are unclear, as this is a university level activity. AFLS consistently provides opportunities for students to attend football tailgates, which could perhaps provide students with a connection to the college. With agriculture students having a higher likelihood of being retained within AFLS compared to HESC students, additional investigation into reasons for this may be warranted. Intent to switch majors was a negative predictor of retention in AFLS; however, this was not observed with retention at the university level. Results showed many of these students left the college but stayed at the university. According to Bentrim and Henning (2022), students' initial commitment to the institution can predict retention, thus examining students' commitment levels early could help inform retention staff members.

Differing predictors of retention were found at the college and university levels indicating potential unique factors influence retention at each level. While high school GPA predicted retention at the university level in this study, it did not at the college. Similar research (Johnson et al., 2018) has suggested students with higher high school GPAs had an increased probability of not returning to the college of agriculture but were more likely to stay at the university. Accordingly, precollegiate academic variables such as high school GPA might be more appropriately used by university retention staff rather than those at the college level. Likewise, college faculty and administrators could provide more opportunities for more students to attend university events as an AFLS community.

According to the literature, sense of belonging is an important variable regarding student retention (Bentrim & Henning, 2022; Dunn et al., 2013; Pedler et al., 2023; Strayhorn, 2018; Xiao et al., 2019), and based on the relationships found in this study, evaluating sense of belonging and applying Strayhorn's (2018) model at the university and college levels can be appropriate. Theoretically, sense of belonging could be expected to predict retention, but in the case of this study it did not. This finding was surprising, but perhaps the lack of variation in students' sense of belonging potentially served to decrease any relationship existing between sense of belonging and retention, as almost all students reported a high or very high sense of belonging at both the university and college level. Furthermore, only about half of freshmen college of agriculture students responded to this survey, and it is plausible nonrespondents possess different levels of perceived belonging to the college than respondents.

When analyzing how sense of belonging fits into Foreman et al.'s (2018) Collegiate Outcomes Model, sense of belonging can be directly influenced by precollegiate characteristics or college experiences (Estepp et al., 2023), which should potentially impact sophomore retention. However, identified predictors of retention from this study included high school GPA for university level retention and attending athletic events, majoring in agriculture rather than HESC, and intent to switch to a major outside AFLS for college level retention. While each of these variables has potential relationships with students' sense of belonging, this study revealed they can also directly influence retention. One possible explanation for why sense of belonging was not a predictor of retention could be that sense of belonging may act as more of a mediating variable between student variables and retention. The combination of sense of belonging, precollegiate characteristics, and collegiate experiences has the potential to be a more powerful predictor of retention (Tinto, 2003).

Based on the results of this study, there are several recommendations for practice and further research. To improve retention, faculty members and administrators in AFLS should identify why HESC students are more likely to leave the college and focus more effort on retaining these students. Many of these students stayed at the university, thus qualitative inquiries could be made with these students to determine why they left AFLS. Since attending a University of Arkansas athletic event predicted retention, perhaps AFLS should consider encouraging students to attend, possibly as a group with admission sponsored by the college. As intent to switch majors was identified as a negative predictor of retention, working to identify students early who intend to switch majors could potentially help with retention, especially if one-on-one advising and consultation could occur. Some of the items measured, such as attending a student club meeting or the AFLS welcome event, were not strongly related to retention nor predicted retention at the university or college level. Nonetheless, these events are important for getting students involved, so perhaps encouraging more students to engage and including more events to follow up on the AFLS welcome event could help student involvement and potentially retention of students from their freshman to sophomore years.

Future studies should attempt to gain more representative samples and test other levels of Strayhorn's (2018) model to evaluate its ability to predict retention on the college level and compare results to the university level. As sense of belonging has been shown to be an important variable for student retention, further analyses, particularly those using path analysis or showing variable interactions, should be conducted to determine how sense of belonging fits into the Collegiate Outcomes Model (Foreman et al., 2018). Several student characteristics such as being a first-generation college student, ethnicity, gender, living

on campus, and distance from home were not statistically significant predictors of retention. The literature suggested these variables were influential on college success and retention; however, this was not the case in this study. Further research should quantify the impact these variables can have on retention in colleges of agriculture to determine how much time college retention personnel should devote to each. This study was limited to retention from freshman to sophomore years. This line of inquiry should be continued longitudinally to examine the long-term impacts of precollege experiences/characteristics, college experiences, and sense of belonging on retention and ultimately graduation.

References

Alston, A. J., Roberts, R., & English, C.W. (2019). Building a sustainable agricultural career pipeline: Effective recruitment and retention practices used by colleges of agriculture in the United States. *Journal of Research in Technical Careers, 3*(2). https://doi.org/10.9741/2578-2118.1073.

Astin, A. W. (1993). *What matters in college?*. Jossey-Bass.

Barbera, S. A., Berkshire, S. D., Boronat, C. B., & Kennedy, M. H. (2020). Review of undergraduate student retention and graduation since 2010: Patterns, predictions, and recommendations for 2020. *Journal of College Student Retention: Research, Theory, & Practice, 22*(2), 227-250. https://doi.org/10.1177/1521025117738233

Bentrim, E. M., & Henning, G. W., Eds. (2022). *The impact of a sense of belonging in college: Implications for student persistence, retention, and success*. Stylus Publishing, LLC.

Codallo, M. V. (2019). *Factors that influence university student retention in colleges of agriculture* [Unpublished master's thesis]. North Carolina State University.

Davis, J. A. (1971). *Elementary survey analysis*. Prentice-Hall.

De los Rios, M. J., & Oseguera, L. (2023). Organizational behavior and student persistence in college. In R. D. Reason & J. M. Braxton (Eds.), *Improving college student retention: New developments in theory, research, and practice* (pp. 123-152). Stylus.

Dunn, J. R., Hains, B. J., & Epps, R. B. (2013). Stakeholders' perspectives: Students' perceptions of retention efforts in a college of agriculture. *NACTA Journal, 57*(1), 2-9. https://www.jstor.org/stable/pdf/nactajournal.57.1.2.pdf

Dyer, J. E., Breja, L. M., & Haase Wittler, P. (2002). Predictors of student retention in colleges of agriculture. Proceedings of the 27th Annual National Agricultural Education Research Conference. 490-500. https://files.eric.ed.gov/fulltext/ED462290.pdf

Estepp, C. M., Shoulders, C. W., & Johnson, D. M. (2020). Predicting freshmen academic outcomes and sophomore retention in a college of agriculture. *NACTA Journal, 64*, 466-475. https://www.jstor.org/stable/27157820

Estepp, C. M., Doss, W., James, S. F., Simmons, L. M., & Johnson, D. M. (2023). Examining sense of belonging among freshmen college of agriculture students. *NACTA Journal, 67*, 301-309. https://doi.org/10.56103/nactaj.v67i1.137

Fernandez, J. M., Goecker, A. D., Smith, E., Moran, E. R., & Wilson, C. A. (2020). *Employment opportunities for college graduates in food, agriculture, renewable natural resources and the environment: United States, 2020-2025*. United States Department of Agriculture.

Field, A., & Miles, J. (2012). *Discovering statistics using SAS*. Sage.

Foreman, B., Retallick, M., & Smalley, S. (2018). Changing demographics in college of agriculture and life sciences students. *NACTA Journal, 62*(2), 161-167. https://www.jstor.org/stable/90022551

Freeman, T. M., Anderman, L. H., & Jensen, J. M. (2007). Sense of belonging in college freshman at the classroom and campus levels. *The Journal of Experimental Education, 75*(3), 203-220. https://www.jstor.org/stable/20157456.

Garton, B. L., Dyer, J. E., & King, B. O. (2000). The use of learning styles and admission criteria in predicting academic performance and retention of college freshmen. *Journal of Agricultural Education, 41*(2), 46-53. https://doi.org/10.5032/jae.2000.02046

Garton, B. L., Ball, A. L., & Dyer, J. E. (2002). The academic performance and retention of college of agriculture students. *Journal of Agricultural Education, 43*(1), 46-56. https://doi.org/10.5032/jae.2002.01046

Hausmann, L. R. M., Schofield, J., & Woods, R. L. (2007). Sense of belonging as a predictor of intentions to persist among African American and White first-year college students. *Research in Higher Education, 48*(7), 803-839. https://doi.org/10.1007/s11162-007-9052-9

Huang, L., Roche, L. R., Kennedy, E., & Brocato, M. B. (2017). Using an integrated persistence model to predict college graduation. *International Journal of Higher Education, 6*(3), 40-56. https://eric.ed.gov/?id=EJ1142304

Hurtado, S., & Carter, D. F. (1997). Effects of college transition and perceptions of campus racial climate on Latino college students' sense of belonging. *Sociology of Education, 70*(4), 324-345. https://doi.org/10.2307/2673270

Johnson, D. M., & Shoulders, C. W. (2017). Power of statistical tests used to address nonresponse error in the Journal of Agricultural Education. *Journal of Agricultural Education, 58*(1), 300-312. https://doi.org/10.5032/jae.2017.01300

Johnson, D. M., Shoulders, C. W., Edgar, L. D., & Dixon, B. L. (2018). Predictors of freshman to sophomore retention in a college of agricultural, food, and life sciences. *NACTA Journal, 62*(3), 218-224. https://nactaarchives.org/index.php/vol-62-3-sept-2018/2774-freshman-to-sophomore-retention.

Koon, L. A. F., Frick, M. J., & Igo, C. G. (2009). What kind of students are enrolling in a college of agriculture and are they staying? A mixed methods approach. *NACTA Journal, 53*(2), 21-28. https://www.nactateachers.org/index.php/vol-53-num-2-june-2009-sp-663391841/159-what-kind-of-students-are-enrolling-in-a-college-of-agriculture-and-are-they-staying-a-mixed-methods-approach

Lindner, J. R., & Lindner, N. J. (2024). Interpreting Likert-type scales, summated scales, unidimensional scales, and attitudinal scales: I neither agree nor disagree, Likert or not. *Advancements in Agricultural Development, 5*(2), 152-163. https://doi.org/10.37433/aad.v5i2.351

Maslow, A. H. (1954). *Motivation and personality*. Harper and Row.

Maslow, A. H. (1970). *Motivation and personality* (2nd ed.). Harper and Row.

Maslow, A. H. (1987). *Motivation and personality* (3rd ed.). Pearson Education.

Means, D. R., & Kniess, D. R. (2023). Sociodemographic characteristics and college student persistence, retention, and graduation. In R. D. Reason & J. M. Braxton (Eds.), Improving college student retention: New developments in theory, research, and practice (pp. 97-122). Stylus.

Millea, M., Wills, R., Elder, A., & Molina, D. (2018). What matters in college student success? Determinants of college retention and graduation rates. Education, 138(4), 309–322. https://www.ingentaconnect.com/contentone/prin/ed/2018/00000138/00000004/art00003

National Research Council. (2009). *Transforming agricultural education for a changing world*. National Academies Press.

Pedler, M. L., Willis, R., & Nieuwoudt, J. E. (2022). A sense of belonging at university: Student retention, motivation and enjoyment. *Journal of Further and Higher Education, 46*(3), 397-408. https://doi.org/10.1080/0309877X.2021.1955844.

Porter, C. J. (2020). Students' racial identity development. In J. C. Garvey, J. C. Harris, D. R. Means, R. J. Perez, & C. J. Porter (Eds.), *Case studies for student development theory: Advancing social justice and inclusion in higher education* (pp. 23-26). Routledge.

Pratt, I. S., Harwood, H. B., Cavazos, J. T., & Ditzfeld, C. P. (2019). Should I stay or should I go? Retention in first-generation college students. *Journal of College Student Retention: Research, Theory & Practice, 21*(1), 105-118. https://doi.org/10.1177/1521025117690868

Rayfield, J., Murphrey, T. P., Skaggs, C., & Shafer, J. (2013). Factors that influence student decisions to enroll in a college of agriculture and life sciences. *NACTA Journal, 57*(1), 88-93. https://www.jstor.org/stable/pdf/nactajournal.57.1.88.pdf

Reason, R. D., & Braxton, J. M. (2023). Toward a revision of two empirically supported theories of college student persistence. In R. D. Reason & J. M. Braxton (Eds.), *Improving college student retention: New developments in theory, research, and practice* (pp. 51-72). Stylus.

Rhee, B. (2008). Institutional climate and student departure: A multinomial multilevel modeling approach. *Review of Higher Education, 31*(2), 161-183. https://doi.org/10.1353/rhe.2007.0076

Sass, D. A., Castro-Villarreal, F., Wilkerson, S., Guerra, N., & Sullivan, J. (2018). A structural model for predicting student retention. *The Review of Higher Education, 42*(1), 103-135. https://doi.org/10.1353/rhe.2018.0035

Seidman, A. (2012). *College student retention: Formula for student success* (2nd ed.). Rowman & Littlefield Publishers.

Shoulders, C. W., Edgar, L. D., Johnson, D. M. (2019). The relationship between student admissions data and six-year degree completion. *Journal of Human Sciences and Extension, 7*(1), 104-116. https://doi.org/10.54718/SYCY2862

Smathers, K., Chapman, E., Deringer, N., & Grieb, T. (2022). The relationship between financial stress and college retention rates. *Journal of College Student Retention: Research, Theory & Practice, 0*(0). https://doi.org/10.1177/15210251221104984

Sommerfeld, A. (2011). Recasting non-cognitive factors in college readiness as what they truly are: Non-academic factors. *Journal of College Admission, 213*, 18-22. https://files.eric.ed.gov/fulltext/EJ962511.pdf

Strayhorn, T. L. (2018). *College students' sense of belonging: A key to educational success for all students* (2nd ed.). Routledge.

Tinto, V. (2003, November 5-7). Promoting student retention through classroom practice [Paper presentation]. Enhancing Student Retention: Using International Policy and Practice Conference, Amsterdam, Netherlands. https://www.researchgate.net/profile/Vincent-Tinto/publication/255589128_Promoting_Student_Retention_Through_Classroom_Practice/links/5759719008ae414b8e43bfa4/Promoting-Student-Retention-Through-Classroom-Practice.pdf

Xiao, M., Bradley, K. D., & Lee, J. (2019). Exploring the relationship between student involvement and first-to-second year retention at four-year postsecondary institutions. *Mid-Western Educational Researcher, 33*(3), 191-205. https://scholarworks.bgsu.edu/mwer/vol32/iss3/2.