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ABSTRACT

Students and faculty alike would like to know what factors are related to success in college courses. The purpose of this study was to evaluate factors that relate to a student's success in Animal Physiology I (Phys I), an upper-level animal science course at the University of Arkansas. Student data were confidentially collected and coded. Data collected were student high school grade point average (HSGPA); composite ACT score; English, reading, math, and science subscores on the ACT; and student grades in English composition I and II, college algebra, chemistry, biology, microbiology, animal physiology II, and reproductive physiology. Prematriculation performance confirmed that students with higher HSGPA and (or) ACT scores had better grades in animal physiology I. However, ACT subscores were not more informative than the ACT composite score. Performance in prerequisite courses (chemistry and biology) was significantly related to student grades in Animal Physiology I. Student grades in related courses indicated the same results, that is, students that do well in high school tend to have better grades in college, including in Animal Physiology I.

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INTRODUCTION

There have been a number of studies conducted to predict the success of incoming or currently enrolled students. These predictions of success have been based on performance on standardized tests, grades in introductory courses, and high school academic performance (Buschena and Watts, 2001). Prematriculation factors such as high-school grade point average (HSGPA) and American College Testing (ACT) score are strong predictors of academic performance (Garton et al., 2001). It stands to reason that students who have high HSGPA also tend to have higher GPA in college, which is positively correlated with college course success (Golembiewski et al., 1998; Krockover et al., 1987). Martin (1989) found that upper-level agriculture courses normally build on knowledge gained in previous courses. Therefore, success in previous courses should have an impact on performance in upper-level courses.

Our hypothesis was that specific prematriculation items and prerequisite course grades would be good predictors of performance in Animal Physiology I. Specific objectives of this study were to determine: 1) the relationship between prematriculation performance and letter grade earned in Animal Physiology I (Phys I), 2) if performance in prerequisite courses influenced success in Phys I; and 3) if performance in Phys I influenced performance in subsequent courses.

MATERIALS AND METHODS

Records for students (n = 169) enrolled in Phys I during the fall semesters of 2000, 2001, and 2002 were extracted from the University of Arkansas' database. The following information was collected from each student's record: HSGPA, ACT composite and subsection scores, semester course load while enrolled in Animal Physiology I, term GPA, cumulative GPA, academic major, and course grade for 11 courses. The course grades evaluated were: Animal Physiology I (Phys I), Principles of Biology (BIOL 1543), Fundamentals of Chemistry (CHEM 1074), University Chemistry II (CHEM 1123), Introductory Animal Science (ANSC 1003), Composition I (ENGL 1013), Composition II (ENGL 1023), College Algebra (MATH 1203), General Microbiology (MBIO 2013), Animal Physiology II (ANSC/POSC 3042), and Fundamentals of Reproductive Physiology (ANSC 3433). Principles of Biology and Fundamentals of Chemistry or University Chemistry II are prerequisites for Animal Physiology I.

Letter grades were converted into numerical functions for ease of calculation. An "A" was assigned the number 4, "B" 3, "C" 2, "D" 1, and "F" 0. Eighteen of the 169 transcripts examined were either withdrawals or incompletes in Animal Physiology I and were removed from further data analysis. It should also be noted that the grading scale for Phys I was 92% and greater–A,

MEET THE STUDENT-AUTHOR

Margo D. Hale

I am a 2000 graduate of Springdale High School. In May 2004, I completed my B.S. degree in animal science, graduating magna cum laude. I also graduated with Honors Distinction for completing the Dale Bumpers Honors program. While at the U of A I was a Chancellor's Scholar, Arkansas Distinguished Governor's Scholar, and a Coca-Cola Scholar. I was also selected for Mortar Board and the National Society of Collegiate Scholars.

I worked in Dr. Charles Rosenkrans' Animal Physiology Lab for two years. During that time I worked on numerous research projects, conducted lab tests, and compiled a great deal of data. The project I chose for my Honor's Project was very different from the projects I had worked on in the lab. I conducted an educational study, looking at factors that determine success in an animal physiology course. This project was conducted under the guidance of Dr. Charles Rosenkrans, my faculty mentor. I am returning to the U of A in the fall to enter the M.S. degree program in agricultural and extension education.

82%-91%–B, 72%-81%–C, 62%-71%–D, and 61% and lower–F. The other courses were graded on the scale of 90% and greater–A, 80-89%–B, 70-79%–C, 60-69%–D, and 59% and lower–F. Data were analyzed using the CORR, FREQ, and GLM procedures of the SAS system. Means separation was accomplished by using the Tukey adjustment within the LS means option. Data are presented as least-squares means.

RESULTS AND DISCUSSION

In order to get a better understanding of our evaluated population, factors such as course load, term GPA, and cumulative GPA were evaluated to determine their relationship with grades in Animal Physiology I (Phys I). These values along with prematriculation scores are presented in Table 1. Mean course load (number of hours in which the student was enrolled during the semester they took Phys I) was 12.82 hours. Course load was correlated with Phys I grade ($r = 0.26$; $P < 0.001$). Mean separation of course load revealed no difference between the load of A through D students; however, students earning an F in Phys I were enrolled in fewer hours. Mean term GPA was 2.83, and mean cumulative GPA was 3.04; both were correlated with Phys I grade ($r \geq 0.77$; $P < 0.0001$). The high correlations between Phys I grade and GPA were expected considering Phys I grade was a component of GPA calculations.

The two prematriculation indicators used in our analyses were HSGPA and ACT scores. Mean high school GPA was 3.40 and was correlated ($r = 0.35$; $P < 0.0001$) with Phys I grade. As shown in Table 1, students earning an A in Phys I had a greater ($P < 0.05$) high school GPA than students earning a C or D. Composite ACT score average was 23.7 (on a scale of 36) and was correlated ($r = 0.36$; $P < 0.0001$) with the Phys I grade. As shown in Table 1, students earning an A in Phys I had higher ($P < 0.001$) composite ACT scores than students earning a C or D in Phys I. Similar results were found with the ACT subsection scores.

The second objective was to determine if performance in prerequisite and related core courses is related to Animal Physiology I grades. The University of Arkansas Catalog of Studies lists two prerequisites for Animal Physiology I. Those prerequisites were Principles of Biology (BIOL 1543) and University Chemistry II (CHEM 1123) or Fundamentals of Chemistry (CHEM 1074). To assess this objective, the letter grade students earned in the collateral classes were used as the main effect and Phys I grade as the response variable. Each of the selected classes was analyzed independently.

The BIOL 1543 grade was correlated with Phys I grade ($r = 0.59$; $P < 0.0001$). Sixty-four percent of the students who earned an A in BIOL 1543 made an A in Phys I. All of the students who earned an A in Phys I made either an A or B in BIOL 1543. Means separation by BIOL 1543 letter grade is presented in Table 2.

Letter grade earned in CHEM 1123 or 1074 was correlated with Phys I grade ($r \geq 0.61$; $P < 0.01$). All of the students who made an A in Phys I made an A, B, or C in CHEM 1123, with 73% of them making either an A or B. Of the students who failed CHEM 1123 (received an F) 60% of them made a D or F in Phys I, with the highest grade received in Phys I being a C. Fifty-six percent of those that made an A in CHEM 1074 made an A in Phys I, and 89% made and A or B. Means separation based on chemistry grades is presented in Table 2.

Means separation for grades in additional selected classes is presented in Table 2. Grade in Phys I was correlated with MBIOL 2013 grade ($r = 0.36$; $P < 0.0001$). Seventy-three percent of the students who made an A in Phys I made an A or B in MBIO 2013. Seventy percent of the students who made a D in MBIO 2013 made a D in Phys I. College algebra grade was correlated with grade for Phys I ($r = 0.41$; $P < 0.0001$). Eighty-seven percent of those making an A in Phys I made either an A or B in MATH 1203. There was a correlation between ANSC 1003 grade and Phys I grade ($r = 0.53$; $P < 0.0001$). Sixty-one percent of the students who made an A in ANSC 1003 made an A in Phys I, 42% of the students who made a B in ANSC 1003 made a B in Phys I, and all of those who made a D in ANSC 1003 made a D in Phys I. The strong relationship between ANSC 1003 and Phys I grade may be due to the fact that the same instructor taught both classes.

The third objective of this study was to determine the relationship between performance in Phys I and the performance in subsequent courses. The two subsequent courses evaluated were Animal Physiology II (ANSC/POSC 3042) and Fundamentals of Reproductive Physiology (ANSC 3433).

Grade in Phys I was correlated to grade in ANSC/POSC 3042 ($r = 0.76$; $P < 0.0001$) and to grade earned in ANSC 3433 ($r = 0.83$; $P < 0.0001$). Eighty-seven percent of those students who earned an A in Phys I made an A in ANSC/POSC 3042. Ninety-four percent of those students who made an A in Phys I made an A in ANSC 3433, and all of them made an A or B.

We consistently found that higher-ability students, based on prematriculation data, tend to excel in most college courses. Those with high HSGPA and (or) ACT usually had high scores in college courses. This is consistent with other studies, where it was found that previous academic performance was the most significant predictor of collegiate academic performance (McKenzie and Schweitzer, 2001). The number of hours enrolled in the

semester the student took Phys I was lower for students ultimately earning an F in Phys I. That observation could be due to the U of A policy that restricts the number of hours a student may enroll in when they are at risk of academic suspension. Those low enrollment hours also could be associated with students working extensively at jobs outside of school.

It was interesting to note that students making an A in biological and physical sciences tended to have higher average grades in Phys I than students who made an A in composition or math courses. In addition, it is noteworthy that students who failed biology, microbiology, introductory animal science, or composition courses did not choose to enroll or complete Phys I. Furthermore, very few students who earned a D in composition or introductory animal science enrolled in Phys I. Those courses are not usually considered "weed-out" classes; however, they appear to eliminate some of the students.

The results of the study supported the hypothesis that prematriculation performance, prerequisite course performance, and performance in related courses would be correlated with performance in Phys I. Success in Animal Physiology I implies previous and subsequent scholastic success.

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Table 1. Least-square means of prematriculation and term items as distributed by letter grade earned in Animal Physiology I

	Animal Physiology I grade				
Item	A	B	C	D	F
Number of students	40	46	43	16	6
Course load	14.3a[z]	13.8a	13.5a	13.1a	8.8b
Term GPA	3.73a	3.29b	2.71c	1.87d	0.97e
Cumulative GPA	3.68a	3.23b	2.84c	2.47d	1.89e
High School GPA	3.65a	3.51ab	3.30bc	3.10c	3.18ac
ACT Scores					
Number of students	34	37	32	15	6
Composite	25.7a	24.1ab	22.3b	21.9b	22.5ab
English	26.3a	24.7ab	23.0b	21.9b	22.0ab
Math	23.7a	22.7ab	21.0ab	20.0b	19.5ab
Science	25.0a	23.6ab	21.5b	22.7ab	23.3ab

[z] Means with different letters differ (P < 0.05) when adjusted using the Tukey method.

Table 2. Least-squared means of Animal Physiology I grade as distributed by letter grade earned in selected courses

	Selected course grade (n)				
Course	A	B	C	D	F
Biology	3.58az (39)[z]	2.78b (50)	2.10cd (52)	1.56d (13)	- (0)
Fund. Chemistry	3.83a (9)	3.33a (7)	2.50ab (8)	1.60b (5)	2.00ab (2)
Univ. Chemistry II	3.64a (12)	3.42a (30)	2.64b (37)	2.14bc (14)	1.00c (5)
Intro. Animal Sci.	3.48a (31)	2.23b (33)	2.06b (16)	1.00ab (1)	- (0)
Composition I	3.06a (58)	2.42b (61)	1.89b (30)	2.00ab (2)	- (0)
Composition II	3.18a (54)	2.38b (68)	2.04b (29)	2.00ab (3)	- (0)
College Algebra	2.92a (54)	2.73ab (37)	2.09bc (37)	1.88bc (10)	0.67c (5)
Microbiology	3.26a (30)	2.89a (38)	2.68ab (34)	2.05b (21)	- (0)

[z] Means with different letters differ (P < 0.05) when adjusted using the Tukey method.