Variables Associated with Course Completion Status and Final Course Grade in an Introductory Animal Science Course

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Introduction
Introduction

• Data were collected as part of departmental assessment.

• Departmental assessment plan:
  – Collect and analyze data on students in two Animal Science courses over 5 years.
    • Domestic Animal Biology (ASC 101)
    • Capstone in Animal Agriculture (ASC 470)
Introduction

- ASC 101: Domestic Animal Biology
  - Required for Animal Science, Equine Science and Management, and Agricultural Education majors.
  - Taxonomy, anatomy, physiology, nutrition, reproduction, genetics, behavior
  - Lecture and Lab
  - 3 credits
### ASC 101 Course Grade Breakdown:

<table>
<thead>
<tr>
<th>Graded Item</th>
<th>Point Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quizzes</td>
<td>10 (100 total)</td>
</tr>
<tr>
<td>Homework Assignments</td>
<td>10 (70 total)</td>
</tr>
<tr>
<td>Laboratory Exercises</td>
<td>10 (110 total)</td>
</tr>
<tr>
<td>Exams</td>
<td>100 (200 total)</td>
</tr>
<tr>
<td>Lab Practical</td>
<td>100 (100 total)</td>
</tr>
<tr>
<td>Cumulative Final</td>
<td>150 (150 total)</td>
</tr>
<tr>
<td>Bonus</td>
<td>30 total</td>
</tr>
</tbody>
</table>
Materials and Methods
Objectives

In an introductory animal science course, what factors are associated with...

- Receiving a high or low course grade?
- Remaining enrolled or dropping/withdrawing?
Specific explanatory variables are associated with course withdrawal and course grade percentage.
Materials and Methods

• Assessment tools administered:
  – Demographic Survey
  – California Critical Thinking Skills Test
  – Background knowledge test

• Outcomes recorded:
  – Dropping/withdrawing versus remaining enrolled in the course
  – Course grade percentage
Materials and Methods

- Demographic Survey
  - 15 questions
  - Information on demographics and agricultural background

- Background knowledge test
  - 20 questions
  - Nutrition, reproduction, genetics, anatomy, etc.
Materials and Methods

- CCTST (Form 2000)
  - Population: College students and adults.
  - Questions: 34, multiple choice.
  - Questions are not discipline-specific.
Statistics

N=405 (after 20 subjects excluded).
Characteristics of sample: frequencies, means calculated for each variable.

Multiple Logistic Regression

– Purpose: find variables associated with dropping/withdrawing from course.

– Approach:
  • Categorized by course completion status.
  • Chi-squared test of independence or Wilcoxon rank-sum test, p<0.25.
  • Manual input of variables (SAS 9.2).
  • Model fit checked using Hosmer-Lemeshow test.
Statistics

- **Multiple Linear Regression**
  - Purpose: find variables associated with final course grade percentage.
  - Approach:
    - Plots and one-way ANOVA tests used to identify potential explanatory variables.
    - Variables suspected of displaying multicollinearity checked using chi-squared tests of independence and variance inflation factor.
    - Distribution of residuals plotted.
    - Manual input of variables for impact on $R^2$. 
Results and Discussion
Results: Multiple Logistic Regression

Outcome: Dropping/withdrawing from course.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Adj. Odds Ratio Estimate</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Location Lived In (KY vs. other)</td>
<td>2.37</td>
<td>1.07, 5.24</td>
</tr>
<tr>
<td>HS GPA (&lt;3.0 vs. &gt;3.5)</td>
<td>3.84</td>
<td>1.34, 10.99</td>
</tr>
<tr>
<td>HS GPA (3.0-3.49 vs. &gt;3.5)</td>
<td>2.29</td>
<td>1.01, 5.20</td>
</tr>
<tr>
<td>Age (by year)</td>
<td>1.15</td>
<td>1.03, 1.27</td>
</tr>
<tr>
<td>Year (2010 vs. 2011)</td>
<td>2.37</td>
<td>1.08, 5.21</td>
</tr>
</tbody>
</table>

AUC=0.72

Hosmer-Lemeshow p=0.15
Results: Multiple Linear Regression

Outcome: Course grade percentage.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Adj. parameter estimate</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept</td>
<td>80.08</td>
<td>75.51, 84.65</td>
</tr>
<tr>
<td>CCTST Percentile &lt;34</td>
<td>-9.67</td>
<td>-12.88, -6.47</td>
</tr>
<tr>
<td>CCTST Percentile 34-66</td>
<td>-5.43</td>
<td>-8.39, -2.48</td>
</tr>
<tr>
<td>High School GPA &lt;3.0</td>
<td>-6.74</td>
<td>-11.52, -1.96</td>
</tr>
<tr>
<td>High School GPA 3.0-3.49</td>
<td>-5.24</td>
<td>-8.04, -2.44</td>
</tr>
<tr>
<td>Urban</td>
<td>3.16</td>
<td>-1.49, 7.80</td>
</tr>
<tr>
<td>Suburban</td>
<td>5.90</td>
<td>2.69, 9.11</td>
</tr>
<tr>
<td>Rural Nonfarm</td>
<td>6.65</td>
<td>2.83, 10.48</td>
</tr>
<tr>
<td>Agricultural Clubs</td>
<td>4.45</td>
<td>1.74, 7.15</td>
</tr>
<tr>
<td>Public High School</td>
<td>-3.78</td>
<td>-6.94, -0.61</td>
</tr>
<tr>
<td>Year (forced)</td>
<td>-1.85</td>
<td>-4.35, 0.65</td>
</tr>
</tbody>
</table>

$R^2 = 0.24$
Discussion: Course Withdrawal

- Location Lived In
  - Investment in course? Educational differences?
- High School GPA
  - Maintenance of study skills?
- Age
  - Time constraints?
- Year
  - Students in 2011 surveyed several weeks later than 2010.

Dyer and Breja (1999): Ag. clubs and high school ag. classes associated with intent to complete college ag. degree.
Discussion: Course Grade

• CCTST
  – Problem solving ability reflected by grade?

• Community Type
  – Educational or socioeconomic differences?

• High School GPA
  – Academic skills/study habits?
  – Garton et al. (2005) found similar for cumulative GPA upon degree completion.
Discussion: Course Grade

- High School Type
  - Preparation level, socioeconomic factors?

- Agricultural Clubs
  - Motivation, interest level, knowledge level?
    - Multicollinearity with Background Knowledge Test.
  - Other authors found gender (McMillan et al. 2009) or major (Peffer, 2011) to be associated with final course grade in undergrad. animal science courses.
Conclusion

• Variables associated with course completion status and course grade percentage identified.

• Logistic regression model showed some predictive ability for course withdrawal.
  – Variables: Location lived in, high school GPA, age, year.
Conclusion

• Linear regression model explained some variability in course grade.
  – Variables: CCTST, high school GPA, high school type, community type, agricultural clubs.
• Further study needed to determine why variables were associated.
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