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Introduction

Students and teachers alike are both constantly bombarded with information from a multitude of sources. Agricultural biotechnology is commonly in the news, and seemingly surrounded by controversy on a regular basis. Priest's study (2000) found that even though a majority of United States citizens are supportive of biotechnology, there is a rise of opposition to biotechnology. Priest (2000) also found that 69.9% of respondents were not very well informed or not informed at all when it comes to the issue of biotechnology. Cavanagh et al. (2005) found that 87.2% of those surveyed thought the general public is not given enough information about biotechnology, and its role in human health.

Purpose

The purpose of this research is to establish current curriculum standards for plant biotechnology and analyze the enrollment of students. Additionally, this research aims to gather data on student and teacher perceptions of plant-based biotechnology.



Methodology

This descriptive study will occur in two phases. In phase one, a review of the historical and current status of plant biotechnology education will be conducted. Publicly-available enrollment data for biotechnology courses across the State of Texas will be analyzed. Additionally, data will be collected from the curriculum available for AFNR courses.

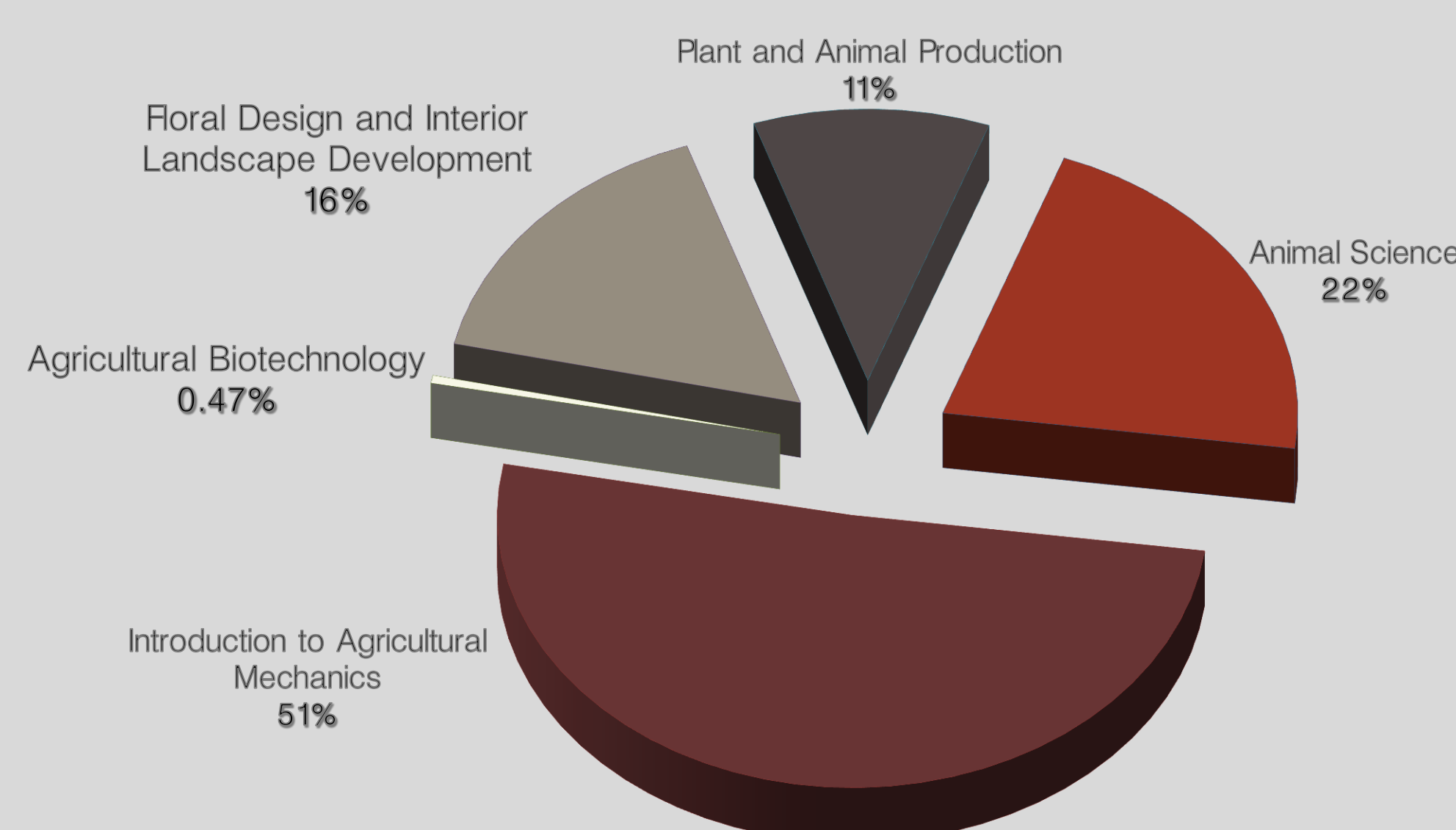
The Texas Essential Knowledge and Skills (TEKS) curriculum standards addressing biotechnology will be analyzed, and compared to course objectives included in the AFNR curriculum as outlined through the Texas Education Agency (TEA). From the data, we will identify our sampling frame, extrapolate enrollment trends, and identify the biotechnology competencies (concepts and skills) included in the Texas secondary agriculture programs.

Methodology Continued

Two quantitative questionnaires will be developed, one three-part questionnaire for teachers, and a two-part instrument for students. These questionnaires will be developed in Qualtrics and delivered online to a sample of the population identified in phase one. The first section of both questionnaires will include follow-up and demographic information, and an assessment of their perceptions of biotechnology. The second section of both questionnaires will assess knowledge about basic biotechnology concepts. In the third section, teachers engaged in biotechnology education in secondary agriculture programs will be asked to rank the items identified in phase one following the Borich Model. They will rank each item on both importance, and self-perceived ability to teach the concept.

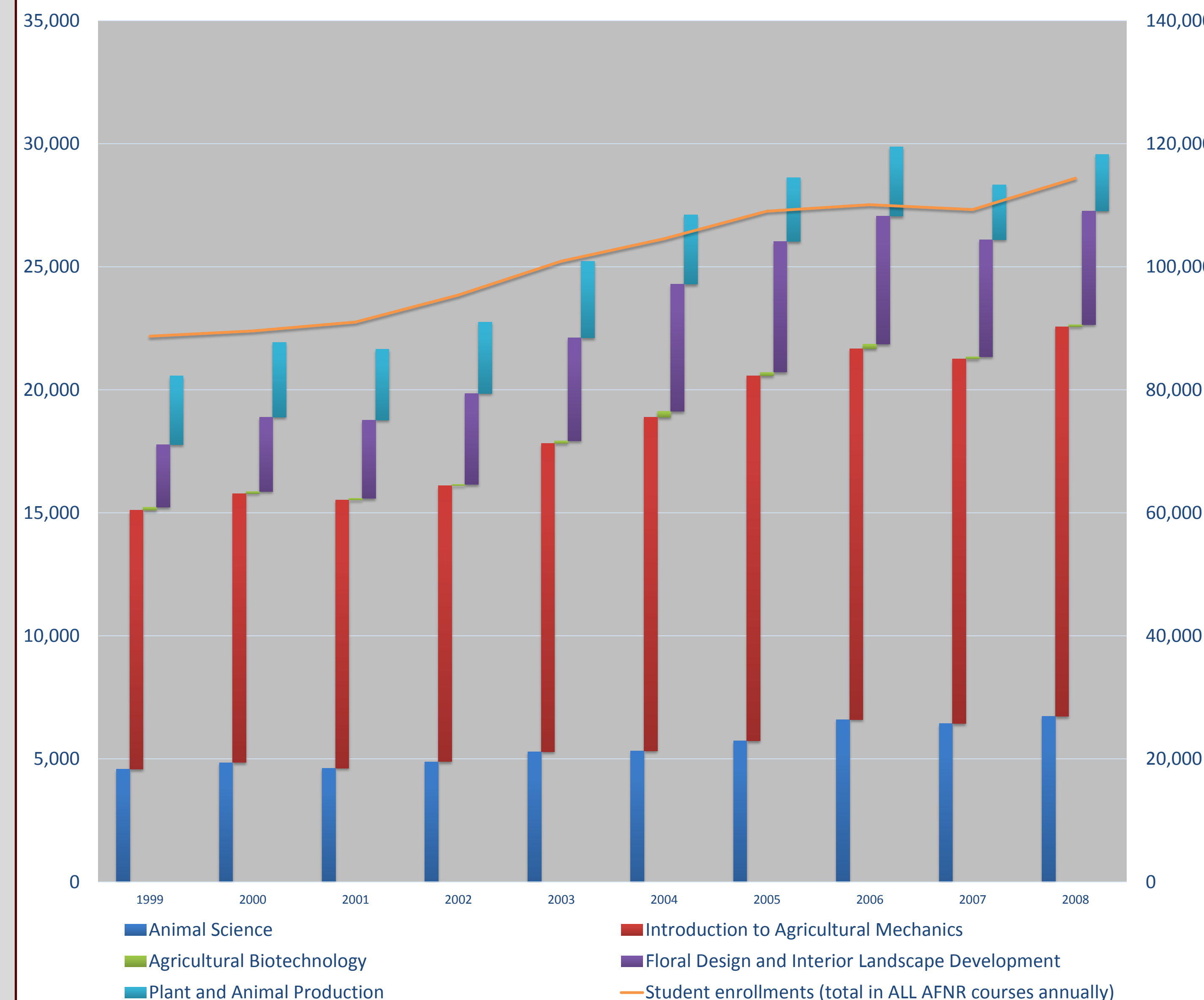
Results to Date

Percentage of Total Enrollment in Selected AFNR Courses (1999-2008)



Our research has found that there is a tremendous gap between enrollment of students in agricultural biotechnology in comparison to other AFNR courses in Texas. This demonstrates that essential knowledge, skills and concepts for plant biotechnology are not reaching enough students across Texas. Even though the trend of students enrolling in agricultural science courses is increasing, the overall trend of students enrolling in biotechnology courses is decreasing.

Agricultural Biotechnology Enrollment (1999-2008) Comparison of Selected AFNR Courses & Overall AFNR Enrollment



Results Continued

Our research has also found that there is a lack of specific plant biotechnology education modules curriculum modules in the TEKS for:

- **§130.2.** Principles of Agriculture, Food, and Natural Resources. Despite section C.4.F: "Compare and contrast issues impacting agriculture, food, and natural resources such as biotechnology,..." , there is no specific module addressing basic biotechnology concepts to address any myths, misconceptions, or basic concepts for plant biotechnology as would be expected in an introductory AgriScience course.
- **§130.20.** Horticulture Science. There exist no curriculum module to educate students on the use of biotechnology in horticulture.
- **§130.21.** Advanced Plant and Soil Science. There exist no curriculum module to educate students on the use of biotechnology in plant science.

Discussion

It is evident that there is a distinct lack of plant biotechnology implementation in Texas AgriScience courses. After 2008, the Agricultural Biotechnology course was removed. In place of it, a biotechnology and advanced biotechnology course was developed in the STEM subsection of TEKS, as opposed to AFNR. Unfortunately, this removed the only course in the AFNR curriculum that addressed the topic of plant biotechnology for agricultural use in depth.

It is important for students to understand biotechnology, especially students in agriculture. If students remain in the dark about this technology, it will hamper future scientific progress through increased public resistance to the appropriate use of this technology based on misguided fears.

Future plans for this research include determining student and teacher perceptions of biotechnology, and assessing basic biotechnology concepts. This will determine if there is a need for teacher in-service. Additionally, this needs analysis will serve to address the effect a lack of biotechnology curriculum has on students. If such a need is found, research for developing an effective plant biotechnology curriculum module will be conducted.

References

- Priest, S. H. (2000). US public opinion divided over biotechnology?. *Nature Biotechnology*, 18(9), 939-942.
- Cavanagh, H., Hood, J., & Wilkinson, J. (2005). Riverina high school student's views of biotechnology. *Electronic Journal Of Biotechnology*, 8(2).

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