A CONTENT ANALYSIS OF UNDERGRADUATE INTRODUCTORY ANIMAL SCIENCE COURSES PERTAINING TO INDUSTRY REFERENCES

A Thesis

by

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ABSTRACT*

The consistency of instruction between various sections of introductory courses is a concern in higher education, along with properly preparing students to enter careers in industry. The study was conducted at Texas A&M University, using an introductory course, General Animal Science, within the Department of Animal Science. This course was chosen due to the utilization of specific animal science industry related terminology within the course content in support of learning outcomes. The study was a quantitative nonexperimental research method, and a content analysis that was conducted over several semesters. General Animal Science is a large-scale course that contains multiple sections and this study evaluated assessments and lectures created by individual faculty members who instructed different face-to-face sections. These sections were selected as they were composed of both animal science majors and non-majors. Assessment questions and lectures were collected throughout the semesters and were compiled into individual documents for coding. Specific industry-related terms were chosen from literature to use as a benchmark to establish methodology for content analysis using priori coding. Comparing the use of specific industry coded terminology in assessment questions yielded no significant difference ($p<0.05$). These findings demonstrate consistent use of industry related terminology in assessment questions across multiple

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sections, irrespective of individual instructor or student major. Industry-related terminology was determined to be utilized in the introductory animal science course lectures at varying frequencies depending on the term. Varying frequencies of industry-related terms were seen across the semesters which would be expected as one section was a summer session. This benchmark study provides the necessary foundation for future analysis of lectures and assessments within courses in the animal science department.

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1. INTRODUCTION

1.1. Introduction

To more effectively instruct a new generation of learners, changes have occurred within higher education. An increase in the use of innovative teaching methods within the classroom has increased. A significant goal of pedagogy is to increase overall student performance which includes retention of knowledge, student engagement, motivation, problem-solving critical thinking abilities, and soft-skills necessary for future employment. Literature suggests that there is currently a gap between the skills recent college graduates possess and the desired set of skills that employers are looking for in new hires (McLester and McIntire, 2006). Across disciplines, research has been conducted to explore the use of different pedagogical techniques as a means to increase career readiness and professionalism (DiBenedetto and Myers, 2016); (Ramsey et al., 2016); (Simpson et al., 2019).

The focus of increasing career readiness is typically on integrating experiential learning into the curriculum and addressing the desired soft-skills directly. To incorporate experiential learning into the classroom, real-world examples or experiences related to that particular industry are required. Fundamentally, this requires that educators are aware of undergraduate student's prior knowledge and how that does or does not align with the industry in which they are planning to enter upon graduation. Specifically, within animal science, there has been a shift in the demographics of undergraduates entering the department – from those with a lifetime of agricultural exposure to those having limited livestock experience (Adams et al., 2015); (Bundy et al., 2019). With this shift in demographics, the method by which content is being presented is worthy of examination. Students with limited livestock experience may not intuitively understand the scope of the animal science industry, nor the breadth of potential careers which they could enter upon graduation.

Recently, introductory animal science courses have been utilized as a part of university core curriculums, fulfilling a general science credit required by students irrespective of major. This practice has the potential to increase the general exposure of animal science content to a university population, including students who may have no prior knowledge of the discipline of animal science and its associated industries. By conducting a content analysis of introductory animal science courses, a baseline of data presenting specific vocabulary utilized within those courses will be generated. Examining the frequency of industry-related terminology utilization will likely provide a foundation for future studies aimed at triangulation of language and impact upon student perception and attainment of course learning outcomes. Additionally, investigation of student preparation for advanced aspects of animal-science curriculum as well as career preparedness is the long-term goal of this research area.

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2. LITERATURE REVIEW

2.1. Introduction

Agriculture is an industry which impacts every person in society. Two of the largest terrestrial biomes on the planet are croplands and pastures (Foley et al., 2005). Both pastures and croplands are influence by animal agriculture, either by grazing, or use of the crops and by-products as feed. Animal agriculture is responsible for the welfare, health, environmental footprint, and management of livestock in production systems (Morota et al., 2018). Animal agriculture is accountable for animal products for consumption, but also creates other commodities that are impactful to society such as body coverings, labor, vegetation management, pasture fire control, etc (Sahlu et al., 2009). The animal science industry has a global impact and the demand for animal products is expected to increase by 70% by the year 2050 (FAO, 2009). With an increase in demand for products, there is an increase in the production systems which create jobs in a vast variety of fields. Animal science specialties include genetics, animal breeding, nutrition, physiology, animal health, ethology, meat science, dairy product science, and biotechnology (Damron, 2000). Earning a college degree is a traditional path to receiving the necessary credentials to enter a career within a specific field. However, receiving college credentials within a certain major does not necessarily qualify one for a career in that industry.

College enrollment has increased from 2 million in 2007 to 18.4 million in 2017 (U.S. Census Bureau, 2018). There can be a disconnect from those who are majoring in agriculture and those who enter a specific career. Even faced with an increase in college enrollment, 77% of employees who are farmers, ranchers, and other agricultural managers lack a bachelor's degree (U.S. Census Bureau, 2016). Individuals who obtain careers that are closely related to their college major, tend to have better income profiles and better job satisfaction (Xu, 2013). The disconnect between educational specialization and career employment needs to be addressed considering the overall success that is seen in college majors who obtain jobs in their field of study. A survey conducted on animal science graduates over a 50-year period reported that 10.2% of graduates entered a career in farm/ranch/dairy/feedlot, 36.3% education, 3.4% medical, 2.4% finance, 9.8% government, 6.1% private business, 17.1% allied animal/food industry, 2% wildlife, and 12.2% veterinary clinic, (Dodson and Benson, 2010). A number of the career paths that animal science majors enter are related to food safety, human medicine, animal medicine, or educating future animal scientists. These careers have a significant impact on society and it is important that college graduates are properly prepared to enter such careers.

Work-readiness or career preparedness is the ability to enter employment in industry effectively and have the necessary skills to be successful (Jackson, 2018). Career readiness includes critical thinking, problem-solving, contextual learning, teamwork, adaptability, global knowledge, writing, and self-direction (Associates, 2015). While higher education is aimed at career readiness with contextual knowledge, to evaluate if the goals are being met, exploration of industry perspectives needs to occur.

To examine what skill set industry representatives desire, job postings targeting recent agriculture and natural resource graduates were searched for common themes. Three major themes that emerged were soft skills, technical skills, and content knowledge (Wilson, 2019). Soft skills were defined with several categories which consisted of interpersonal skills, critical thinking skills, organizational skills, ability to work independently, communication skills, and leadership skills (Wilson, 2019). This is congruent with other literature indicating that soft skills align with personality traits, and have the potential to predict success in life (Heckman and Kautz, 2012). Ten soft skills classifications were created by business executives and ranked as most important to least important. Nearly all of the respondents (93%) agreed that integrity was an extremely important skill followed by communication, responsibility, interpersonal skills, professionalism, positive attitude, teamwork skills, flexibility, and work ethic (Robles, 2012).

To accompany soft skills, technical skills are also desired by employers. Employers desire skills such as data management, mechanical skills, teaching and facilitation skills, and computer skills (Wilson, 2019). Traditionally in the classroom, soft skills and technical skills are not explicitly taught to undergraduates. Undergraduate courses typically focus on the content knowledge of the industry. This practice is understandable as employers are also desiring specific industry knowledge, fields, or concepts (Wilson, 2019).

Physiological content knowledge is an area that college graduates are excelling in, however soft skills, technical skills, and how to apply the content knowledge is where a gap is found. DiBenedetto and Myers (2016) constructed a conceptual model that includes 9 main skills for student readiness; learning skills, life skills, career skills, social skills, knowledge competencies, incidental learning skills, dispositions, experience, and interdisciplinary topics. These nine skills were used to summarize the desired skill set of college graduates.

College graduates may gain these skills through their classroom education, outside experiences, prior knowledge or a combination of all three. Familiarity with the life experiences of undergraduates prior to entry into the classroom enables instructors to more effectively bridge the gap in skills and knowledge between such experiences and course content so as to increase career readiness. The prior knowledge that undergraduates are entering their majors with is shifting in accordance with societal changes, and this is evident across disciplines.

There have been changes recently within education to adapt to the new generations of learners. A major problem facing education is that students seem to learn the information for a test, however, they are not able to retain the information for a long period of time (Halpern and Hakel, 2003). There is a difference when teaching students to learn the subject matter for a semester-long course, and teaching the students to retain that information for a long period of time. This can be detrimental when handing out degrees to graduates that did not retain the information they “learned” in college. In recent years pedagogy has begun to incorporate innovative teaching methods in the classroom as a means to increase student performance. Improvements have been made in the hope of increasing student engagement, motivation, critical thinking abilities, retention of knowledge, and problem-solving. There are a few new methods that have proven to be effective at increasing the motivation and the overall student engagement, however, those new strategies have not been able to increase the retention of knowledge (Tanner, 2011). Animal science, alongside other disciplines, are conducting pedagogical research to enhance the retention of knowledge. To enhance retention of knowledge, an understanding of how students process information is needed first.

Every student in an education setting has a preferred learning style. The learning style that best fits their personal preference has to do with the sensory mode they are most receptive to and this allows them to absorb the information (Mortensen et. al., 2015). Learners are most commonly grouped into four categories, visual, auditory, read/written, and kinesthetics (Dobson, 2009). A challenge for educators is trying to connect with every student in the classroom and this can be difficult with the different types of learners. There is an inherent desire amongst educators to enhance critical thinking skills, active learning, retention of knowledge, and problem-based learning in classrooms (Maiga and Bauer, 2013). Aside from the sensory type learning styles, there are several additional learning styles that have been identified.

Gregorc Learning styles consist of concrete sequential, abstract sequential, abstract random, and concrete random. Concrete sequential learning refers to students who prefer direct hands-on experience, abstract sequential are learners who avoid active experiences, with a preference for simulated experiences, abstract random learners prefer experiences that are subjective, and concrete random are learners who prefer applications through ideas and practice (Gregorc, 1979). Concrete sequential learners were discovered to be the most prominent in an introductory food science class (Schmidt and Javenkowski, 2000). Concrete sequential learners are in alignment with real-world learning and are seen across multiple disciplines in pedagogy. Despite the various learning styles, some instructional methods, active learning techniques, were preferred by the majority of students (Lehman, 2011). Instructors need to consider learning styles while teaching because engaging the students in active learning is important for the receiving and retaining of information. Current literature illustrates the importance of retention of knowledge, however, this is not a new area of interest due to the presence of other studies dating back to the 1920s and 1930s (Custers 2010).

In response to challenge of the gap between training and preparedness, there have been new methods developed to try and increase knowledge and skill retention. Professionals in the medical industry have seen an increase in the inability of students to recall anatomical knowledge as well as the lack of ability to utilize problem-solving skills (Doomernik et. al, 2017). An example of an attempt to address that challenge was the creation of a simulation to instruct nurses on safe sleep practices pertaining to infants. After the simulation was provided for them, there was an increase in the percentages of nurses who were able to correctly place an infant in a safe sleep environment (Rholdon et. al., 2018). Outside of the area medical pedagogy, another example can be found in the creation of a stereoscopic 3D serious gaming environment, which allows for depth perception training that assists in seeing complex 3D structures. Utilization of the 3D environment was then compared to a 2D virtual experience in order to assess the retention of fire safety training after a 24-hour period (Tawadrous et. al., 2017).

Digital video games can also be used to learn and enhance language (Ebrahimzadeh and Alavi, 2017). Research has been conducted regarding the retention of foreign language vocabulary, and it was determined that increasing the number of training sessions increased the retention of the words (Bahrick et. al., 1993). There have been several math games created to enhance the student's retention and give the additional practice of the content. Some games are presented as puzzles, others may have math problems to solve before the next stage of gameplay can occur, and some measure the cognitive abilities of the players (Ke, 2008). There is an example of a chemistry class using a video game as an educational tool to increase the students' understanding of boiling and freezing points (Ardac, and Sezen, 2002).

A classic strategy is to utilize problem-based learning. Examples within the discipline of animal science include assignment of a real-world learning project with the goal of improving the student's retention of knowledge within an equine science course. An exam was given at the end of the semester and the test contained both questions that were related to the content of the learning projects and questions over additional content. The questions that were related to the learning projects had higher retention of knowledge as indicated by the higher percentage of correct answers when compared to the questions that were not related to the learning project (White et.al., 2017).

Various techniques can be used to assist students with their ability to recall information, amongst them, is the way students take notes. Undergraduates in animal science were evaluated on the methods in which they took notes and a correlation was seen between higher grades, and notes that were in an outline format (Stutts et. al., 2013). While the initiative has been taken to increase the learning experience of students in multiple disciplines, there are still gaps in knowledge to explore. Additional studies need to be conducted in animal science to continue to improve student retention of knowledge.

Undergraduate courses in higher education vary greatly in environment. Some are taught in lecture halls, at lab benches, online, or even outside at a construction site. No matter the setting of the course, instructors strive to provide the best learning experience for their students. There has been a transition away from traditional lectures to other environments, one of which being the flipped classrooms that have been gaining popularity over the past several years. An introductory equine course within a Department of Animal Science was converted to a flipped classroom format and student learning experience was evaluated. This study concluded that flipped classrooms were a positive pedagogical advancement to increase the overall learning experience of the students (Mortensen and Nicholson, 2015). The students who were in the flipped format were able to retain a greater amount of knowledge and were even able to enhance their critical thinking skills. There have been several studies conducted to verify the potential positive outcomes that a flipped classroom format can provide for a traditionally lecture based course.

When constructed correctly, flipped classrooms are able to reach various types of learners. A book and video that covered the same content were available to students in a flipped Agriculture Economics, AGEC, class at Kansas State (Barkley, 2015). The AGEC flipped class showed improvements in the student's grades and evaluations of the course, compared to the traditional lecture-based class. Birmingham-Southern College implemented a flipped classroom into a limited number of biology, ecology, and biochemistry courses. The results indicated that the flipped classroom, which promotes active learning, further developed the students' critical thinking skills (Styers et al., 2018). Even when a course receives a partial shift to a more interactive format, this can lead to increases in the student's learning (Knight and Wood, 2005).

A common theme in the tools previously discussed, used to increase the retention of knowledge and increase student performance were hands-on activities. Experiential learning is not a new concept, as there is evidence that in the late 1800s educators introduced experiential learning to challenge traditional lectures by promoting engaging students in their individual interests through building upon their previous experiences (Dewey, 1897). Experiential learning encompasses multiple educational opportunities such as fieldwork, internship, undergraduate research, study abroad (McKeachie and Svinicki, 2013). Experiential learning has shown results of being successful in courses across multiple disciplines. Science With Practices created an opportunity for agricultural students to incorporate work experiences into their learning. Students that participated in the program believed that there was an increase in their academic experiences (Retallick and Steiner, 2009). Similar success was seen in a study with agribusiness students who were required to work with an industry coach (Downey, 2012). An equine science course conducted an experiential program that was designed to investigate the participant's perceptions of content knowledge, hands-on skills, career preparation. The students believed that participating in this experience was a major influence on their career preparedness, and increased their knowledge of the equine/sport horse industry (Splan et al., 2016).

However, the success that is seen with the implementation of experiential learning does not indicate that experiential learning is appropriate to be used in every situation, and it does require considerable planning to promote educational growth (Millenbah and Millspaugh, 2003).

The element of experiential learning that is hands-on opportunities with industries that need to be explored. Building relationships with industry while students are still in their undergraduate career could facilitate closing the gap of knowledge and skills that exists between graduates and employers. It is important for student classroom success, but also for their preparation for real-world application. A major challenge that employers are facing today is the lack of communication, problem solving, adaptability, and resourcefulness of recent college graduates (DiCerbo, 2014). When assessing these skill sets, Matthew Barr conducted an experiment where students were split into two groups. Both groups received the same lectures, however, one group received video games to play as additional tools. It was found that the group who played video games had an increase in test scores when it came to communication, adaptability, and resourcefulness (Barr, 2017). From this, it can be concluded that video games could be a potential solution for preparing students for a career after they graduate.

Leadership skills are another skill that industry professionals look for in potential employees and this skill cannot be easily practiced in a large traditional lecture course. A simulation that included various forms of media such as audio, text, and animations was used by Boyd and Murphrey to determine if cognitive skills would be enhanced pertaining to leadership concepts. The results showed there was an improvement in the student's ability to answer questions that were increasingly difficult, which suggests that simulations can be used to assist in improving cognitive skills (Boyd and Murphrey, 2012).

Growing class sizes challenge educators to become more creative at introducing hands-on learning in the classroom to improve the learning experience (Downey, 2012). With an increase in class size, funding also needs to be taken into consideration. Experiential learning can be a time consuming and expensive educational tool to implement, especially on a large scale (Hovey et al., 2018). Realizing that vocabulary references to industry taking place during a classroom lecture are not the same as experiential learning, this is one way in which instructors do present students with examples of real-world application of the content without incurring any additional resource cost.

References to industry can be used in classroom lectures, and are also found in textbooks as a means to assist with improving the student learning experience. Content analysis of textbooks has been utilized to examine industry references and depict the frequency of real-world examples and connotations behind the references (Simon et al., 2018). Exploring textbook content and its presentation provides insight into student learning, however, textbooks are frequently a supplementary instructional method, therefore, the significance of their content must be viewed accordingly (Chew-Wah et al., 1981). Lectures remain the most common instructional method employed by universities, resultantly conducting a content analysis has the potential to be significantly more insightful than data generated from textbook review.

Content analysis is often used in qualitative work to summarize the importance of language to a topic. Content analysis is a way to make "inferences by systematically and objectively identifying special characteristics of messages" (Holsti, 1969) pg. 68. Early content analysis can be seen in religious documents, and media such as newspapers. A shift in research has been made from smaller documents to larger data sets, which can be analyzed with computers. Large volumes of data are manageable when content analysis is adopted by researchers (Stemler, 2000). Krippendorff (1980) states that there are six questions that need to be addressed when conducting a content analysis: "1) Which data are analyzed? 2) How are they defined? 3) What is the population from which they are drawn? 4) What is the context relative to which the data are analyzed? 5) What are the boundaries of the analysis? 6) What is the target of the inferences?".

In addition to these questions, there are guidelines that need to be followed pertaining to the type of data being used. The data may not have a large amount of missing data, and the data needs to be alignment with the definition of the content analysis (Stemler, 2000).

Established coding methodology is applied to documents to create a technique that can be replicated to emerge content categories from many words (Krippendorff, 2018). There are two main types of coding: emergent, and priori coding. Emergent allows for categories to be formed after some analysis of the data has already begun, while priori coding establishes set categories before data analysis of the documents has started (Stemler, 2000). Three types of units are often seen in content analysis: sampling units, context units, and recording units. Sampling units have variability because the researcher uses their expertise to form the units from meaning and data sets can contain words, sentences, or paragraphs.

An example of content analysis is examining job postings to identify what skills and/or knowledge employers are looking for in recent graduates based upon the language of the job postings (Wilson, 2019). The study conducted by Wilson and colleagues categorized skills desired by employers based upon analysis of 85 job postings related to an agricultural career. Evaluation of agricultural job postings using specific terminology and databases allowed for the categorization and subsequent inferences. School mission statements underwent a content analysis to make inferences on the determining the primary object of the school (Stemler and Bebell, 1999).

Specific terminology and its usage are important to education (Yager, 1983). Researchers use terminology to communicate their findings to other researchers and to the public (Wandersee, 1988). It is important for those in the field to understand the meaning and impact of such terminology so that their findings can be understood.

Students also need to understand the specific terminology that is used by their particular field in order to be successful in it.

Common industry-related animal science terminology found in literature are 'industry', 'management', 'manager', 'product', 'producer', 'production' 'commercial', and 'consumer' (Boykin et al., 2017); (Hasty et al., 2017); (Reiling et al., 2003); (Ramsey et al., 2016). Literature that the terms were derived from were animal science focused literature. The specific journal articles were chosen as the topics were related to educational research or industry-related content. Other animal science literature that may have focused on physiological topics and others were excluded due to the interest in on the career preparedness skills desired from industry. These common terms can be used to conduct a content analysis of introductory animal science course lectures as a means of benchmarking language within that course. The frequency of the use of these terms in this context will provide a foundation for future studies investigating language within the context of the animal science curriculum.

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3. CONTENT ANALYSIS OF UNDERGRADUATE INTRODUCTORY ANIMAL SCIENCE LECTURES PERTAINING TO INDUSTRY REFERENCES

3.1. Introduction

Agriculture is an industry that has a global impact on everyday lives. In order to survive, it is necessary that people consume food products, and animal-based product are a primary protein source. The animal science industry has a global impact and the demand for animal by-products is expected to increase 70% by year 2050 (FAO, 2009). The increase in demand for animal products also calls for an increase in employment within the industry. Due to the significant impact which animal science has on society, it is necessary that the individuals entering careers in that field are adequality prepared. A traditional path to receiving the necessary credentials to be accepted into a job within an industry is to earn a college degree. However, receiving college credentials within a certain major does not necessarily qualify one for a career in that industry.

A disconnect between college graduates and the skills desired by industry representatives has been seen across multiple disciplines. Career readiness includes critical thinking, problem-solving, contextual learning, teamwork, adaptability, global knowledge, writing, and self-direction (Associates, 2015). Industry representatives with associations with the department of animal science were surveyed about their perceptions of career readiness. They indicated the level of preparation, specifically career preparedness for a career in industry, was a more important thank a particular content-based skill. Graduates of the animal science department at a large research university were perceived as being less than well prepared to enter the industry (Early, 2018). In an effort to further refine necessary skills, job postings targeting recent agriculture and natural resource graduates were searched for common themes. Three major themes that emerged were soft skills, technical skills, and content knowledge (Wilson, 2019). Content knowledge is an area that college graduates are excelling in, however soft skills, technical skills, and how to apply the content knowledge is where the deficit is found. To bridge the gap, the current skills being taught at the collegiate level need to be evaluated.

DiBenedetto and Myers (2016) constructed a conceptual model that includes 9 main skills for student readiness; learning skills, life skills, career skills, social skills, knowledge competencies, incidental learning skills, dispositions, experience, and interdisciplinary topics. These nine skills were used to summarize the desired skills of college graduates.

College graduates may gain these skills through their classroom education, outside experiences, prior knowledge or a combination of all three. Familiarity with the life experiences of undergraduates prior to entry into the classroom enables instructors to more effectively bridge the gap in skills and knowledge between such experience and course content so as to increase career readiness. The generalized types of prior knowledge that undergraduates are entering their majors with is shifting in accordance with societal changes, and this is evident across disciplines.

In an effort to more effectively teach a new generation of learners' changes are occurring within higher education. A significant challenge facing education is that student effort is increasingly focused on retaining information for use on a test, without subsequent incorporation and retention of that knowledge over time (Halpern and Hakel, 2003). In recent years, incorporation of innovative teaching methods in the classroom as a means to increase student performance has become a significant component of pedagogy. Strategies have been implemented with the objective of increasing student engagement, motivation, critical thinking abilities, retention of knowledge, problem-solving and soft-skills necessary for future employment. Literature suggests that there is currently a gap between the skills recent college graduates possess and the desired set of skills that employers are looking for in new hires (McLester and McIntire, 2006). Research has been conducted across disciplines exploring the use of different pedagogical techniques as a means to increase career readiness and professionalism (DiBenedetto and Myers, 2016); (Ramsey et al., 2016); (Simpson et al., 2019).

Every student in an education setting has a preferred learning style. The learning style that best fits a person relates to the sensory mode they are most receptive to which allows them to absorb the information (Mortensen et al., 2015). Instructors need to consider learning styles while teaching because engaging the student in active learning is important for the receiving and retaining of information. Active learning is more apt to occur when the learning styles of the students are taken into consideration and incorporated into the instructor's teaching. When students partake in an engaging lecture it is important for both the initial understanding of the content and for long-term retention are positively impacted (Miller et al., 2013).

Gregorc Learning styles consist of concrete sequential, abstract sequential, abstract random, and concrete random. Concrete sequential refers to students who prefer to learn with direct hands-on experience (Gregorc, 1979). Concrete sequential learners were discovered to be the most prominent in an introductory food science class (Schmidt and Javenkowski, 2000). Real-world learning often referred to as experiential learning addresses the concrete sequential learners and is seen across multiple disciplines in pedagogy to help increase student retention and engagement.

Realizing that vocabulary references to industry taking place during a classroom lecture are not the same as experiential learning, instructors do present students with examples of real-world application of the content as part of their lectures. References to industry can be used in classroom lectures and are also found in textbooks as a means to assist with improving the student learning experience. Content analysis of textbooks has been utilized to examine industry references and depict the frequency of real-world examples and connotations behind the references (Simon et al., 2018). Exploring textbook content and its presentation provides insight into student learning, however, textbooks are frequently a supplementary instructional method, therefore, the significance of their content must be viewed accordingly (Chew-Wah et al., 1981). Lectures remain the most common instructional method employed by universities, resultantly conducting a content analysis has the potential to be significantly more insightful than data generated from textbook review.

Content analysis is often used in qualitative work to summarize the importance of language to a topic. Content analysis is a way to make "inferences by systematically and objectively identifying special characteristics of messages" (Holsti, 1969) pg. 68. An example of content analysis is examining job postings to identify what skills and/or knowledge employers are looking for in recent graduates based upon the language of the job postings (Wilson, 2019). The study conducted by Wilson and colleagues categorized skills desired by employers based upon analysis of 85 job postings related to an agricultural career. Evaluation of agricultural job postings using specific terminology and databases allowed for the categorization and subsequent inferences.

Specific terminology and its usage are important to education (Yager, 1983). Researchers use terminology to communicate their findings to other researchers and to the public (Wandersee, 1988). It is important for those in the field to understand the meaning and impact of such terminology so that their findings can be understood. Students also need to understand the specific terminology that is used by their particular field in order to be successful in it.

Common industry-related animal science terminology found in literature are 'industry', 'management', 'manager', 'product', 'producer', 'production', 'commercial' and 'consumer' (Boykin et al., 2017); (Hasty et al., 2017); (Reiling et al., 2003); (Ramsey et al., 2016). These common terms can be used to conduct a content analysis of introductory animal science course lectures as a means of benchmarking language within that course. The frequency of the use of these terms in this context will provide a foundation for future studies investigating language within the context of the animal science curriculum.

The objective of the present study is to establish a benchmark to quantify the frequency of industry-related terminology in an introductory animal science undergraduate course through the completion of content analysis. This project has the following hypothesis frequency of industry coded terminology in lecture transcriptions will appear throughout the semester.

3.2. Materials and Methods

All procedures were approved by the Texas A&M Institutional Review Board. The study was conducted over a summer and fall semester.

3.2.1. Content Analysis

Content analysis is a research method that can be broadly defined as "any technique for making inferences by objectively and systematically identifying specified characteristics of messages", (Holsti, 1969). Early content analysis can be seen in religious documents, and media such as newspapers. A shift in research has been made from smaller documents to larger data sets, that can be analyzed with computers. Large volumes of data are manageable when content analysis is adopted by researchers (Stemler, 2000). Established coding methodology is applied to documents to create a technique that can be replicated to emerge content categories from many words (Krippendorff, 2018). Two main types of coding, emergent, and priori coding. Emergent allows for categories to be formed after some analysis of the data has already begun, while priori coding establishes set categories before data analysis of the documents has started (Stemler, 2000). Three types of units are often seen in content analysis: sampling units, context units, and recording units. Sampling units have variability because the researcher uses their expertise to form the units from meaning and can data sets be containing words, sentences, or paragraphs.

3.2.2. Participants and Facilities

The study took place in undergraduate courses at Texas A&M University, College Station, in the Animal Science Department. The focus of this study was instructor lectures in an undergraduate introductory animal science course. General Animal Science is a 3-credit hour course that is taught by multiple instructors, is offered face-to-face, online, and as an honors section. For the purposes of this study, the face-to-face lectures are compared, and the honors sections along with online sections were omitted due to the differences in content and method of delivery of content. Two of the nine-course learning outcomes are: Implement Animal Management Strategies: Animal Products/outputs and Evaluate Socially Responsible Techniques to Produce Animal Products.

3.2.3. References to Industry

References to the animal science industry are defined as services and products that contribute to the economic stimulus of that industry. Terms that would elicit coding as a reference to industry are ‘industry’, ‘management’, ‘manager’, ‘producer’, ‘product’, ‘production’, ‘commercial’, and ‘consumer’ (Reiling et al., 2003; Sahlu et al., 2009; Ramsey et al., 2016; Hasty et al., 2017).   ‘Industry’ is the main of the focal point, with the other terms branching off. ‘Production’ is the beginning of the animal science chain, where ‘product(s)’ which are created through ‘management’ and ‘managers’/’producer’ to be marketed towards ‘consumer’. These specific terms were chosen to provide a benchmark for a methodology to conduct a content analysis on the frequency of industry-related terms within a lecture.

3.2.4. Data Collection

One section of general animal science lectures was recorded over the summer semester as a pilot study. Two sections of general animal science lectures were recorded over the duration of the fall semester. A high-resolution recorder (Zoom H1n Handy Recorder; Tokyo, Japan) was used to collect the recordings. The recorder was placed at the front of the lecture hall and the input level was adjusted so the peak level stayed around -12dB to ensure high audio quality. The battery levels of the recorder were at full charge before every lecture. Recordings began 5 minutes prior to the lecture and ended 5 minutes after the lecture to account for any additional information given by the instructor outside of the allotted lecture time. Lectures were not recorded when the faculty members were absent, or when there was an examination given.

3.2.5. Audio Editing

Directly following the lecture, the audio files were downloaded from the recorder to a computer and backed up. The audio files were edited using a software (Camtasia: Screen Recorder and Video Editor; TechSmith Corporation) to discard audio that did not contain lecture content and to reduce background noise.

3.2.6. Transcription Quality Assurance

Audio recordings were submitted to a transcription company (Descript; San Francisco, CA) and “White Glove Service” was used which delivered a 98% accuracy on transcriptions. Trained undergraduate researchers confirmed that the transcriptions were 99% accurate by comparing the audio files to the transcriptions. The undergraduate researchers were trained with several previous audio files and transcriptions from the pilot study and were evaluated to achieve at least a 98% accuracy. The undergraduate researchers were responsible for correcting any mistakes they came across in the transcriptions and formatting the transcriptions for coding. For formatting, the undergraduate researchers erased all speaker names, timestamps, and combined all separate paragraphs into one large paragraph. The researchers also highlighted any part of the transcription in which a student, teaching assistant, or guest lecture was speaking. Each were highlighted a different distinguishable color, with a key present at the top of the transcription. Lectures were completely disregarded from the data analysis if technical difficulties occurred that did not allow for the entire lecture to be recorded.

3.2.7. Formation of Data Sets

Transcriptions were reviewed by the primary researcher after quality assurance was finished. The primary researcher broke the transcription into data sets that varied from lecture to lecture depending on the length of the lecture and the amount of content covered. Data was broken into multiple sampling units, and each individual data set contained a discussion of a single topic. Transition words such as “Now”, “Alright then”, and “Okay” were used to assist the researcher in discerning the transition to a new topic. The primary researcher used their emic perspective of general animal science which allowed them to have a thorough understanding of the topics which made creating data sets more reliable. Representative quotes from a lecture are shown in (Table 3.1) to illustrate the transition of topics.

Table 3.1 Representative Quotes

Data set #	Representative Quote
F.B.5.16	“We also saw that problem uh back in the '80s I think it was '70s '80s when we were really feeding these hogs and the swine industry was developing and somewhere there was a lot of cheap peanuts. And so people were feeding those hogs peanuts. And so we saw the same thing. 'Cause a peanut makes a very soft oily fat 'Kay? And so we talk about monogastrics. And so that's why you know the saying what you eat is what you are? It's very true. So those pigs were eating a lot of peanuts and then the became a very soft pale fat. So we don't feed a lot of peanuts to in the pork industry anymore 'Kay? Questions on pig breeds? Those are the big ones I want you to know.”
F.B.5.17	“Now we'll roll into sheep breeds. We'll hit those real fast. What I want you to talk about in terms of the sheep breeds the main way we classify those animals is by what their goals are 'Kay? And so is it a meat breed? Is it a wool breed? Or is it a specialty breed that goes back to one of these two? Dual-purpose eh It's kinda iffy. A lot of times when we try to do dual-purpose stuff, neither one of 'em is really good. And so the sheep industry has kinda lagged behind. They're catching up. And we're gonna talk about a few 'Kay? Somebody tell me something they know about the sheep industry. Jack?”
F.A.20.71	“So we look how some of these are. Let's say we're ultra sounding. Let's say we're counting number born alive. Let's say that we are measuring, um, longissimus dorsi measurements on animals. These are physical characteristics of these animals that we can collect from a data perspective.”
F.A.20.72	“Now, then you've got heritability. So you've got what you're looking for from a physiological standpoint, from a genetic standpoint. You're comparing what those traits are then you have to look, what is the heritability of those specific traits? So we, uh, characterize, um, heritability on various levels. But we've got heritability, variation of phenotype from the parent to the offspring, the greater the value. So higher the heritability level if we go here. A higher, highly heritable is anywhere between .4 and .6. Moderately heritable .2 to .4. Lowly heritable 0 to .2.”

Semester.Section.lecture#.dataset

3.2.8. Coding

Undergraduate researchers were trained to properly conduct a content analysis of the lecture transcriptions. Undergraduates were trained with at least a 98% accuracy using previously coded transcriptions from the pilot study. All transcriptions from the pilot study were coded by the primary researcher. Undergraduates were assigned a section of general animal science to evaluate, each being identified by the section number. The data sets are identified by a series of letters and numbers. The first being semester (S or Fr), the section number (A or B), the lecture number of the semester (1-40), and the individual data set number within the lecture (1-200). There was variation when comparing lecture numbers between sections at the end of the fall semester because section A met 3 times a week for 50 minutes, and section B met 2 times a week for 75 minutes. Both sections met for approximately 2,250 minutes each over the 15-week semester.

Excel spreadsheets, one for each section and semester, were used by the undergraduate researchers to code the completed transcriptions which contained individual data sets that were numbered. A word search of the document was used to identify terminology defined as a reference to industry. If a data set contained the desired terminology, credit was given in the spreadsheet under the column linked to that term. If the data set did not contain a term, ‘No reference’ was recorded for that data set. Any data set that contains teaching assistant, guest lecture, or student speech were excluded from the data analysis. If a data set had more than 1 term, both terms were recorded in the spreadsheet, however, the cell in the spreadsheet was highlighted yellow to denote that it was the term that first appears in the data set. When data analysis occurred, credit was only given to the term that first appears in the data set for the frequency count. The transcriptions were read by the undergraduate researcher to determine if the correct context of the word is being utilized. If the wrong context of the word was used (i.e., Production system v.s. Production of a hormone), it was still recorded in the excel spreadsheet, however, the cell was highlighted red to signify incorrect context and the data set was not recorded as containing an industry-related term. A total of (n=559) terms were omitted from the summer section, and (n=821) terms were omitted from the final data analysis for the fall section (Table 3.2).

Table 3.2 Word Count

Section	Coded	Duplication	Alternate Definition	Total Terms	Total Word Count
Summer A	602	534	25	1161	158173
Fall B	1005	748	73	1826	427265

Terms- From the literature; Summer A: pilot study

3.2.9. Data Analysis

Data analysis was initially conducted using word search functions within the Word software and the tabulation functions within Excel (Simon et al., 2018). As this study is a benchmark, only the frequencies of terms were reported. Further analysis directed towards the triangulation of vocabulary use and student learning will be conducted in future studies.

3.3. Results

Priori coding of eight terms relating to animal science were analyzed over 80 hours of introductory animal science lectures. The term that was utilized most frequently by Section A was ‘production’, and the term that occurred least frequently by Section A was ‘manager’ (Table 3.3). The term that occurred most frequently in Section B in the fall was ‘product’ and the least frequently used term was ‘manager’ (Table 3.3).

Table 3.3 Frequency Count of Industry-Related Terms In Lecture

	Summer		Fall	
Terms	Frequency	%	Frequency	%
Industry	80	2.92	219	2.80
Management	23	0.84	32	0.41
Manager	1	0.03	2	0.02
Producer	147	5.37	145	1.86
Product	68	2.50	238	3.05
Production	218	7.96	202	2.59
Commercial	15	0.55	23	0.29
Consumer	50	1.83	144	1.84
Total Terms	*602*	*22*	*1005*	*12.86*
No Terms	2135	78	6809	87.1
Total Data Sets	2737	100	7814	100

Terms- From the literature

The summer section had (n= 2737) total data sets for the course, of which (n= 602, 22%) contained animal science industry-related terms. The fall section had (n = 7814) total data sets for the course, of which (n= 1005, 12.86%) contained an animal science industry-related term.

The benchmark study illustrated that the methodology used was an effective way to collect, and analyze data for conducting a content analysis on lectures in courses.

3.4. Discussion

The purpose of this study was to establish a benchmark to quantify the frequency of industry-related terminology in an introductory animal science undergraduate course through the completion of content analysis. The methodology used allowed for a large quantity of data to be collected and analyzed (Stemler, 2000).

This study was only comprised of independent variables, which did not allow for any comparison to occur. However, despite the ability to make comparisons, the frequency of industry-related terms were determined. A limitation of this study was that only eight terms were used to examine the influence that industry-related terms have on the content that is being discussed in introductory animal science courses.

Future studies need to be conducted to open code lectures to allow any other references to industry to emerge. Using priori coding with specific predetermined terminology limited the study. Open coding allows for themes to emerge within the content analysis that can detect data sets that may have a reference to industry, that did not contain any of the terms used for priori coding. Again for this study, references to the animal science industry are defined as services and products that contribute to the economic stimulus of that industry.

Open coding can be used on the data to allow for emerging themes of the additional content taught in the course to be discovered. Using a content analysis on the course could be used to see the amount of faculty-references being made in the course to see how instructors are preparing their students for success within the department as the continue their degree. This methodology may be used to examine the alignment of course content and the course and department learning objects.

Methodology was benchmarked in this study to allow for future studies to be conducted and further explore the content of introductory animal science courses. This methodology can potentially be applied to higher-level courses within animal science to examine the content being delivered in those courses as well.

Roughly 40% of animal science graduates enter an industry-related career in animal science, and 60% of graduates entering other careers (Dodson and Benson, 2010). This study focuses on the potential for increasing career preparedness in that 40% entering the animal science industry, however the methodology established can be applied to examine the course content for relevance to the other careers as well.

Methodology established in this study can be used to examine not only animal science course content, but has the potential to be used within disciplines across pedagogy.

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4. CONSISTENCY OF INDUSTRY-RELATED TERMINOLOGY USED IN ASSESSMENT QUESTIONS ACROSS INSTRUCTORS OF AN INTRODUCTORY ANIMAL SCIENCE COURSE

4.1. Introduction

Receiving college credentials within a certain major does not necessarily qualify one for a career in that industry. There is a growing presence of graduates entering careers not related to their college majors (Robst, 2007). As example, a survey evaluating animal science graduates during a 50-year period study revealed that 10.2% of graduates entered a career in farm/ranch/dairy/feedlot, 17.1% allied animal/food industry, 12.2% veterinary clinic, 36.3% education, 3.4% medical, 2.4% finance, 9.8% government, 6.1% private business, and 2% wildlife (Dodson and Benson, 2010). That study demonstrated that there are animal science graduates not entering careers directly associated with the traditional industries associated with their majors. Many animal science graduates pursue careers related to food safety, human medicine, animal medicine, and future educators. Due to the significant impact, these careers have on society, it is important that college graduates are properly prepared to enter these fields and do so with a strong understanding of the discipline of animal science and it's association with their career of choice.

Career readiness includes critical thinking, problem-solving, contextual learning, teamwork, adaptability, global knowledge, writing, and self-direction (Associates, 2015). (DiBenedetto and Myers, 2016) constructed a conceptual model that includes nine skills for student readiness, learning skills, life skills, career skills, social skills, knowledge competencies, incidental learning skills, dispositions, experience, and interdisciplinary topics. These nine skills were used to summarize the desired skills of college graduates from industry representatives.

A disconnect between college graduates and the skills desired by industry representatives has been seen across multiple disciplines. As an example, highly desired characteristics for employment in equine-assisted activities at the management level were oral communication skills, work ethic, personal disposition, and teamwork abilities; with only 42% of respondents strongly agreeing that a bachelor’s degree was imperative for hiring (Burk and Gramlich, 2018). Industry representatives with associations with the department of animal science were surveyed about their perceptions about career readiness. They indicated the level of preparation, specifically the student’s ideal level of preparedness for a career in industry, was more important that particular content-based skill. A recent survey of graduates of an animal science department at a large recent university revealed that they felt less than well prepared to enter the industry (Early, 2018). Graduates are trying to achieve employment after graduation, however there are challenges due to a disconnect between the skills that they have acquired and the skills that are desired by employers.

The disconnect between educators and industry representatives has become evident in undergraduate education (Thompson et al., 2018). Due to the gap between higher education content and the expectations of industry representatives, research needs to be conducted in ways to evaluate current student learning and ways to improve that learning. Various instructors have different teaching methods and assessment techniques to evaluate their student's performance. Differences in teaching methods are demonstrated to be impactful. Students perceive that different instructors had a high impact on their performance when compared to the course type and program level (Marsh and Overall, 1981). This instructor preference can be seen even when faculty are instructing the same content; data suggests that the instructor's unique teaching methods and assessments are critical to student learning. Evaluation is needed on the current methods of assessment in order to provide a foundation for future research on the efficacy of those methods at enabling students to transfer knowledge into real-world experiences. "Information learned in the classroom must be taught using methods for students to transfer the knowledge gained into real-world experiences" (DiBenedetto and Myers, 2016). Real-world experiences can be achieved by participating in internships, study abroad, experiential learning, or reflecting on previous experiences. Expecting today's students to relate the same experiences in the classroom with real-world applications as previous generations, maybe a challenge because the life experiences of students have changed with the generations.

Changes have recently been made within educational systems in an effort to adapt to the new generations of learners. A major problem facing education is that students seem to learn the information for a test, but they are unable to retain the information for a long period of time (Halpern and Hakel, 2003). Pedagogy has begun to focus on the incorporation of innovative teaching methods in the classroom as a means to increase student performance, including student engagement, motivation, critical thinking, and problem-solving. Few new methods have been effective at increasing motivation and student engagement, but those new strategies have not increased the retention of knowledge (Tanner, 2011). A common way to measure retention of knowledge is through assessments. Assessment range from quizzes, practical labs, examinations, portfolios, surveys (both qualitative and quantitative), and monitoring students (Mason et al., 2018).

Although the initiative has been taken to increase students' learning and career preparedness there are still gaps in knowledge and practice. A disconnect between educators and industry expectations in undergraduate education is an example of one such gap (Thompson et al., 2018). The need to improve preparing students and the subsequent implications that student preparedness has on the field of animal science, as well as society, suggests that research of methodology valuable to enhance student learning needs to be conducted. Real-world learning, also referred to as experiential learning, has been documented as one way to assist students in increasing knowledge retention and performance (White et al., 2017). This is not a new concept, as there is evidence that in the late 1800s educators introduced experiential learning to challenge traditional lectures by promoting engaging students in their individual interests through building upon their previous experiences (Dewey, 1897). Today there remains a strong student response to learning that is related to real-world applications.

While experiential knowledge has seen to be effective at increasing student performance, it is often not implemented due to the time-consuming nature and high costs associated with it (Wells, 2019). Alternative solutions need to be discovered to achieve the same results as experiential learning with the reduction of time and cost. There are connections that can be made in the classroom to industry that are not experiential learning. Such as, references to industry are used in textbooks (Simon et al., 2018), and in lectures to illustrate the content of the course in the real world. Although references to industry during a lecture and assessment questions are not considered experiential learning, both are presenting the students with a real-world application of the content. With there being a deficit in the “level of prep” of animal science students (Early, 2018), a reasonable question is: Can lectures and assessment questions, which contain references to industry, create a middle ground for traditional lectures and experiential learning? The gap between higher education and industry needs to be addressed, however, current content needs to be evaluated for benchmark purposes.

Therefore, the purpose of the study was to examine the consistency of industry-related terminology use in assessment questions. We hypothesized that the frequency of industry coded terminology in assessment questions will be consistent across sections irrespective of the distribution of students via major within the sections.

4.2. Materials & Methods

We used a quantitative nonexperimental research design to conduct the study described herein. Nonexperimental research is used to study independent variables that are nonmanipulable (Johnson, 2001). Kerlinger (1966), believed that nonexperimental research was more important to educational research problems than traditional experimental studies. Such design best fits our study because data collection focused on assessment questions and students’ majors, which are both independent variables.

4.2.1. Participants and Facilities

The study took place at university and focused on undergraduates enrolled in an introductory, general animal science course within the Department of Animal Science. The frequency of specific animal science industry-related terms that support learning outcomes were evaluated.

General animal science is a 3-credit hour course taught by multiple instructors and offered as a face-to-face and online platform course and an honors section. For the purposes of our study, we compared the face-to-face lectures and omitted the honors sections and online sections because of differences in content delivery. Two of the nine-course learning outcomes are: Implement animal management strategies: animal products/outputs and Evaluate socially responsible techniques to produce animal products. This study was conducted over two fall semesters and these sections were selected because they included both students who were animal science majors and students who were non-majors. The instructors were different for both sections, Section A had a scheduled meeting time of 50 minutes three days a week, and Section B had a scheduled meeting time of 70 minutes two days a week.

Student's majors were collected from the undergraduate animal science advising office Table 4.1. Assessment questions were collected from the faculty instructors of the course at the end of each semester. Data collection methods were approved through the Texas A&M University Institutional Review Board.

Table 4.1 Distribution of Majors

Section & Semester	Total Number of Student	Major	Major %	Non-Major	Non-Major %	*P* value
Fall 2018						
Section A	340	22	6.5	318	93.5	<0.0001*
Section B	356	245	68.8	111	31.2	<0.0001*
Total	*696*	*267*	*38.4*	*429*	*61.6*	-
Fall 2019						
Section A	306	24	7.8	282	92.2	<0.0001*
Section B	279	219	78.5	60	21.5	<0.0001*
Total	*585*	*243*	*41.5*	*342*	*58.5*	-

*Significant differences (p<0.05) between sections within a semester between major and non-major students

4.2.2. References to Industry

References to the animal science industry are defined as services and products that contribute to the economic stimulus of that industry. Terms that would elicit coding as a reference to industry are ‘industry’, ‘management’, ‘manager’, ‘producer’, ‘product’, ‘production’, ‘commercial’, ‘consumer’, and ‘show/ stock-show’ (Reiling et al., 2003; Ramsey et al., 2016; Hasty et al., 2017). These specific terms were chosen to provide a benchmark for a potential relationship between student performance on questions containing industry related terminology as opposed to those that do not.

4.2.3. Data Collection

Assessment questions were collected from the faculty instructors of General Animal Science at the end of each semester. Questions used for coding were collected from all of the examinations and quizzes that were administered throughout the two fall semesters between the two sections. The assessment questions were compiled into individual documents based on the semester and the sections in which they are given.

Overall, Section A provided (n= 395) in the fall of 2018, (n=385) in the fall of 2019 and Section B provided (n= 396) in the fall of 2018, (n=469) in the fall of 2019 total assessment questions derived from all examinations and quizzes.

4.2.4. Coding

A word search of the document was performed by the main researcher to identify the questions coded with the animal science industry relevant terminology. If assessment questions contained more than one of the desired terms, to avoid recounting of the same question, credit was given to only the first term that appeared in the question. Questions were excluded if the industry term was used in a different context, such as “production” being used as “production of an enzyme” rather than “a production setting”.

Of the (n=1645) questions examined, (n=36) terms were omitted due to repetition, and/or used in the wrong context. “Production” was used in the wrong context (n=25), and “management”, “products” “producers”, “industry” were in questions that had been previously coded for another term (n=11).

4.2.5. Data Analysis

Data analysis began by using Windows software including Word and Excel (Simon et al. 2018). A Chi-square analysis was performed to determine significant differences in the use of the specific terminology between sections. The data were analyzed in SAS (v. 9.4, SAS Institute Inc., Cary NC), and results are considered statistically significant at $p<0.05$.

4.3. Results

When examining assessment questions in an undergraduate animal science course, we identified the number of questions containing specific industry terminology. Within Section A, there was a total of 395 assessment questions throughout fall 2018, with (n=43; 10.9%) questions identified containing the specific industry-related terminology that was determined from the literature. In fall 2019, Section A had a total of exams and quiz questions Section B had a total of (n=385) questions, with (n=28; 7.27%) questions coded with specific industry terminology. Section B in fall 2019 had a total of (n=469) questions, with (n=23; 4.9%) questions coded with specific industry terminology.

In the fall of 2018 the most frequently used term in Section A was "production", appearing (n=18), and in Section B "industry", appearing (n=13). In the fall of 2019 the most frequently used term in Section A was "production", appearing (n=14), and in Section B "industry", appearing (n=10). The least frequently used term in fall 2018 in Section A was "manager" appearing (n=0), and "management" appearing (n=0) in Section B's assessment questions. The least frequently used term in fall 2019 in Section A was "manager" appearing (n=0), and "management" appearing (n=0) in Section B's assessment questions.

There was no significant difference when comparing the use of specific industry coded terminology in assessment questions between Section A and Section B (Table 4.2).

Table 4.2 Assessment Question Breakdown

Section	Total Number of Questions	Questions containing "Industry"	Questions containing "Management"	Questions containing "Producer"	Questions containing "Product"	Questions containing "Production"	Questions containing "Manager"
Fall 2018							
Section A	395	12	2	1	9	18	-
Section B	396	13	-	5	3	9	1
Total	791	25	2	6	12	27	1
P value	-	0.76	0.17	0.25	0.08	0.14	0.30
Fall 2019							
Section A	385	8	-	1	5	14	-
Section B	469	10	-	2	3	7	1
Total	854	18	-	21	7	21	1
***P* value**	**-**	**0.96**	**-**	**0.68**	**0.32**	**0.07**	**0.36**

"-" no questions contained a term ; *Significant differences (p<0.05) between sections within a semester

4.4. Conclusion

The purpose of the study was to examine the consistency of industry-related terminology use in assessment questions. We found consistency between the use of industry terminology on assessments created by different instructors, across two sections of the course. To increase the consistency of the education undergraduates, receive, instructors create course work together to verify that content and assessments align with learning outcomes to prepare students properly and uniformly (Borrelli et al., 2010). Two of the nine learning outcomes of the course are related to the industry, however, only approximately 10% of the assessment questions contained specific industry terminology. This gap provides an opportunity for growth on assessment questions surrounding the industry. Few assessment questions were related to industry creating a potential deficit of industry associated vocabulary assessment as a tool for career preparedness of animal science majors. Baker, 2011 demonstrated the benefits of marketing and branding the agricultural industry in courses to assist in the future success of students. Assessment questions related to the industry could help bridge the gap of true experiential learning and traditional lecture by providing a middle ground of “experience” through assessment questions.

Understanding the demographics of students can assist the faculty in customizing the course content to provide the best learning experience (Colorado and Eberle, 2012). Through the methodology created in this study, a benchmark has been established on evaluating the frequency of specific terminology used in an introductory animal science course.

A limitation of the study was the lack of demographic data of the students enrolled in the class besides their major. Insight on the major of the student provides a small amount of information on their potential prior knowledge. However, the course is an introductory class that is a university core science course, so assumptions made based on student major does not provide enough information to accurately determine the student's interest or prior knowledge of animal science. Another limitation of this study was restricting to the coding of the assessment to only the six pre-determined industry terms based upon included from literature. There might have been questions that inferred references to the industry, yet did not use these specific terms, and were therefore excluded.

A potential future study would be to code examination questions for common themes rather than for the presence of specific terms. This could enhance research for a more in-depth analysis of assessment questions. To take the research one step further, lectures given by the instructor could be coded and matched with assessment questions to give a more rigorous investigation of continuity of industry references. Examination scores could also be examined to for use in triangulation of inclusion of industry-related vocabulary in lectures and assessments and student performance.

With a more complete of the students enrolled in the class, there can likely be greater customization of the content. Instructors can add examples of non-farm type animals if they have a heavy non-major composition or students within major without any livestock background. This could potentially assist students with a deeper understanding of the material and have a better overall performance. For students who are animal science majors, instructors can add more industry-related questions to assist with the student's understanding of the content as that will be necessary for future success. Industry-relevant questions have the potential to better prepare students for future required management classes within the program, and have the potential to assist with a more thorough understanding of content for career readiness. There is also the possibility that increasing the frequency of assessment questions involving industry could increase the student’s knowledge of operations of the industry itself. Having consistency between professors is important for the success of the students within the animal science major because students within the program should receive the same basic knowledge from an introductory course, irrespective of the instructor, in order to help prepare them for future courses and careers.

Our study served as a benchmark study to establish a methodology to collect and assess assessment questions in introductory animal science courses. The methodology established can be translated to other courses within animal science or outside of the discipline. The gap between industry expectations and higher education is present and a solution needs to be found. This study takes the first steps towards the solution by developing a way to quantify what is currently being assessed by educators.

4.5. Literature Cited

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5. CONCLUSIONS

Pedagogy is an important area to conduct research within the discipline of animal science. The ever-growing population of the world is challenging the animal science industry to investigate methods to feed the world with animal products. The increase in demand for animal products increases the demand of individuals entering employment in the industry. College is one way to prepare for a career, however, there is a gap between the skills that college graduates are receiving and those desired by industry representatives.

In order to close the gap, an important initial step is examination of the current content of animal science courses within higher education. By answering the question about what is currently being taught to animal science undergraduates, potential solutions can begin to be explored.

This content analysis demonstrated that terms related to industry are being used in the course, however in low proportion compared to other terms used. Future studies need to be conducted to open code the lectures to allow any other references to industry to emerge. Using priori coding with specific predetermined terminology limited the study. Open coding may also be used on the data to allow for emerging themes of the additional content taught in the course to be discovered.

Methodology was benchmarked in this study to allow for future studies to be conducted and further explore the content being taught and assessed in introductory animal science courses. This methodology can potentially be applied to higher-level courses to examine the content being taught in those courses as well.