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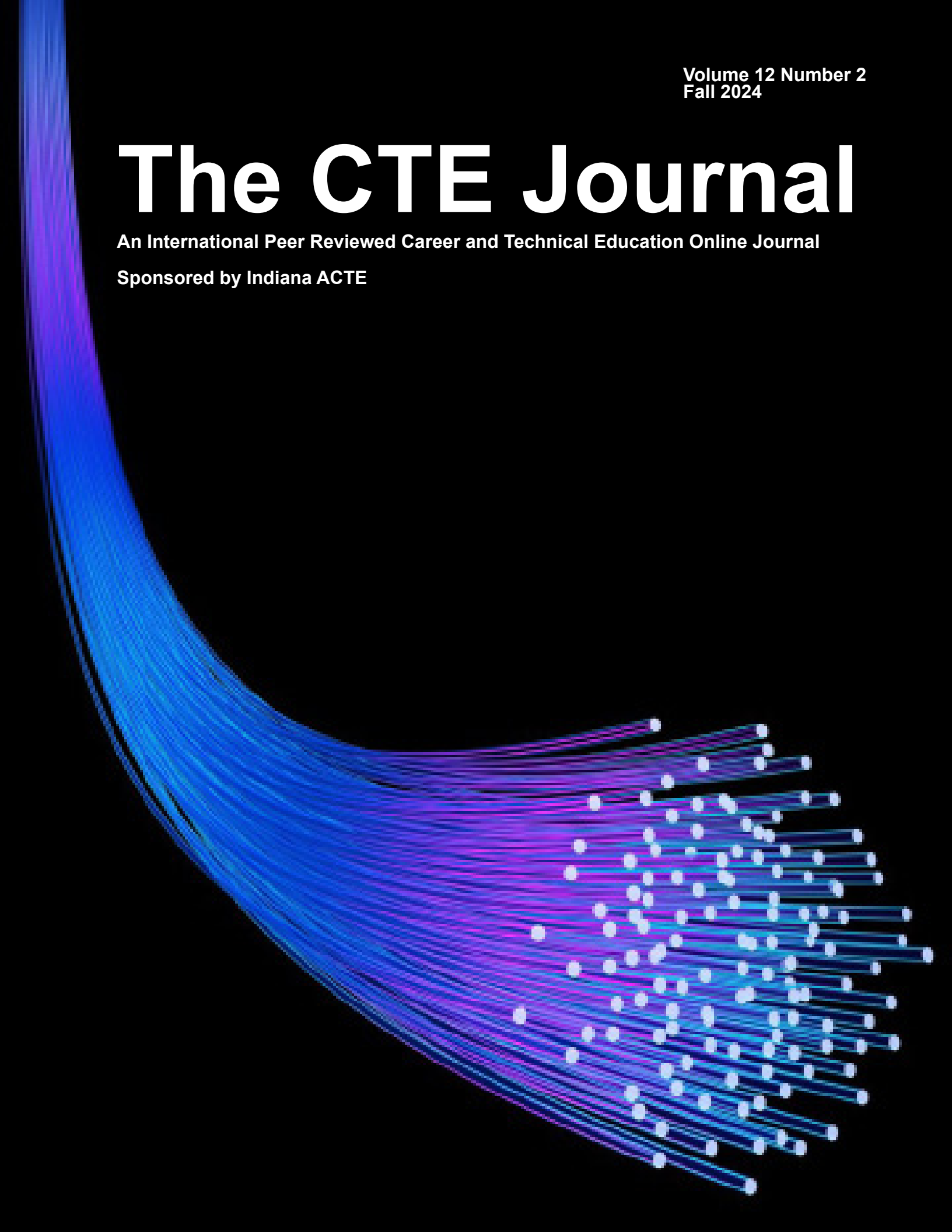


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An Industry Assessment of Employability Skills Needed in Concentrated Animal Feeding Operations of the Swine, Dairy, and Fed-Beef Industries

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Abstract

The purpose of this study was to identify the desired employability skills needed by entry-level employees entering a profession in concentrated animal feeding operations (CAFO's) within the swine, dairy, and fed-beef industries. The study's population consisted of CAFO employers at different management levels within a designated geographical region. Overall, 31 skills were observed that examined the level of preparedness of employees and the level of importance of those skills. Data were collected through an online survey. Participants in this study valued honesty/integrity and dependability/dedication to the job above other interpersonal skills. Other skills employers valued included proper safety procedures, animal management/welfare, and livestock handling. It was recommended industry stakeholders implement and model characteristics, which support and encourage honesty and integrity in the workplace. Educational institutions should seek to develop programs where students are able to participate in real life applications that meet industry needs.

Introduction

A constantly changing labor market has created new challenges. Students must acquire adaptable, transferable skills as well as specific content knowledge to be adequate employees (Wise, 2008). Employability skills are commonly termed as generic skills, non-technical skills, capabilities, key competencies, personal transferable skills, soft skills and attributes and are

considered relevant to both entry-level and established employees (Watty, Jackling, & Wilson, 2012). Less than 20 % of those who go into the workforce from high school will receive formal, on-the-job training, suggesting the fate of the majority of high school graduates with no higher education relies on low-skill/low-wage work or some type of career and technical education (CTE) training in high school. (Gray, 2009).

Employers in the U. S. argue young adults are not entering the workforce with the skills necessary to compete in for 21st Century employment (Symonds, Schwartz, & Ferguson, 2011). In 2005, 60% of U. S. manufacturing companies surveyed expressed high school graduates were poorly prepared for entry-level jobs (National Association of Manufacturers, 2005). Robinson and Garton (2008) found college graduates entering the workforce do not believe they can perform the employability skills at the level required for success in their positions. Employers tend to find competent workers from other countries because resident graduates often lack employability skills (Husain, Mokhtar, Ahmad, & Mustapha, 2010). Even though many graduates possess excellent academic qualifications, a major concern from employers is these graduates do not have the right combination of skills and personal attributes (Daud, Sapuan, Abidin, & Rajadurai, 2011). Studies prove employability skills are a need in the education system to ensure graduates are competent and competitive (Husain et. al., 2010).

Career and Technology Education (CTE) is an educational strategy for providing young people with the academic, technical, and employability skills and knowledge to pursue postsecondary training or higher education and enter a career field prepared for ongoing learning (Partnership for 21st Century Skills, 2010). Courses that focus on CTE project-based learning strive to incorporate “rigorous projects which are carefully planned, managed, and assessed to help students learn key academic content, practice 21st Century Skills (such as collaboration, communication and critical thinking), and create high-quality, authentic products and presentations” (Ravitz, Hixson, English, & Megendoller, 2012, pg.5). Kazis (2005) stated the rigor and relevant curriculum of a CTE program makes the case there is need in today’s classrooms for high-quality curricula that incorporates rigorous coursework with an occupational curriculum. Curricula includes highlighting applied teaching and learning styles tied to careers to help make learning relevant to the student. Connecting students to labor markets and employers helps provide ongoing exposure to the world of work. State leaders and stakeholders are collaborating to develop rigorous, high-quality standards that build on industry expectations for the competencies required for success in each field (Brand, Valent, & Browning, 2013).

More than half of all workers in the food industry are in the production environment as front-line supervisors, managers of production and operation, bakers, slaughterers and meat packers, food batch makers, inspectors, testers, sorters, and samplers (Napoleon, Freedman, Seetharaman, & Sharma, 2006). As the population of the world continues to increase and the available land for food production decreases, the need for successful agricultural production and marketing becomes increasingly more important (Barrick, Samy, Gunderson, & Thoron, 2009). As the land availability for food production decreases, the need for concentrated animal feeding operations (CAFO) will increase. Because of its unique diversity, agriculture is one of the primary drivers of the [REGION] economy. The most common CAFOs in the [REGION] are in the swine, dairy, and fed-beef industries. These industries not only provide animal protein to countries around the globe, but have large economic impacts in the area as well.

The swine production industry (which is the process of farrowing, nursery, and the finishing of the swine animal) within the [REGION] and surrounding areas accounts for more than 17,000 jobs and a wealth generated economic contribution of an estimated \$1.1 billion (Guerrero & Amosson, 2013). The milk production sector (which is the process of producing milk) attributes to over 10,000 jobs and an economic contributing estimate of \$1.1 billion (Guerrero, Amosson, & Jordan, 2012). The fed-beef industry (which is the process of finishing the fed-beef animal for an average of 140 days before processing) accounts for over 12,000 jobs and an economic contribution of over \$14 billion (Guerrero, Amosson, & McCollum, 2013).

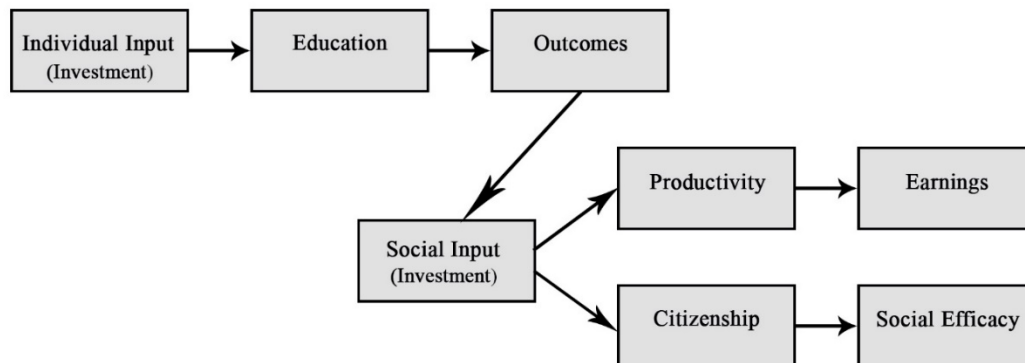
Based on employment estimates within these CAFOs, and the vast economic contributions they potentially deliver to local communities, the need for individuals with employable skills to fill these positions is paramount. Employers in the U. S. argue young adults are not entering the workforce with the skills necessary to compete in the 21st Century workforce (Symonds, Schwartz, & Ferguson, 2011). This study seeks to determine specific employability skills needed in CAFOs within the swine, dairy, and fed-beef industries of the [STATE REGION].

Theoretical Framework

Human Capital Theory (Swanson, Holton, & Holton, 2001) served as the theoretical framework for this study. This theory is illustrated in Figure I.

Figure I: Human Capital Theory (Swanson, Holton, & Holton, 2001)

Swanson (2001) defined human capital as an investment in people, while van Loo and Rocco (2004) determined human capital “is an investment in skills and knowledge” (p.99). Sleezer and Denny (2004) acknowledged the important role human capital, specifically knowledge and innovation capacities, will play in the new economy. They noted the number of



highly qualified workers is declining, which will continue to be problematic over the coming years, creating a high demand for college-educated workers.

Effective interaction involves knowing how to influence others within the organization's culture (Carnevale, 1990). Data from Wilhelm, Logan, Smith, and Szul, (2002) demonstrated employers value the human relations’ skills higher than the conceptual and technical skills. Harvey (2000) listed two sets of attributes employers desire in their employees: interactive and personal.

Communication, teamwork and interpersonal skills were described as interactive attributes required by employers.

Human capital is referred to as a process involving training, education and professional initiatives to improve the knowledge, skills, abilities, values and social assets that lead to employee job satisfaction and performance while improving the performance of the company (Marimuthu, Arokiasamy, & Ismail, 2009). There are two ways human capital skills required for success in any occupation may be acquired: on-the-job training and education whether formal or informal (Laband & Lentz, 1983). The cost of developing human capital is increasing (Husain et.al., 2010). Employers expect educational institutions to produce graduates with employability skills required by the market without additional training from the industry.

Review of Literature

Findlay (1993) posited regardless of the profession, “competence in one’s professional work role is important in the overall learning process” (p. 46). Industry expects workers at all levels to solve problems, create ways to improve the methods they use, and engage effectively with their coworkers (Bailey, 1997; Packer, 1998). Employers seek trainable recruits more often than before and look less for trained recruits (Maclean & Ordonez, 2007). The lack of soft skills can deter ones career despite have the necessary technical ability and professional expertise (Klaus, 2010).

Students’ high school experiences too often fail to prepare them for postsecondary education or for the rigors of work in an information-based economy (Bangser, 2008). At the outset, it is crucial to make a distinction between training for employment and training for employability, between a trained recruit for the workforce and a trainable recruit (Maclean & Ordonez, 2007). Employers reported the greatest training needs to update employees' skills and productivity, in addition to technical skills, were related to interpersonal communications and teamwork, individual responsibility and work habits, basic academic skills, and life skills such as time management, punctuality, and courtesy (Clagett, 1997).

Agricultural and natural resources leaders value individuals who can think critically and communicate clearly in all situations, including during a crisis or when solving a problem (Easterly, Warner, Myers, Lamm, & Telg, 2017). Klein (1990) declared educating students for a career in agriculture and natural resources demands greater skills plus a more holistic perspective on its interaction with society. Morgan (2010) found many of the agriculture competencies desired by employers, such as ability to meet deadlines, reliability, dependability, and strong work ethic, were taught indirectly through university structure as opposed to being taught through curriculum. Holzer (2012) also underscored the deficit of middle and highly skilled workers to fill higher wage positions and suggested education and skills of prospective employees fail to keep pace with employer needs.

As the array of issues facing the agriculture community and the content imperative to the solving emerging problems continues to expand, the agricultural education system could broaden and refine itself to address the challenges associated with supplying food globally while sustaining a natural system (Easterly et al., 2017). To an extent, CTE courses such as agricultural education exists to help prepare individuals for careers (Castellano, Stringfield, & Stone, 2003). Education

systems do not exist in social and economic isolation, but function to meet the particular needs of a particular society at a particular time (Maclean & Ordonez, 2007).

Public schools of the early 1900s, funded by the Smith-Hughes Act of 1917, bore the responsibility for preparing compliant and reliable workers to meet the demands of factories, mills, offices, and stores (Perry & Wallace, 2012). Today, some are advocating competence of new workforce entrants should be certified by credentials, separate from educational degrees, when earned, validate the prospective of an employee's relevant qualifications (Eisner, 2010). Providing curriculum where students can acquire technical skills is essential and should be initiated during high school (Lynch, 2000). Some states have moved to create such a nationally recognized "work readiness" credential, signifying one's ability to perform entry-level work, with performance attributes defined by employers (Eisner, 2010). Some CTE courses help students develop analytical, synoptic and presentational skills, which are highly valued in the modern economy (Lowden, Hall, Elliot, & Lewin, 2011).

For programs to produce employable graduates, the program and learning environment must be considered purposeful and systematic (Knight & Yorke, 2003). Since university faculty play a vital role in the development of their own curriculum, the disconnect between professors' perceptions of industry needs and the actual needs of the industry can be problematic in preparing employment ready graduates (Morgan & Rucker, 2013). It is widely recognized, academia should prepare students for the job market as well as provide general education about relevant topics (Urutyan & Litzenberg, 2010).

The characteristics many new graduates lack is: communication (presentation and written), teamwork, interpersonal skills, work ethic, time management, meet deadlines, realistic job expectations, job loyalty, and professionalism (Eisner, 2010). Since employees must do more to help the company be successful, students seeking jobs need skills that emphasize innovation and cultural competency as well as critical thinking, problem solving, communication, teamwork, ethical and social responsibility, and foundational skills like reading and basic math (Schuele & Madison, 2010). Holzer (2012) noted many graduates with degrees do not possess the sector-required skills to receive high wage jobs, placing the blame on disconnection between the labor market and the school systems. Indicators at the state, national, and international levels reported assessments in math and reading skills, high school graduation rates, college attendance, and employer surveys all state too many high school students are dropping out, and too many graduates are unprepared for college and/or employment (Wise, 2008).

Professionalism and work ethic, defined as "demonstrating personal accountability, effective work habits, e.g., punctuality, working productively with others, time and workload management" are rated "very important" for high school graduates' successful job performance by 80.3% of employer respondents (Casner-Lotto & Barrington, 2006, pg.23). Deficits employers find are entitlement attitude/unrealistic expectations, work ethic/laziness, lack of loyalty/commitment to company, work-life balance, immaturity, lack of confidence, understanding work required, communication skills, and need for instant gratification (Eisner, 2010).

Research by Gray and Herr (2006) showed 30% of high school graduates seeking employment were not provided the necessary skills in high school, which has resulted in high unemployment rates of high school graduates (Bureau of Labor Statistics, 2014). Research has shown skills such as problem solving, effective communication, teamwork, critical thinking, and possessing interpersonal skills (Biling, 2003; Schmidt, 1999) are the employability skills most desired by employers. In the U. S. young adults suffer from a skills gap where they do not have the necessary competencies and work ethic to obtain employment (Easterly, et al., 2017).

Foundation skills including basic skills, thinking skills, and personal qualities along with workplace competencies are identified across many organizations as being fundamental requirements for new jobs (North & Worth, 2004). One study found 75% of long-term job success depends on people skills, while only 25% is dependent on technical knowledge (Klaus, 2010). Singh & Singh (2008) found employability skills are not job specific, but are applicable across all domains as well as all levels of employment.

Purpose and Objectives

The purpose of the study was to identify the desired employability skills needed by entry-level employees entering the profession in concentrated animal feeding operations (CAFOs) within the swine, dairy, and fed-beef industries. The following research questions were addressed in this study:

1. Determine the demographics (position of placement, number of employees supervised, formal education of employees) of individuals whom hire and manage people in CAFOs within the swine, dairy, and fed-beef industries.
2. Describe the level of preparation and importance of skills, knowledge, and abilities needed for employability which are desired in CAFOs within the swine, dairy, and fed-beef industries.
3. Analyze employers' perceptions of an entry-level employee's preparedness level in conjunction to importance of skills, knowledge and abilities needed for employability desired by CAFOs in the swine, dairy, and fed-beef industries.
4. Identify the value of life experiences and trainings as it applies to the preparation of individuals within the swine, dairy, and fed-beef industries.

Methodology

Research Design

This quantitative study was non-experimental and descriptive in nature. The study evaluated factors associated with identifying the preparedness and importance level of employable skills of entry-level employees within the swine, dairy, and fed-beef industries. The variables explored included interpersonal skills, communication skills, computer skills, and technical competencies. Two additional sections also evaluated life experiences and future trainings needed. Data pertaining to these variables were recorded in a descriptive questionnaire adapted from Graham (2001).

Population

The target population for the study consisted of CAFO corporate office managers, general managers, assistant general managers, and departmental managers who make hiring decisions

and manage employees within a specific geographical area. Initially, 231 employers within the swine ($n=6$), dairy ($n=108$), and fed-beef industries ($n=117$) were identified by using contact information provided by a professional organization tied to each specific industry.

Snowball Sampling

To further grow the pool of data, additional participants with similar employment characteristics were recruited by using a snowball sampling technique. Heckathorn (2015) expressed snowball sampling, or chain-referral-sampling, of a hidden population begins with a convenience sample of initial subjects. One of the most important benefits of the snowball sampling technique is the possibility for the researchers to reference people in the questionnaire they would not have known by locating members of a specific population (Etikan, Alkassim, & Abubakar, 2015). This technique allows every recruited participant to recruit relevant subjects without requiring every participant to recruit subjects (Explorable, 2010).

Instrumentation

The instrument used in the study was adapted from Graham (2001). The instrument consisted of three sections to determine the employability skills needed by entry-level CAFO employees entering the profession of the swine, dairy, and fed-beef industries.

Section One measured the self-perceived preparedness and importance level of 31 employability skills within four categories: 1=interpersonal skills (13 items), 2=communication skills (4 items), 3=computer skills (3 items), 4=technical skills (11 items). Employers rated the entry-level employees on their preparedness level along with a perceived importance level in the four areas. The preparedness and importance levels were measured on a five-point, Likert-type response scale. The response scale used was: Importance scale (Real Limits): 1 = *Unimportant* (RL = 1.0-1.50), 2 = *Somewhat important* (RL = 1.51-2.50), 3 = *Important* (RL = 2.51-3.50), 4 = *Very important* (RL = 3.51-4.50), 5 = *Extremely important* (RL = 4.51-5.0). Preparedness scale (Real Limits): 1 = *Unprepared* (RL = 1.0-1.50), 2 = *Somewhat prepared* (RL = 1.51-2.50), 3 = *Prepared* (RL = 2.51-3.50), 4 = *Well prepared* (RL = 3.51-4.50), 5 = *Thoroughly prepared* (RL = 4.51-5.0).

Section Two of the questionnaire was comprised of six items, identified the importance of different life experiences for an entry-level employee. Section Three consisted of ranking the perceived importance level of eight employee trainings which may be needed for employee growth. Results were also entered in Microsoft Excel prior to being moved to Statistical Package for Social Sciences (SPSS) Version 24.0.

Validity and Reliability

Validity is defined as the ability of a questionnaire to measure what it purports to measure (Ary, Jacobs, Razavieh, & Sorenson, 2002). A panel of four university faculty, one Extension specialist, and three industry professionals reviewed the instrument to establish face and content validity within the questionnaire. The panel was used to gain insight as to clarity, readability, and appropriateness. The reliability for the questionnaire used in the study was adapted from Graham (2001). A Chronbach's alpha was used to calculate the internal consistency of the scaled items for this instrument at 0.93. Review of the survey instrument by the Institutional Review Board (IRB) at the University was required. The chairperson of the university's IRB approved research design and methods protocols before distribution and analyzation.

Data Collection

Elements of Dillman's Tailored Design Method (Dillman, Smyth, & Christian, 2014) were used to employ an optimal response. Prior to the questionnaire being administered, an introductory letter was sent to prospective participants explaining the purpose of the questionnaire, its importance, and the need for additional survey participants. Within the initial letter, all prospective participants were informed participation in the study was voluntary and anonymous. Approximately two weeks after the introductory letter went out, an email was sent including the link to the questionnaire. Two follow-up emails, as well as a paper letter, were sent out by the researcher. These letters thanked participants who had responded to the questionnaire instrument and encouraged non-respondents to participate in the study.

Data Analysis

Using the snowball sampling technique, a total of 83 participants completed the survey instrument. The number of responses within each industry comprised of 30 swine, 18 dairy, and 35 fed-beef operations. Data were analyzed using Statistical Package for Social Sciences (SPSS) Version 24.0. For the objectives of the study, frequencies, percentages, means, mean weighted discrepancy scores (MWDS), and standard deviations were used for descriptions and comparison of factors.

Borich (1980) noted the versatility of his model allows for modification and expansion. A discrepancy can be calculated by comparing the participants' behaviors, skills, and competencies, with the goals of the program: "a discrepancy analysis identifies the two polar positions of what is and what should be" (Borich, 1980, p. 39). To determine the perceived level of importance of the employability skills needed in industry and the perceived level of competence at performing the skills, discrepancy scores were taken from the data on the employability skill constructs. The employability skill constructs were ranked from high to low to determine the greatest discrepancies, which would signify where the curriculum should be enhanced. A discrepancy score for each employability skill construct was calculated by taking the mean importance rating minus the mean preparedness rating. A weighted discrepancy score was then calculated for every employability skill by multiplying the discrepancy score by the mean importance rating. A mean weighted discrepancy score for each of the employability skills was then calculated by taking the sum of the weighted discrepancy scores, divided by the number of respondents (*swine*, $n=30$; *dairy*, $n=18$; *fed-beef*, $n=35$). The employability skill constructs were then ranked, from high to low; using the mean weighted discrepancy scores. Items with a high discrepancy score indicated areas needed for enhancement and improvement toward educational and training efforts.

Findings

Objective One

In objective one, respondents were asked to identify the size and capacity of workforce within each of their respected industries. Being able to identify the demographics of each industry, the data collected can give an insight about the position of the respondent relative to their job title, the number of people each respondent supervised, and the level of formal education by majority of their employees. The highest percentage of respondents in the swine industry reported consisted of department managers ($n = 18$) with a rate of 60%. The highest percentage of

respondents in both the dairy and fed-beef industries identified were general managers; dairy ($n = 14$) with a rate of 77.78%, and fed-beef ($n=22$) with a rate of 64.71%.

Most of the respondents in the swine industry selected they most often supervise six to ten employees ($n = 8$, 26.67%). Whereas both, the dairy industry ($n = 7$, 38.89%) and fed-beef industry ($n = 11$, 32.35%) selected they tend to supervise twenty-six to fifty employees. All respondents within the swine ($n=16$, 31.37%), dairy ($n=11$, 36.67%), and fed-beef ($n=26$, 45.61%) industries reported a high school diploma as their traditional employees' highest level of education.

Objective Two

In objective two, respondents were asked to evaluate the perceived preparedness level of their employees as well as identify the importance level of 31 employability skills in CAFOs. In the swine industry, thirteen skills were indicated as employees were *Prepared* (RL = 2.51-3.50) and eighteen skills were identified as *Somewhat Prepared* (RL = 1.51-2.50). The top five items ranked as *Prepared* consisted of 'Honesty/ Integrity' ($M=3.27$, $SD=0.96$), 'Working Well with Fellow Employees' ($M=3.07$, $SD=0.96$), 'Maintaining a Positive Attitude' ($M=2.97$, $SD=0.84$), 'Dependability/Dedication to the Job' ($M=2.93$, $SD=1.08$), and 'Understand and Follow Instructions' ($M=2.72$, $SD=0.94$). When evaluating importance, two items were identified as *Extremely Important* (RL = 4.51-5.00). These two skills were 'Honesty/ Integrity' ($M=4.63$, $SD=0.55$) and 'Animal Management/Animal Welfare' ($M=4.57$, $SD=0.76$). Eighteen skills were identified as *Very Important* (RL = 3.51-4.50), nine skills were identified as *Important* (RL = 2.51-3.50), and two skills were identified as *Somewhat Important* (RL = 1.51-2.50). The top three skills ranked as *Very Important* consisted of 'Understand and Follow Instructions' ($M=4.48$, $SD=0.56$), 'Dependability/Dedication to the Job' ($M=4.38$, $SD=0.67$), and 'Proper Safety Procedures' ($M=4.37$, $SD=1.02$).

In the dairy industry, seven skills indicated employees were *Prepared* (RL = 2.51-3.50) and twenty-two skills were identified as *Somewhat Prepared* (RL = 1.51-2.50). Two skills were identified as *Unprepared* (RL=1.00-1.50). The top five items were ranked as *Prepared* consisted of 'Maintaining a Positive Attitude' ($M=3.17$, $SD=0.90$), 'Honesty/ Integrity' ($M=3.06$, $SD=0.97$), 'Understand and Follow Instructions' ($M=2.83$, $SD=0.83$), 'Working Well with Fellow Employees' ($M=2.61$, $SD=0.83$), and 'Open-minded to new experiences or ideas' ($M=2.72$, $SD=0.94$). The two skills were identified as *Unprepared* were 'Business Comprehension' ($M=1.39$, $SD=0.59$) and 'Marketing Comprehension' ($M=1.39$, $SD=0.59$). When evaluating importance, one skill was identified as *Extremely Important* (RL = 4.51-5.00). This skill was 'Honesty/ Integrity' ($M=4.83$, $SD=0.37$). Eighteen skills were identified as *Very Important* (RL = 3.51-4.50), ten skills were identified as *Important* (RL = 2.51-3.50), and two skills were identified as *Somewhat Important* (RL = 1.51-2.50). The top four skills ranked as *Very Important* consisted of 'Livestock Handling Procedures' ($M=4.50$, $SD=0.83$), 'Dependability/Dedication to the Job' ($M=4.50$, $SD=0.69$), 'Understand and Follow Instructions' ($M=4.50$, $SD=0.60$), and 'Proper Safety Procedures' ($M=4.44$, $SD=0.76$).

In the fed-beef industry, nineteen skills indicated employees were *Prepared* (RL = 2.51-3.50) and twelve skills were identified as *Somewhat Prepared* (RL = 1.51-2.50). The top five items in which were ranked as *Prepared* consisted of 'Honesty/ Integrity' ($M=3.37$, $SD=1.02$) 'Working

Well with Fellow Employees' ($M=3.23$, $SD=0.96$), 'Open-minded to new experiences or ideas' ($M=3.14$, $SD=1.10$), 'Dependability/Dedication to the Job' ($M=2.97$, $SD=1.18$), 'Initiative' ($M=2.94$, $SD=1.01$). When evaluating importance, one skill was identified as *Extremely Important* ($RL = 4.51-5.00$). This skill was 'Honesty/ Integrity' ($M=4.82$, $SD=0.38$). Seventeen skills were identified as *Very Important* ($RL = 3.51-4.50$) and thirteen skills were identified as *Important* ($RL = 2.51-3.50$). The top four skills ranked as *Very Important* consisted of 'Dependability/Dedication to the Job' ($M=4.38$, $SD=0.80$), 'Working Well with Fellow Employees' ($M=4.34$, $SD=0.86$), 'Understand and Follow Instructions' ($M=4.26$, $SD=0.77$), and 'Proper Safety Procedures' ($M=4.24$, $SD=0.94$).

Objective Three

The purpose of objective three was to analyze employers' perceptions of an entry-level employee's preparedness level in conjunction to importance of skills, knowledge and abilities needed for employability desired by CAFOs in the swine, dairy, and fed-beef industries. To accomplish this, the Borich (1980) needs assessment model was used for assessment. The largest MWDS scores indicated the greatest need for educational training development as perceived by the swine industry (Table 1). In the swine industry, the skills containing the greatest mean weighted discrepancy scores were 'Animal Management/Animal Welfare' ($MWDS=8.92$), 'Setting Priorities' ($MWDS=7.92$), 'Understand and Follow Instructions' ($MWDS=7.88$), 'Proper Safety Procedures' ($MWDS=7.86$), 'Animal Health' ($MWDS=7.56$), and 'Animal Health' ($MWDS=7.56$). The skills containing the lowest mean weighted discrepancy scores were 'Marketing Comprehension' ($MWDS=2.58$), 'Technical Writing' ($MWDS=2.51$), 'Yard Maintenance/Welding' ($MWDS=1.30$), and 'Vehicle & Heavy Equipment Operation/Maintenance/Mechanics' ($MWDS=1.12$).

Table 1

Overall Mean Weighted Discrepancy Scores for Employable Skills in the Swine Industry
($n=31$)

Skills Needed	Category	Importance		Preparedness		(MWDS)
		M	SD	M	SD	
Animal Management/Animal Welfare	4	4.57	0.76	2.70	1.24	8.52
Setting Priorities	1	4.17	0.73	2.27	1.00	7.92
Understand and Follow Instructions	2	4.48	0.56	2.72	0.94	7.88
Proper Safety Procedures	4	4.37	1.02	2.57	1.15	7.86
Animal Health	4	4.20	0.91	2.40	1.23	7.56
Decision Making/Problem Solving	1	4.10	0.91	2.30	1.00	7.38
Livestock Handling Procedures	4	4.33	0.79	2.63	1.22	7.37
Initiative	1	4.21	0.67	2.47	1.06	7.36
Dependability/Dedication to the Job	1	4.38	0.67	2.93	1.08	6.34
Honesty/Integrity	1	4.63	0.55	3.27	0.96	6.33
Record Keeping	4	3.93	0.94	2.43	0.84	5.89
Animal Feeding/Nutrition	4	3.83	1.24	2.30	1.24	5.88

Possess a desire to see the business be successful	1	3.97	0.71	2.53	1.20	5.69
Working Well with Fellow Employees	1	4.33	0.65	3.07	0.96	5.49
Organizational skills	1	3.80	0.79	2.37	0.80	5.45
Professionalism	1	3.83	0.78	2.60	1.08	4.73
Open-minded to new experiences or ideas	1	3.87	0.81	2.67	0.83	4.64
Ability to Work Independently	1	3.80	0.87	2.63	1.08	4.43
Ability to Speak a Second Language	2	2.93	1.12	1.80	0.83	4.21
Management/Overseeing several tasks at once	1	3.57	0.84	2.40	1.20	4.16
Computer Control Systems	3	3.17	1.18	1.93	0.74	3.94
Maintaining a Positive Attitude	1	3.90	0.80	2.97	0.84	3.62
Business Comprehension	4	3.13	1.06	2.00	1.03	3.55
Computerized Record Systems	3	3.17	1.07	2.13	0.72	3.27
Spreadsheets/Word Processing	3	3.00	1.05	1.93	0.81	3.20
Feed	4	2.90	1.25	1.80	0.98	3.19
Production/Processing/Management						
Indulging/Responding to Others	2	3.45	0.56	2.55	0.67	3.09
Comments during Conversation						
Marketing Comprehension	4	2.67	1.16	1.70	0.94	2.58
Technical Writing	2	3.03	1.00	2.21	0.85	2.51
Yard Maintenance/Welding	4	2.17	1.19	1.57	0.84	1.30
Vehicle & Heavy Equipment	4	2.21	1.16	1.70	0.94	1.12
Operation/Maintenance/Mechanics						

Note. Categories (1 = interpersonal skills; 2 = communication skills; 3 = computer skills; 4 = technical skills); Importance scale (Real Limits): 1 = Unimportant (RL = 1.0-1.50), 2 = Somewhat important (RL = 1.51-2.50), 3 = Important (RL = 2.51-3.50), 4 = Very important (RL = 3.51-4.50), 5 = Extremely important (RL = 4.51-5.0). Preparedness scale (Real Limits): 1 = Unprepared (RL = 1.0-1.50), 2 = Somewhat prepared (RL = 1.51-2.50), 3 = Prepared (RL = 2.51-3.50), 4 = Well prepared (RL = 3.51-4.50), 5 = Thoroughly prepared (RL = 4.51-5.0). MWDS = Mean Weighted Discrepancy Score.

The largest MWDS scores indicated the greatest need for enhanced education and training as perceived by the dairy industry (Table 2). The skills containing the greatest mean weighted discrepancy scores were 'Livestock Handling Procedures' (MWDS=9.75), 'Dependability/Dedication to the Job' (MWDS=9.25), 'Proper Safety Procedures' (MWDS=8.89), 'Honesty/Integrity' (MWDS=8.59), and 'Animal Management/Animal Welfare' (MWDS=8.05), and 'Initiative' (MWDS=7.74). The skills containing the lowest mean weighted discrepancy scores were 'Yard Maintenance/Welding' (MWDS=2.83), 'Technical Writing' (MWDS=2.59), 'Spreadsheets/Word Processing' (MWDS=1.25), and 'Marketing Comprehension' (MWDS=1.08).

Table 2

Overall Mean Weighted Discrepancy Scores for Employable Skills in the Dairy Industry
(*n*=31)

Interpersonal Skills Needed	Category	Importance		Preparedness		(MWDS)
		<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	
Livestock Handling Procedures	4	4.50	0.83	2.33	1.15	9.75
Dependability/Dedication to the Job	1	4.50	0.69	2.44	1.26	9.25
Proper Safety Procedures	4	4.44	0.76	2.44	1.12	8.89
Honesty/Integrity	1	4.83	0.37	3.06	0.97	8.59
Animal Management/Animal Welfare	4	4.39	0.68	2.56	1.17	8.05
Initiative	1	4.22	0.92	2.39	1.06	7.74
Animal Health	4	4.11	0.87	2.28	0.93	7.54
Understand and Follow Instructions	2	4.50	0.60	2.83	0.83	7.50
Possess a desire to see the business be successful	1	4.22	1.13	2.50	1.12	7.27
Working Well with Fellow Employees	1	4.33	0.94	2.72	0.93	6.98
Decision Making/Problem Solving	1	3.61	1.06	1.78	0.92	6.62
Management/Overseeing several tasks at once	1	3.67	1.29	2.00	0.88	6.11
Organizational skills	1	3.67	1.00	2.06	0.87	5.90
Animal Feeding/Nutrition	4	3.39	1.11	1.72	0.73	5.65
Record Keeping	4	3.67	1.25	2.22	0.97	5.30
Ability to Speak a Second Language	2	3.44	1.21	1.89	0.87	5.07
Vehicle & Heavy Equipment Operation/Maintenance/Mechanics	4	3.61	0.95	2.22	0.79	5.02
Setting Priorities	1	3.67	1.05	2.33	1.00	4.89
Professionalism	1	3.56	1.01	2.28	0.93	4.54
Maintaining a Positive Attitude	1	4.17	0.83	3.17	0.90	4.17
Feed	4	3.00	1.11	1.61	0.76	4.17
Production/Processing/Management						
Indulging/Responding to Others	2	3.39	1.16	2.33	0.88	3.58
Comments during Conversation						
Computerized Record Systems	3	3.00	1.24	1.82	0.98	3.53
Ability to Work Independently	1	3.33	0.94	2.28	0.99	3.52
Business Comprehension	4	2.67	1.15	1.39	0.59	3.41
Open-minded to new experiences or ideas	1	3.56	0.90	2.61	0.83	3.36
Computer Control Systems	3	2.82	1.29	1.65	0.90	3.32

Yard Maintenance/Welding	4	3.00	1.20	2.06	0.62	2.83
Technical Writing	2	2.59	1.37	1.59	0.69	2.59
Spreadsheets/Word Processing	3	2.12	1.08	1.53	0.92	1.25
Marketing Comprehension	4	1.94	1.13	1.39	0.59	1.08

Note. Categories (1 = interpersonal skills; 2 = communication skills; 3 = computer skills; 4 = technical skills); Importance scale (Real Limits): 1 = Unimportant (RL = 1.0-1.50), 2 = Somewhat important (RL = 1.51-2.50), 3 = Important (RL = 2.51-3.50), 4 = Very important (RL = 3.51-4.50), 5 = Extremely important (RL = 4.51-5.0). Preparedness scale (Real Limits): 1 = Unprepared (RL = 1.0-1.50), 2 = Somewhat prepared (RL = 1.51-2.50), 3 = Prepared (RL = 2.51-3.50), 4 = Well prepared (RL = 3.51-4.50), 5 = Thoroughly prepared (RL = 4.51-5.0). MWDS = Mean Weighted Discrepancy Score.

The largest MWDS scores indicated the greatest need for educational training development as perceived by the fed-beef industry (Table 3). The skills containing the greatest mean weighted discrepancy scores were ‘Honesty/Integrity’ (MWDS=7.00), ‘Proper Safety Procedures’ (MWDS=6.48), ‘Dependability/Dedication to the Job’ (MWDS=6.19), ‘Animal Management/Animal Welfare’ (MWDS=6.10), ‘Livestock Handling Procedures’ (MWDS=6.01), and ‘Understand and Follow Instructions’ (MWDS=5.72). The skills containing the lowest mean weighted discrepancy scores were ‘Spreadsheets/Word Processing’ (MWDS=1.96), ‘Marketing Comprehension’ (MWDS=1.91), ‘Technical Writing’ (MWDS=1.60), and ‘Open-minded to new experiences or ideas’ (MWDS=1.20).

Table 3

Overall Mean Weighted Discrepancy Scores for Employable Skills in the Fed Beef Industry (n=31)

Interpersonal Skills Needed	Category	Importance		Preparedness		(MWDS)
		M	SD	M	SD	
Honesty/Integrity	1	4.82	0.38	3.37	1.02	7.00
Proper Safety Procedures	4	4.24	0.94	2.71	0.99	6.48
Dependability/Dedication to the Job	1	4.38	0.80	2.97	1.18	6.19
Animal Management/Animal Welfare	4	4.15	0.97	2.68	1.08	6.10
Livestock Handling Procedures	4	4.09	0.92	2.62	0.97	6.01
Understand and Follow Instructions	2	4.26	0.77	2.91	0.97	5.72
Decision Making/Problem Solving	1	3.80	0.82	2.40	1.05	5.32
Record Keeping	4	3.77	1.04	2.43	0.96	5.06
Ability to Work Independently	1	3.89	0.78	2.63	0.90	4.88
Possess a desire to see the business be successful	1	4.03	0.86	2.83	1.25	4.84
Working Well with Fellow Employees	1	4.34	0.86	3.23	0.96	4.84
Initiative	1	4.11	0.71	2.94	1.01	4.82
Animal Health	4	3.79	1.09	2.53	1.01	4.77

Feed	4	3.65	1.13	2.35	1.16	4.72
Production/Processing/Management						
Setting Priorities	1	3.74	0.91	2.49	1.05	4.71
Animal Feeding/Nutrition	4	3.53	1.01	2.35	1.00	4.15
Organizational skills	1	3.66	0.86	2.53	0.98	4.12
Maintaining a Positive Attitude	1	3.89	0.85	2.91	0.84	3.77
Management/Overseeing several tasks at once	1	3.50	0.88	2.57	1.18	3.25
Vehicle & Heavy Equipment Operation/Maintenance/Mechanics	4	3.44	1.14	2.50	0.92	3.24
Business Comprehension	4	3.15	1.09	2.15	0.91	3.15
Indulging/Responding to Others	2	3.50	0.92	2.62	0.84	3.09
Comments during Conversation						
Ability to Speak a Second Language	2	3.03	1.03	2.09	0.97	2.86
Computer Control Systems	3	3.40	0.93	2.57	0.99	2.82
Computerized Record Systems	3	3.40	1.05	2.63	1.02	2.62
Yard Maintenance/Welding	4	3.26	1.12	2.47	0.95	2.59
Professionalism	1	3.46	1.10	2.74	1.02	2.47
Spreadsheets/Word Processing	3	3.11	1.06	2.49	1.18	1.96
Marketing Comprehension	4	2.71	1.23	2.00	0.97	1.91
Technical Writing	2	2.54	0.97	1.91	1.05	1.60
Open-minded to new experiences or ideas	1	3.49	0.94	3.14	1.10	1.20

Note. Categories (1 = interpersonal skills; 2 = communication skills; 3 = computer skills; 4 = technical skills); Importance scale (Real Limits): 1 = Unimportant (RL = 1.0-1.50), 2 = Somewhat important (RL = 1.51-2.50), 3 = Important (RL = 2.51-3.50), 4 = Very important (RL = 3.51-4.50), 5 = Extremely important (RL = 4.51-5.0). Preparedness scale (Real Limits): 1 = Unprepared (RL = 1.0-1.50), 2 = Somewhat prepared (RL = 1.51-2.50), 3 = Prepared (RL = 2.51-3.50), 4 = Well prepared (RL = 3.51-4.50), 5 = Thoroughly prepared (RL = 4.51-5.0). MWDS = Mean Weighted Discrepancy Score.

Objective Four

The purpose of objective four was to identify the value of life experiences and trainings as it applies to the preparation of individuals within the swine, dairy, and fed-beef industries.

The top three life experiences which respondents in the swine industry identified as most important were 'General work experience/manual labor' ($M=3.43$, $SD=1.02$), 'Farm and/or Ranch Experience' ($M=2.93$, $SD=1.03$), and 'Career-related employment' ($M=2.87$, $SD=0.92$).

The top three most needed trainings as identified in the swine industry were 'Animal Management/Animal Welfare' ($M=3.00$, $SD=1.41$), 'Proper Safety Procedures' ($M=3.54$, $SD=2.23$), and 'Animal Health' ($M=3.86$, $SD=1.55$) indicating the largest need for better preparation of their employees.

The top three life experiences which respondents in the dairy industry identified as most important were 'General work experience/manual labor' ($M=3.39$, $SD=1.01$), 'Farm and/or Ranch Experience' ($M=3.17$, $SD=1.12$), and 'Career-related employment' ($M=2.83$, $SD=1.21$). The top three most needed trainings as identified in the dairy industry were 'Animal Management/Animal Welfare' ($M=2.50$, $SD=1.21$), 'Animal Health' ($M=3.00$, $SD=1.33$), and 'Livestock Handling Procedures' ($M=3.78$, $SD=2.15$) indicating the largest need for better preparation of their employees.

The top three life experiences respondents in the fed-beef industry identified as most important were 'General work experience/manual labor' ($M=4.00$, $SD=0.77$), 'Career-related employment' ($M=3.44$, $SD=1.01$), and 'Farm and/or Ranch Experience' ($M=3.18$, $SD=1.01$). The top three most needed trainings as identified in the fed-beef industry were 'Animal Management/Animal Welfare' ($M=3.34$, $SD=1.93$), 'Proper Safety Procedures' ($M=3.83$, $SD=2.48$), and 'Livestock Handling Procedures' ($M=4.03$, $SD=1.81$) indicating the largest need for better preparation of their employees.

Conclusions

About one-third of all high school graduates do not go to college, but immediately go to work (Gray, 2004). A recurring theme from agricultural employers is their difficulty in recruiting professionals particularly for rural postings (Pratley, 2008). Since human capital is more valuable than resources such as land, labor, and other assets, it is vital to help individuals develop the skills specific to their sector (Maiga, Cartmell, Edwards, & Robinson, 2013; Zubović, Domazet, & Stošić, 2009).

CTE provides all students educational opportunities, equipping them for the dramatic transition from high school to postsecondary education and career options (Brewer, 2004). Unfortunately, there is no definite way of knowing which of the thirty-three percent of graduates going into the workforce are taking some type of CTE course. However, it is evident employability is a large factor in the CAFOs in the Texas High Plains and surrounding counties. Corporate trainers are implementing in house trainings which teach how to read people, draw out clients, and build relationships: skill-oriented executive education fill in the holes of their employees' formal education (Klaus, 2010).

When describing objective one, the highest percentage of respondents from the swine industry were Departmental Managers (60%), whereas the highest percentage of respondents from both the dairy and fed-beef industry were General Managers (dairy=78%, and fed-beef=65%). Respondents from the swine industry typically supervised 6 to 10 employees, whereas the dairy and fed-beef industries indicated they generally supervised 26 to 50 employees on a daily basis. All three industries unanimously indicated a majority of the employees they supervise carried a high school diploma as their highest level of education.

Objective two observed the preparedness and importance level of employees with in each of the three CAFO industries. For the category of interpersonal skills, all three industries deemed 'Honesty/Integrity' and 'Working Well with Fellow Employees' as the most prepared among their employees. 'Maintaining a Positive Attitude' and 'Dependability/ Dedication to the Job' followed closely among the industries. Within the category of communication skills, all three

industries deemed ‘Understand and Follow Instructions’ and ‘Indulging/Responding to Others Comments during Conversation’ as prepared. In the category of computer skills, all industries marked their employees as somewhat prepared for the three skills. In the category of technical skills, all three industries deemed ‘Animal Management/Animal Welfare’ and ‘Livestock Handling Procedures’ and ‘Proper Safety Procedures’ as the most prepared skills.

When observing the importance level of each industry’s employees, interestingly enough, all three industries deemed the same skills in each category as the most important. For interpersonal, those skills were ‘Honesty/Integrity’, and ‘Dependability/Dedication to the Job’. In communication, the most important skill among all industries as indicated by respondents was ‘Understand and Follow Instructions’. In the way of computer skills, they were ‘Computerized Record Systems’ and ‘Computer Control Systems’. Lastly, the skills deemed most important for technical skills were ‘Animal Management/Animal Welfare’, ‘Proper Safety Procedures’, and ‘Livestock Handling Procedures’.

Objective three observed 31 skills and an analysis between preparation levels and importance of the skills were identified by a mean weighted discrepancy score (MWDS). Within each industry, the greatest value of mean weighted discrepancy scores identified the greatest potential need for enhanced education and/or training. The dairy and fed-beef industries contained the same top five skills showing the greatest need for enhanced education and/or training within each respective industry. Although very similar to dairy and fed-beef, the swine industry differed in two skills needed such as ‘Setting Priorities’ and ‘Animal Health’ possessed higher MWDS’s.

Objective four identified the value of life experiences and trainings as it applies to the preparation of individuals within the swine, dairy, and fed-beef industries. All three industries valued ‘General Work Experience/Manual Labor’ as the most valuable experiential learning which employees could acquire. The trainings all industries unanimously identified as the most required area of need was ‘Animal Management/Animal Welfare’. Both the swine and fed-beef industries valued ‘Proper Safety Procedures’ as the next important training, whereas the dairy industry valued ‘Animal Health’ as second.

Implications

Holzer (2012) emphasized the deficit of skilled workers and suggested education and skill trainings of prospective employees fail to keep pace with employer needs. Over 40% of employers rate new entrants with a high school diploma as “deficient” in their general preparation for entry-level jobs (Casner-Lotto & Barrington, 2006). Employers in this study identified the highest formal education level by majority of their employees was a high school level education. These percentages were represented in swine at 31.37%, dairy at 36.37%, and fed-beef at 45.61%. This indicated the majority of employees throughout the CAFO workforce in the study graduated from a high school setting and began working in one of the three industries.

Professionals should be reminded, education and knowledge does not just include technical skills, but personal attributes such as honesty/integrity, working well with fellow employees, and maintaining a positive attitude are considered just as important. All industries referenced ‘Honesty/Integrity’ as an important skill, if not the greatest skill, identified. Industry is in need of employees who are trustworthy, follow moral principles, and practice good character. The

characteristics of ‘Honesty/Integrity’ may not always be taught or trained directly, but can be modeled and demonstrated by others in order to develop a desired culture throughout the industry. Recommendations were made for all stakeholders to encourage character instruction along with leadership and communication skills (Williams, Robertson, Kieth, & Deal, 2014). Industry stakeholders can implement, model, and practice these characteristics to support and encourage honesty and integrity in the workplace on a daily basis.

A valued skill which employers throughout CAFO industries also desired among their employees was ‘Dependability/Dedication to the Job’. Employer’s desire employees who show reliability and dependability to the industry not only to do the right thing (integrity), but accomplish the goals of the enterprise in a timely manner. Abilities for goal setting, employee buy-in, and leadership guidance are factors which contribute to the ability of an employee being dependable and/or dedicated to any industry.

Among all industries, a skill following ‘Honesty/Integrity’ in importance, and had one of the largest mean weighed discrepancy scores throughout the CAFO’s studied was the need for ‘Animal Management/Animal Welfare’. This indicated the employers in all industries of the CAFOs desired their employees were correctly trained on how to properly manage animals of a particular species and an animal’s well-being takes priority. The safety and humane treatment of all animal species is of the utmost importance to any CAFO.

Two closely related trainings were observed as needs for all industries. These were proper ‘Livestock Handling Procedures’ and ‘Proper Safety Procedures’. Education and trainings of workplace safety procedures are crucial to the protection and the wellbeing of both industry employees and the animals they care for. Many CAFO industries have implemented safety reward programs allowing employees to earn monetary benefits every quarter if all safety procedures who have been followed and there have not been any reported accidents on the premises. Simmons-McDonald (2009) stated lifelong learning is a critical factor in the employability of an individual. Many students can develop these skills desired in entry-level positions by acquiring employment through general work placement programs, internships, or on-the-job trainings.

Recommendations

The study above provided baseline data in regard to the perception of employers in the swine, dairy, and fed-beef industries who manage people a daily basis on the preparedness level of their employees. The study was within a specific geographical area. To further grow the pool of data within each industry, participants throughout each identified enterprise were asked to send the questionnaire to employees within specific enterprise with similar employment characteristics by using a snowball sampling technique. Caution should be applied in interpretation of results and generalities of the study should not occur.

Overall, employees in the swine, dairy, and fed-beef industries seem to be prepared in the workforce. However, room for improved curriculum, education, and trainings at the secondary and post-secondary levels will always have a need in order to educate the future workforce. The results of the study should be shared with graduates, undergraduates, and high school age students prior to entering any type of scholastic/academic programs and/or job workforce

training. Furthermore, the results from the study should be shared with CTE administrators, educators, and relevant stakeholders in order to improve curriculum to better prepare the future's workforce. It is vital for university professors who develop program requirements and coursework to remain up-to-date with the current demands of the workforce and integrate feedback from students, researchers, practitioners, and the community (Hurst et al., 2015; Maiga et al., 2013).

Educational institutions, particularly those with CTE programs, have an advantageous opportunity to develop a rigorous curriculum which can be implemented in order to enhance a student's ability to be successful in an industry workplace. Due to the level of importance of skills being so evident, faculty members at the secondary and post-secondary levels should look for curriculum opportunities to enhance interpersonal development to their students. The variables educators should keep in mind when developing a rigorous curriculum are the ranked items according to each industries' mean weighted discrepancy scores. These items included setting priorities, dedication to the job, honesty and integrity within all the industries, along with proper safety procedures, livestock handling procedures, and animal management/animal welfare.

As mentioned above, secondary school institutions should take into consideration the qualities and characteristics CAFO industry employers desire in their employees. These items can help develop, transform, and invigorate workforce programs already working with a career readiness platform. Along with leadership training in the curriculum, secondary institution leaders can work with local businesses and/or industry associations pertaining to CAFOs in their area. These industry partnerships can help develop programs of interests allowing secondary students to be participants of industry designed educational programs. Educational institutions should develop programs and trainings which students are able to participate in real life applications which are relevant with industry needs. Some are advocating the competence of a new workforce entrant should be certified by credentials, separate from educational degrees, when earned, validate the prospective employee's relevant qualifications (Eisner, 2010).

A majority of the employees entering the CAFO workforce are perceived as somewhat prepared in many of the qualifying skills needed for the job, however, many industries are performing on-the-job training to enhance these skills. Employers are looking for trainable recruits who may be trained in a particular industry and not necessarily trained employees (Maclean & Ordonez, 2007). Therefore, CAFOs in the [STATE REGION] and surrounding areas are having to train employees for the jobs needed. Employers should explore potential workshops at annual conferences or other educational engagements which can help provide information on how to implement these skills to their employees.

A similar study should be replicated with a focus toward employers in other geographical areas in an effort to uncover any additional knowledge toward what skills are needed by entry-level employees in the workplace. A more in-depth research with employers should be performed to add to the pool of data. In addition, a study with swine, dairy, and fed-beef industry employees on self-perceived preparedness relative to the skills provided should be administered. As mentioned, the more which is known about competencies needed in agriculture careers and is incorporated into curriculum development, the more employable agriculture graduates will be in

the marketplace (Graham, 2001). Additionally, a study with newly hired swine, dairy, and fed-beef industry employees should be conducted to analyze their own self-perceived preparation level relative to their new career. Furthermore, a qualitative research study such as one on one interviews and focus groups throughout each swine, dairy, and fed-beef industry should be considered as to gather specific skills and traits needed from employees. A qualitative study within each industry would determine and clarify some of the specific needs, qualities, and characteristics which make up a skilled employee.

Finally, it is recommended the results of the study be shared with future students, as well as the faculty of secondary and post-secondary institutions, in an effort to identify the skills needed in the current workplace. Furthermore, educational institutions should continue to collaborate with swine, dairy, and fed-beef industry professionals in an effort to equip future graduates (secondary and/or post-secondary) with the appropriate skills needed for success in the industry workplace.

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Public Relations Career Path Explanation

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Introduction

The purpose of this article is to provide information for individuals interested in pursuing a career in Public Relations. This article contains information on how to pursue a career in PR, the responsibility of this position, along with the yearly salary. Also included in this article is an interview with James Parham who served 45-Years in PR Communications and former CEO of Hirons Advertising Agency.

Responsibility

Public Relation (PR) jobs play a pivotal role in shaping and maintaining the image of a company or organization. According to the U.S. Bureau of Labor Statistics (2022) “public relations managers direct the creation of materials that will enhance the public image of their employer or client.” PR professionals are responsible for managing communication strategies that aim to build positive relationships with customers and employees. Their responsibilities include often creating “media, from press releases to social media messages, that shape public opinion of the company or organization and increase awareness of its brand” (Betterteam, 2023). Looking into a workday for a PR specialist, they “work classic 9-5 with frequent overtime and many work weekends” (Ferriolo, 2023). So long days and some work on the weekend is to be expected to meet deadlines and company goals. But these long hours are necessary because PR specialists are responsible to foster trust, strengthen brand awareness, and drive the achievement of strategic goals through effective communication and relationship-building.

Charting your Career Journey

The process of working in PR looks a little different for everyone. For a starting public relations specialist position only, a bachelor's degree would be necessary. A good place to start would be with a relevant bachelor's degree in fields like communications, journalism, or marketing. However, if individuals want higher up positions such as managers they may consider pursuing a master's degree. According to the US Bureau of Labor Statistics (2022) public relations

managers typically need at least a bachelor's degree, and some positions may require a master's degree. Many years of related work experience are also necessary." Networking and staying informed about PR is important as you look to put your foot in the door. According to Forbes Advisor, "PR is a skills-based field, so gaining relevant experience early in your career or while in school is essential for advancement in the field" (Reiland & Swanston2023). It's also important to consistently focus on developing strong communication and interpersonal skills because these are essential in PR careers. Individuals who often succeed in "PR must have soft skills including strong written and oral communication skills, the ability to solve problems, and the ability to think critically and creatively" (Hayes, 2023). As you embark on your PR career journey, remember that these soft skills are not just helpful, they are the building blocks that pave your way to success in this ever-evolving industry.

Pay

"The median annual wage for public relations specialists was \$67,440 in May 2022"(U.S. Bureau of Labor Statistics, 2022). Additionally, as professionals gain experience and move positions they have a chance to make more yearly. The median annual wage for public relations managers was \$129,430 in May 2022"(U.S. Bureau of Labor Statistics, 2022).

Job Outlook

The outlook for jobs in PR is looking very promising. "Employment of public relations specialists is projected to grow 6 percent from 2022 to 2032, faster than the average for all occupations. About 25,800 openings for public relations specialists are projected each year, on average, over the decade" (U.S. Bureau of Labor Statistics, 2022).

Interview with Dr. James Parham former CEO of Hiron's in Indianapolis, Indiana and current Director of Strategic Partnerships at Ball State University in Muncie, Indiana.



1. What previous experience prepared you for your career in PR?

Just about everything prepared me for a career in PR. This is a highly diversified occupation. If you have a variety of different experiences, it can make your life easier. If you understand culture for example, this may be relevant. My education experience also prepared me for the career. I have a natural resources and journalism degree. I started in communication in the natural resources field. My internships were helpful in getting an early start with learning about communications. This prepared me for my first career. Each situation gave me more insight, which really helped with crisis communication.

2. What did a typical workday look like for you?

It varied quite a bit. My last twenty years plus were in an agency, and I ran the agency for most of that time. When you are in leadership, your work day varies quite a bit. You are responsible for everything. My area of work related to crisis communication. That takes you from morning to noon to night. I often worked an eight to twelve-hour day each day. My job was filled with diverse projects. I might deal with an oil spill in the morning and a speech for the executive branch of government in the evening. A lot of my job involved writing, which consumed half my days.

3. What was your favorite part about working in PR?

The strategic challenges / problem solving. PR problems and communication is a complex science. It is not a guessing game. I love the strategic part of using research-based materials to come up with a workable and viable solution. This is my favorite part! I've enjoyed working in the crisis niche. I enjoyed helping people, especially when they were in a bad situation.

4. What were the main challenges you encounter in PR?

The lack of clarity in communication was the main challenge. This gave me a job though. The clients can also be a challenge. At times clients can have unrealistic results and the metrics may be hard to meet. Clients don't always understand what it takes to meet communication goals. Finding talented staff has become more challenging than ever. The culture shift can be a challenge.

5. What advice would you give someone who would like to get into PR as a career?

Think about a diverse major. Take a lot of subjects in high school and college and learn everything you can about life so you can be more effective in PR. You must develop strong writing skills. Computer proficiency is very important. You also need the ability to socially interact with clients and others. Not everyone has had the social exposures that they need.

6. How much impact did you have on the PR companies or organizations that you worked for in the past?

I took Hiron's from a small company to one of the largest in the state. I believe I had an impact on the organization and the people that worked for me. I also had an impact on the clients. I have had close to 5,000 students during my career which I have helped.

Conclusion

In conclusion, a career in public relations is a very rewarding position and needs individuals who excel in communications and strategic thinking. Professionals working in PR play an essential role in creating and maintaining the image of an organization.

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Impact of a STEM CTE Intervention on Student Career Interest and Course-Taking Behavior

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Introduction

Demand for highly trained healthcare workers has grown steadily (National Science Board, 2020; U.S. Bureau of Labor Statistics, 2023b). In the United States, healthcare industry employment is projected to grow by 10.8 percent between 2022 and 2032, significantly faster than the average of all other occupations (Dubina et al., 2022; U.S. Bureau of Labor Statistics, 2023a). Demand for nurse practitioners and healthcare support occupations (e.g., physical therapist assistants, home health, and personal care aides) is anticipated to be especially high, driven by an aging population and new healthcare delivery models (Dubina et al., 2022; U.S. Bureau of Labor Statistics, 2023a). Within this context, the call for a more diverse healthcare workforce is growing. Evidence accumulates that a representative healthcare workforce is important to improving healthcare access, patient satisfaction with care, and health outcomes, particularly for patients of color (Hall et al., 2015). Efforts to diversify the healthcare workforce, however, have yielded modest results (Taylor et al., 2022). The share of physicians, nurses, and nurse practitioners who are Black or Latinx continues to lag behind their share in the overall population (U.S. Bureau of Labor Statistics, 2023a).

Literature Review

A growing body of research indicates that participation in Career and Technical Education (CTE) programs, which typically involve a combination of career-oriented courses, internships,

and other work-based learning, can improve academic outcomes and workforce readiness (Jacob, 2017). Studies have found that students who take multiple CTE courses are more motivated and engaged in course content, take more and higher-level math and science courses, are more likely to earn bachelor's degrees, and are less likely to drop out of high school (Stone & Lewis, 2012; Tamim & Grant, 2013). Participation in upper-level CTE courses is associated with a nearly 2 percent wage increase for each course taken (Kreisman & Stange, 2019). The learning science literature suggests that learning in context better aligns with adolescents' attention and motivational biases for learning through exploration and apprentice-like pedagogy (Richardson et al., 2016). It helps students grasp the relevance of academic subjects, engage in the material at a deeper and more personal level, synthesize their varied in-school and out-of-school experiences, and develop informed and realistic postsecondary and career plans (Tamim & Grant, 2013).

Research on CTE courses in science, technology, engineering, and math (STEM) fields (e.g., engineering, computer science, health science) echoes the findings in the general CTE literature. Participation in STEM CTE courses has been linked to increased odds of graduation, increased odds of advancing further in traditional mathematics and sciences courses in high school, and increased odds of pursuing STEM studies in postsecondary education (Gottfried, 2019; Gottfried & Bozick, 2016; Plasman & Gottfried, 2018; Sublett & Plasman, 2017). The applied STEM literature purports that utilizing math and science skills differently from traditional STEM courses helps students gain a more thorough understanding of the material. Students can connect concepts taught across the academic STEM spectrum and see the application of these concepts in real life.

Disparate STEM CTE course participation rates, however, suggest inequities in access to courses, especially advanced CTE courses. Data show that although participation in at least one CTE course is similar for White, Black, and Latinx students (80%, 75%, and 74%, respectively), the pattern looks different for participation in multiple CTE courses (National Center for Educational Statistics, 2013). Twenty-two percent of white students, 18 percent of Black students, and 16 percent of Latinx students achieve the CTE concentrator status of three CTE courses. A study of CTE participation in Illinois found similar underrepresentation in CTE courses with a STEM focus (Hamilton et al., 2015). In the STEM CTE courses, disparities were prevalent for Black and Latinx students as well as females, whose rate of CTE participation was significantly less than their male peers (64.1% male vs. 35.9% female).

CTE courses have been identified as a promising strategy to meet the healthcare workforce demand and expand the pipeline of professionals of color (DeLuca et al., 2006). Approximately 12 million high school students—nearly three-quarters of the U.S. high school population—enroll in one or more CTE courses during high school (Advance CTE, 2022). Data show high CTE participation rates among Black, (75%) and Hispanic (74%) students. However, less than half of CTE participants go on to concentrate in a career cluster (earn at least two credits) with white students (40%) completing at higher rates than their Black (35%) and Hispanic (32%) peers (U.S. Department of Education, 2019).

Study Overview

This study examined the extent to which the Teachers and Students for Community Oriented Research and Education (TSCORE) project, a CTE intervention designed to strengthen rates of health science CTE participation, was associated with positive outcomes for students. The intervention focused on teachers and students in urban and under-resourced schools with limited access to healthcare professionals. Teacher professional development, connections with healthcare professionals, and curriculum development focusing on project-based learning were the core elements of the TSCORE project. This study looked at the impact of the intervention on students in the TSCORE classrooms and was guided by two research questions.

Research Question 1: To what extent is student participation in TSCORE classes associated with increased self-efficacy, perceptions of health science professionals, motivation and interest in pursuing health science careers?

Research Question 2: To what extent is the TSCORE project associated with increased CTE health science course-taking?

The TSCORE Project

TSCORE was developed to address the disparities in CTE course quality and access in Kansas. Teachers were given the opportunity to strengthen the quality of instruction and real-world learning opportunities in urban, under-resourced high schools through the development of an industry partnership model. Given the complexity of career development within the classroom, critical pedagogy served as a theoretical lens for evaluating the TSCORE intervention impact on students' self-efficacy, perceptions, motivation, interests, and behaviors within the realm of health science education and careers. Critical pedagogy emphasizes elements of critical awareness to students' realities, root causes of inequities, and transformative learning (Alonso Luaces et al., 2018; Freire, 1970). Application of critical pedagogy framework for TSCORE is described in depth by Alonso Luaces et al. (2018).

Two districts with existing CTE health science pathways were recruited to participate in the project. The two urban districts serve over 71,000 students, including a significant percentage of minority students (73%) and students living below poverty (77%) (Kansas State Department of Education, 2019). Although CTE courses are popular at the high school level, the number of students who complete at least two courses in the health science pathway is relatively low (49%; M. Kollman, personal communication, May 2016). The TSCORE theory of change involving critical pedagogy asserts that teachers with strong, up-to-date knowledge, connections to industry, and a deep understanding of their students' realities, deliver rigorous educational opportunities for their students. TSCORE teachers participated in a four-week summer professional development (PD) program at a local academic medical center. The main deliverable of the PD was a teacher-created unit (2-3 weeks long) to be implemented with students in the health science pathway during the academic year. The units were tied to each teacher's specific content standards, connected to local health disparities, and include expert panels, hands-on activities, and off-site educational experiences for students to engage with community partners.

TSCORE PD was developed with research around PD effectiveness in mind and thus, was content-focused, incorporates active learning, and includes ongoing coaching and expert support

(Darling-Hammond et al., 2017). During morning sessions in Week One, medical center faculty helped teachers to define and critically reflect on health disparities while providing context-specific data. In the afternoons, an instructional coach guided teachers to identify the competencies/standards for their units and to explore connections with local research. Tours of the community's health resources sparked teachers' interest in the neighborhoods surrounding the school and deepened their understanding of health issues affecting their students. The teachers met with faculty and TSCORE staff to define ideas for their units based on feedback from faculty and community partners.

Week Two dove into what researchers do. The faculty introduced teachers to current research projects and invited them to observe and participate in job-embedded contexts. Participating teachers had daily consultations with experts and participated in guided reflection led by experienced educators. In Week Three, a multifaceted team of researchers introduced teachers to methods of data collection, particularly ethnography, surveys, observation, and interviews. A consultant from the school district led hands-on pedagogical sessions on active learning, encouraging teachers to apply acquired work-based knowledge to their units. During the final week of summer PD (Week Four) teachers finished their units' content, scheduled guest speakers from their newly developed professional networks, confirmed field trip sites, and considered research mentors or topic experts for student projects. TSCORE staff provided a final review of the units before teachers returned to the classrooms.

The TSCORE model included a year-long implementation support program that offered on-site coaching, at least three hours of classroom observations, externships, and industry connections during the academic year. The TSCORE PD coordinator met with teachers at their schools as they started to implement their units. The goal of the observations was to provide on-site and on-time feedback on active learning strategies, student engagement and connections to health disparities in the local community. Moreover, as part of the T-Score professional development, TSCORE provided one-day individualized teacher externships for each teacher at the medical school campus and at different community sites (Alonso Luaces et al., 2023). The goal of the externships was to bridge classroom learning with the real world, meet with experts in the field to obtain feedback on their TSCORE-created units, and increase collaboration with University of Kansas Medical Center (KUMC) faculty.

At the end of the academic year, teachers uploaded their units to the TSCORE project website. To date, fifteen units have been shared on the website, including units on asthma, health informatics, diversity in healthcare, and healthcare advocacy.

Methods

TSCORE was implemented in 2016-2020. During the first year, staff developed and pilot-tested the professional development curriculum. The full implementation of the curriculum occurred from 2017 to 2019. Twenty teachers participated in the program. A quantitative design was employed to evaluate the outcomes of the TSCORE project. A pre-test and post-test design was used to examine self-efficacy, perceptions of health science professionals, motivation, and interest in pursuing health science careers. To assess CTE completion course-taking behavior, an interrupted time series design was employed. This approach allowed the researchers to look at

CTE participation before, during, and after the program. These two methods helped provide a more robust analysis of the program and its impact on students and the CTE system.

Participants

Participants included students from two urban school districts in Kansas enrolled in the CTE Health Science Pathway between 2016 and 2020. Surveys were sent to the entire population of health science teachers and their students for TSCORE-partnered classrooms. The pre-test and post-test analysis focused on student survey responses collected in TSCORE classrooms between 2017-2019. This sample consisted of 205 students from 6 schools with matched pre-test and post-test survey data, as outlined in Table 1. Participant characteristics were similar to the sociodemographic characteristics of students in the school districts.

Table 1. Participant Characteristics

Characteristics	%	n
Gender		
Male	25.4%	53
Female	74.2%	152
Race/Ethnicity		
Asian	10.2%	21
Black	15.1%	31
White	32.7%	67
Hispanic	49.2%	101
American Indian /Alaska Native	2.4%	5
Native Hawaiian/ Other Pacific Islander	1.5%	3
Other	2.4%	5
Primary Language		
English	74.1%	152
Spanish	19.1%	39
Other	6.8%	14

Note: The survey allowed participants to select one or more options for race/ethnicity.

Procedures

At the beginning of the school year, students in TSCORE teachers' classrooms and their parents received an information packet from the study team with information about the study's purpose, the voluntary nature of the study, and the confidentiality of the data. The teacher collected consent forms from interested parents and students.

Survey data were collected using Qualtrics (Qualtrics, Provo, UT), an online survey platform. Prior to teaching the TSCORE unit, teachers administered the pre-test survey. The post-test survey was distributed after the completion of the unit. The surveys were identical in content. Surveys were available in English and Spanish; the average completion time was 10 minutes. To capture pathway completion, the school districts provided the aggregate CTE course completion for students enrolled in the CTE health science pathway between 2016-2019.

Measures

Student Survey

The research team developed a survey instrument to measure four domains: a) self-efficacy, b) perception of health science professionals, c) interest in health science programs and careers, and d) motivation. To measure these domains, survey questions from the STEM Career Interest Questionnaire (Christensen et al., 2013) and the STEM Career Interest Survey (Kier et al., 2014) were adapted for use with students in CTE health science courses. Both reference surveys demonstrated reliability, with Cronbach's alpha scores equivalent to 0.78 and 0.76 respectively, both a respectable range according to guidelines (Christensen et al., 2013; Kier et al., 2014). All adapted survey items, which included rewording items referencing science to include health science in the survey, were placed on an agreement Likert scale. A member of our leadership team who is proficient in English and a native Spanish speaker translated all the documents from English into Spanish. The translated documents were then sent to a unit on the medical school campus that works exclusively with the Latinx community in Kansas and were reviewed by of two native Spanish speakers. Finally, back-translation by a native speaker of English fluent in Spanish was used to certify that the translations are true and accurate. Back-translation involves translating from English back to Spanish and subsequently evaluating the equivalence between the source and target versions (Chen & Boore, 2010). Copies of the Spanish and English versions of the instrument are provided in the Appendix.

District Data: CTE Completion and Graduation

School-level data were requested from the two participating districts. The data included CTE credits earned and CTE concentrator status (concentrator = 2+ CTE credits)

Data Analysis

Student Survey

Data were analyzed using STATA 15.1 (StateCorp, 2017). Students were given the option of an English or Spanish version of the survey. Approximately eight percent ($n = 27$) of the pre-test respondents utilized the Spanish version of the survey at pre-test, while only seven percent ($n = 21$) chose the Spanish version at the post-test. For pragmatic purposes and to center the neutral response at 0, the Likert scale was recoded to a numeric scale ranging from -2 (Strongly Disagree) to 2 (Strongly Agree). Pre-test and post-test responses were compared statistically using a paired-observation t-test.

District Data

Data were analyzed using EXCEL16.17 (Microsoft, 2018). A repeated measures analysis of variance was conducted to assess whether the number of health science CTE completers increased between 2016 and 2019, the years before and during TSCORE implementation.

Results

Research Question 1: To what extent is student participation in TSCORE classes associated with increased self-efficacy, perceptions of health science professionals, motivation and interest in pursuing health science careers?

Students were asked to rate their self-efficacy, perceptions of health science professionals, and interest and motivation to learn about health sciences and to pursue careers in health science fields. Table 2 provides results for the matched sample.

Table 2. Changes in Students’ STEM Self-Efficacy, Perception of Health Sciences, Interest and Motivation for Health Science Careers

ITEM		PRE-TEST MEAN	POST-TEST MEAN	MEAN DIFFERENCE
SELF-EFFICACY AND PERCEPTION OF HEALTH SCIENCES				
Health science is something I can be good at (Self-Efficacy)		0.65	0.82	0.18*
	BIPOC	0.61	0.79	0.17*
	White	0.69	0.88	0.19
Health science professionals provide important services to the community (Perceptions)		0.87	1.27	0.40**
	BIPOC	0.83	1.29	0.46**
	White	0.93	1.36	0.43*
Health sciences is a good career for minorities and women (Perceptions)		0.78	1.25	0.47**
	BIPOC	0.76	1.25	0.49**
	White	0.73	1.33	0.60**
Health science professionals do many things that I like to do (Perceptions)		0.63	0.95	0.32**
	BIPOC	0.65	0.90	0.25**
	White	0.53	1.00	0.47*
STEM INTEREST AND MOTIVATION				
I would like to become a health science professional (Interest)		0.39	0.76	0.37**
	BIPOC	0.38	0.77	0.39**
	White	0.33	0.70	0.37*
I would like to go to a college and get a degree in a health science field after high school (Interest)		0.59	0.89	0.30**
	BIPOC	0.53	0.91	0.37**

	White	0.72	0.94	0.22
I would like to take more science classes that focus on health		0.52	0.64	0.12
(Interest)	BIPOC	0.48	0.58	0.10
	White	0.58	0.71	0.13
Learning about health in my community has increased my interest in health science careers		0.57	0.70	0.13*
(Interest)	BIPOC	0.61	0.77	0.16*
	White	0.45	0.56	0.09
I am motivated to study health sciences in high school		0.55	0.72	0.16*
(Motivation)	BIPOC	0.54	0.65	0.10
	White	0.18	0.5	0.35*

Note: BIPOC represents Black, Indigenous, and people of color.

*p < .05; **p < .01

For nine out of the ten items, TSCORE students demonstrated a statistically significant increase from pre-test to post-test. In all four domains – self-efficacy, motivation, perceptions of health science careers, and interest in pursuing health science coursework/career - scores from pre-test to post-test increased. The post-test means ranged from 0.64 to 1.29, indicating overall agreement that health sciences was a field they could be good at, an attractive profession, and a career pathway of interest and motivation. We also examined the pre-test and post-test change scores for Black, Indigenous, people of color (BIPOC) and white students separately. BIPOC students demonstrated statistically significant increases in three of the four domains examined including self-efficacy, perceptions of health science professionals, and interest in pursuing programs and/or health science careers. White students demonstrated increases in all four domains. At the item level, there were some differences by race/ethnicity. For two items, “I would like to become a health science professional” and “I would like to pursue a degree in health science,” BIPOC students and not white students demonstrated statistically significant increases. For the item “I am motivated to study health science in my high school,” white students and not BIPOC students demonstrated statistically significant increases from pre-test to post-test.

Research Question 2: To what extent is the TSCORE project associated with increased CTE course-taking in STEM fields?

District data were used to evaluate the changes in CTE course-taking during the TSCORE project (Table 3). Project leaders hypothesized that increased rigor, relevance, and student interest in the CTE Health Science Pathway courses would lead to increased enrollment in courses. To address this question, data for the CTE pathway courses were collected for 2016-2019. During 2016-2017, the program was being pilot tested and not implemented in the classroom. Full implementation of TSCORE occurred in 2017-2018 and 2018-2019. Researchers anticipated that the number of CTE concentrators (students completing 2+ CTE courses) would increase during those years.

Table 3. Number of Health Science CTE Concentrators

SCHOOL	2016-2017	2017-2018	2018-2019
School A	56	90	166
BIPOC	43	70	104
White	13	20	62
School B	6	141	137
BIPOC	2	44	26
White	4	97	111
School C	17	56	61
BIPOC	14	34	37
White	3	22	24
School D	107	107	156
BIPOC	53	53	57
White	54	54	99
School E	80	93	100
School F	35	85	129
TOTAL*	301	572	749

A one-way repeated measures analysis of variance was used to evaluate if CTE course concentration increased between 2016-2017 and 2018-2019. The results of the ANOVA indicated a significant time effect, Wilk's Lambda = .202, $F(2, 4) = 7.90$, $p=.04$. Follow-up comparisons indicated that the pairwise differences between 2016-2017 and 2018-2019 and 2017-2018 and 2018-2019 years were statistically significant. We also examined CTE course concentration for BIPOC and white students in four of the schools with race and ethnicity data. For BIPOC students, the number of CTE concentrators increased from 112 students in 2016-2017 to 224 students in 2018-2019. For white students, CTE course concentrators increased from 74 students in 2016-2017 to 296 students in 2018-2019. The growth represented a 100% increase in the number of BIPOC CTE concentrators and a 300% increase in the white CTE concentrators. The repeated measures analysis of variance did not indicate a statistically significant increase for either group when analyzed separately.

Discussion

Despite ongoing efforts to diversify the healthcare workforce, low-income and minority students remain underrepresented in the healthcare industry, one of the fastest-growing segments of the 21st-century economy (National Science Board, 2020). Health science CTE programs show considerable promise for addressing this gap. Students participating in STEM CTE programs are

more likely to pursue rigorous coursework, post-secondary programs, and STEM careers (Stone & Lewis, 2012; Tamim & Grant, 2013). Moreover, students engaged in real-world learning display greater self-efficacy and motivation, earn higher grades, and demonstrate the cognitive and non-cognitive skills to be successful in the healthcare workforce (Gottfried & Bozick, 2016). High-quality CTE programs are not the norm, however, and under-resourced school districts often fall short of providing authentic learning experiences. Inexperienced teachers, outdated curricula, and weak connections to industry inhibit their ability to provide robust STEM learning for students (Brand, 2008; Bridwell-Mitchell, 2017).

The TSCORE project provides a model for transforming CTE programs in under-resourced communities. By leveraging medical school, community health, and hospital partners and empowering teachers through professional development, the program seeks to overcome traditional CTE barriers. The model is built on the belief that teachers in any community, with the right connections, resources, and training, can cultivate students' interest and pursuit of health science pathways and careers (Ramaswamy et al., 2019).

In our study, there was a statistically significant increase from pre-test to post-test in students' self-efficacy, motivation, perceptions of health science careers, and interest in pursuing health science programs and careers. The TSCORE program was intentional in connecting teachers and students to a diverse group of healthcare providers and students responded positively to this exposure. Subgroup analysis revealed that the program was particularly effective in increasing BIPOC students' interest in pursuing health science degrees and careers.

Health science pathway participation also increased during the TSCORE program. Although we were not able to track individual students, we examined school-level trends in CTE health science concentrator rates (2+ courses) and saw significant gains from the first year of program implementation. Students completing 2+ health science courses increased 59% between year 1 and year 2 and 131% between year 1 and year 3 of the program. Neither of the school districts implemented major changes to the CTE pathway programming during those years.

Limitations

The study has some limitations worth noting. The research design did not include a control group so attributing results to the program should be done cautiously. Our study found a positive change from pre-test to post-test in self-efficacy, motivation, perceptions and interest in health science, and course-taking behavior, but there may have been other factors that influenced these outcomes as well. Second, we were not able to train all health science teachers in the two school districts. Although we trained 20 teachers over four years, some health science teachers were not able to participate. This limits the generalizability of the study at the school level. Finally, we had hoped to track student course-taking behavior at the individual level but were only able to track school level participation. Our study demonstrated a marked increase in health science course-taking behavior, but we cannot attribute this solely to TSCORE student enrollment. Increases may also have been due to other factors (e.g., increased interest in health science programs, increased popularity of health science teachers, and word-of-mouth from students). Anecdotal evidence indicates that students who participated in TSCORE classes enrolled in additional health science courses. In future studies, we will examine the student-level effects using the statewide database to track participants over time.

Conclusion and Recommendations

This study demonstrates that under-resourced schools can build health science CTE pathways with appropriate support from community and industry partners. We found that students in TSCORE classrooms significantly improved self-efficacy, motivation, perceptions and interest in health science careers. Our two TSCORE school districts – both serving significant numbers of minority and low-income students – were able to increase the number of health science pathway concentrators by 131% over the course of two years. The gains were larger for white students compared to BIPOC students, a finding warranting further investigation.

Based upon our experience and research, we offer a set of four recommendations for educators and industry partners seeking to utilize the TSCORE model in their local community:

1. Identify a backbone organization that can facilitate the partnership model. In TSCORE, the local academic medical center served as the backbone organization –providing the staff to coordinate activities, mobilize resources, and ensure accountability of all involved partners. Our recommendation is to select the organization with the strongest resources, district buy-in, and network connections to convene the partnership.
2. Create an advisory committee of teachers, CTE leaders, and industry partners to guide the vision and strategy of the partnership program. Ideally, committee members are in decision-making positions so that policies and practices can be implemented quickly. We convened our advisory committee nine months before the official start of TSCORE. Our committee used this time to get to know one another, identify shared goals and strategies, discuss resources, and create an implementation plan for the first year. Funding for this project Currently, the advisory group meets regularly to ensure we are on track with our goals.
3. Assess the needs and capacity of the district’s health science CTE pathway before implementing the partnership model. CTE requirements and curricular opportunities vary by state, district, and even school. Make sure your advisory committee understands how CTE programs are implemented at the school level and what industry partnerships are already in place. Committee members should also take time to explore any barriers to enrollment and persistence in CTE programs (prerequisites, grade requirements, scheduling conflicts, transportation needs, etc.). Understanding the opportunities and barriers helped us develop sequential CTE coursework and activities available to all students.
4. In TSCORE, empowered teachers transformed their classrooms into places where students could explore and study what health science professionals really do. We learned that giving teachers the training, tools, connections, and support was fundamental to overhauling the health science CTE program. We also learned that teachers need time and support – sometimes multiple years - to make the connections and implement the desired change in their classrooms. The TSCORE model allowed teachers to progress at their own pace.

We recognize that there are several strategies to grow and diversify the STEM workforce pipeline. We believe TSCORE highlights the potential of CTE pathway programs to be a significant contributor to this effort.

APPENDIX

TSCORE STUDENT SURVEY

English Version

Q1 What is your gender? Female Male

Q2 What is your primary language? English Spanish Other

Q3 Are you Hispanic / Latino(a)? Yes No


Q4 What is your race?

American Indian / Alaska Native Asian

Black / African American White

Native Hawaiian / Pacific Islander Other (please specify): _____

Q5 Please rate your level of agreement with the following statements.

	Strongly Agree  Strongly Disagree					Not Sure
	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	
Health sciences is a good career area for both minorities and women.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Health sciences professionals provide important services to the community.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Knowing math and science is important for me to be successful in my future career.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Health sciences professionals get to do many of the things that I like to do.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Health science is something I can be good at.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I would like to become a health sciences professional.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I would like to go to a college and get a degree in a health sciences field after high school.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I am motivated to study health sciences in high school.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Learning about health in my community has increased my interest in health sciences careers.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I would like to take more science classes that focus on health.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Spanish Version

P1 ¿Cuál es su género? Femenino Masculino

P2 ¿Cual es su primer idioma? Ingles Español Otro

P3 ¿Es usted Hispano(a) / Latino(a)? Si No

P4 ¿Cual es su raza/etnicidad?

- Indio Americano / Nativo de Alaska Asiático
- Negro / Afroamericano Blanco
- Nativo Hawaiano / isleños del Pacifico Otro (por favor especifique): _____

P5 Por favor clasifique su nivel de acuerdo con los siguientes enunciados.

	Totalmente de acuerdo ←————→ Totalmente en desacuerdo					No estoy seguro/a
	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	
La ciencias de la salud es una buena área de estudios tanto para minorías como para las mujeres.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Los profesionales de las ciencias de la salud brindan servicios importantes a la comunidad.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Tener conocimientos de matemáticas y ciencias es importante para ser exitoso/a en mi carrera a futuro.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Los profesionales de la ciencias de la salud hacen muchas cosas que a mí me gusta hacer.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
La ciencias de la salud es algo en lo que yo puedo ser bueno.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Me gustaría llegar hacer un profesional de la ciencias de la salud	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Después de la preparatoria me gustaría ir a la universidad y obtener una licenciatura en el área de la ciencias de la salud.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Estoy motivado/a de estudiar la ciencias de la salud en la preparatoria.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Aprender acerca de la salud de mi comunidad ha incrementado mi interés en las carreras de ciencias de la salud.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Me gustaría llevar más clases de ciencias con un enfoque en la salud.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

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