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Examining Differences in Noncognitive Skills for State-Level Career Development and Leadership Development Event Participants

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Abstract

Educators are increasingly pressured to include experiences for students which will help develop noncognitive skills. Noncognitive skills lie outside of the physiological ability to process information and encompass adjacent concepts including soft-skills, 21st century skills, or employability skills. Grit, optimism, and self-efficacy are three noncognitive skills which overlap substantially with the three-component model for agricultural education. In agricultural education, Career and Leadership Development Events (CDE/LDE) allow students to work persistently toward a task and develop expectations for ability to perform and outcomes of the competitive event along with other actions researchers have concluded can help build noncognitive skills in adolescents. This study was designed to describe the grit, optimism, and self-efficacy of CDE & LDE competitors in Idaho and determine if differences exist between students who performed at the gold-rank level, and those who did not receive a gold ranking in their respective events. This study was a census of all students (N = 413) who competed at a CDE or LDE at the 2018 Idaho Leadership Development Conference. Results of independent samples t-tests revealed differences between both grit and self-efficacy scores of participants based on ranking and differences in self-efficacy based on event type. The conclusions drawn from this study allow us to recommend areas for continued examination related to noncognitive skills in agricultural education, and practical solutions for agricultural educators to enhance noncognitive skills in their classrooms.

Keywords: noncognitive skills, soft-skills, CDE, LDE, grit, optimism, career development events

Introduction/Review of Literature

The focus of education has changed from simply teaching content-level information for cognitive development of students to proportionate development of both cognitive and noncognitive abilities (Bazelais, et. al, 2016; McGeown, et. al, 2016; Morrison-Gutman, & Schoon, 2013). According to Sousa (2011), cognitive skills are those involved in bringing in and processing information, but they are not inclusive in their ability to predict academic success. The term noncognitive emerged in education in the last decade as a descriptor for factors outside of those dealing with a mental capacity for processing information (Brunello & Schlotter, 2011).

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Researchers entering the noncognitive investigation have examined many noncognitive related concepts. Some of the associated research terms include soft skills, 21st century skills, employability skills, big-five personality factors, growth mindset, meta-cognitive skills, and social-emotional skills (Almeida, 2016; Brunello & Schlotter, 2011; Camfield, 2015). Regardless of the term used, there is no doubt among educational researchers that noncognitive factors play a role in student academic success (Aspinwall & Taylor, 1992: Duckworth & Yeager, 2015; Farrington, et al., 2012; Khine & Areepattamannil, 2016; Rosen, et. al, 2010). Researchers have connected heightened noncognitive performance with increased GPA and standardized test scores (MacCann, et. al, 2009; Petway, et. al, 2016). Noncognitive skills were predictive of reading, science and math achievement scores, and could even mitigate differences between demographic categories, school attendance, and home environment (Rosen, et al., 2010). A comprehensive meta-analysis of hundreds of noncognitive studies allowed Rosen et al. (2010) to highlight the influence of noncognitive skills on graduation rates, honor roll status, science fair achievements, reading comprehension, math fluency, and AP course enrollment. Students who successfully develop noncognitive traits in their education are more prepared to be successful intellectually, socially and economically in society (Brunello & Schlotter, 2011). In a 2006 study, Heckman, Stixrud, and Urzua (2006) examined the longitudinal impacts of heightened noncognitive skills on overall life decision factors. Results indicated positive associations between higher noncognitive scores and successful employment, job satisfaction, and lifetime earnings, and a negative association with diagnosed health issues. In many cases, noncognitive factors were more predictive than cognitive ability for overall quality of life (Heckman et al., 2006).

The volumes of evidence to support the integration of noncognitive education in public schools has fundamentally shifted the way teachers are expected to interact with their students (Camfield, 2015; Farrington, et al., 2012: Rosen, et al., 2010). The focus in the late 1990s on developing noncognitive skills in the educational arena led into the 21st century skills movement with school programs designed to help K-12 students develop positive noncognitive skills (Rosen, et al., 2010). The continuation of noncognitive educational initiatives is currently expressed through nationwide efforts to help students develop a growth mindset, and continued efforts to bring noncognitive skills into the mainstream classroom (Camfield, 2015; Petway, et al., 2016).

Farrington et al. (2012) described five classes of skills and attributes related to success and noncognitive performance. These traits include academic mindsets, perseverance, behaviors, learning strategies, and social skills. Concepts related to the five categories can be found in almost all noncognitive education literature (Khine & Areepattamannil, 2016; Rosen, et al., 2010). Mindsets are overarching beliefs with the potential to influence outlooks on education, study behaviors, and personal success (Farrington, et al., 2012). Two prime examples of noncognitive skills relating directly to the outlined academic mindsets are optimism and self-efficacy (Farrington, et al., 2012), while perseverance in academic settings relates to student motivation to persist in a task despite obstacles or challenges (Farrington, et al., 2012).

Optimism is a noncognitive skill with the potential to influence academic performance and is defined as the positive outlook towards future (Scheier & Carver, 1985). As a personal disposition, optimism refers to belief that one will generally experience positive outcome in life (Scheier & Carver, 1985). Optimism has been studied extensively in the field of education and noted as an overarching theme to guide student perceptions of all educational activities including assignments, grades, outcomes, and can have a large influence in the amount of time and effort students are willing to put into completing their school work (Beard, et. al, 2010). In adolescents, researchers share demographic differences between genders, with females having higher optimism scores than males (Tetzner & Becker, 2019).

Self-efficacy is another noncognitive skill with influences on academic performance. Bandura (1982) defined self-efficacy as the innate ability to achieve goals, and the related personal assessment of the skills required to achieve goals. Pajares (2009) examined self-efficacy in the academic arena, noting self-efficacy as a concept with overwhelming potential to influence academic success. Differences in self-efficacy have been reported between genders for adolescent populations, with the gender more stereotypically successful by societal norms having the advantage in most situations (Hampton & Mason, 2003; Zimmermen, 2000). For example, in science and math arenas, adolescent males have higher self-efficacy than females, which many researchers attribute to societal norms perpetuating males as more successful in these areas (Zimmerman, 2000).

Researchers support the use of grit as a tool to measure academic perseverance (Farrington, et al., 2012). Grit has been defined as "perseverance and passion of an individual to achieve a goal" (Duckworth, et. al, 2007, p. 1087). In recent years, grit studies allowed researchers to highlight the importance of grit as an important noncognitive skill related to academic success (Crede, et. al, 2017). Angela Duckworth conceptualized grit as a concept which could explain success in the face of challenges noting that grit may be more predictive of success than cognitive ability (Duckworth & Quinn, 2009; Duckworth & Robertson-Kraft, 2014). Although there is evidence that grit increases as respondents age, gender differences are not common in either adolescent or adult populations (Duckworth & Quinn, 2009). Critics of Duckworth note that grit, as conceptualized by Duckworth and her team may not be inclusive of all factors which relate to resiliency (Golden, 2017; Kwon, 2018). Our intent in this study was not to use grit as a comparable term for resilience, rather to incorporate concepts of passion and perseverance into the broader noncognitive skill conversation.

The literature related to developing noncognitive skills including grit, optimism, and self-efficacy in adolescents (Bandura, 1982: Duckworth & Yeager, 2015; Scheier & Carver, 1985) bares strong similarity to the literature related to perceived benefits of student growth within school-based agricultural education (SBAE) (Croom, 2008). To grow positive noncognitive skills, researchers suggest allowing students to encounter practical problems, develop situational solutions, engage regularly with the guidance of a caring mentor, and experience authentic assessments of work (Farrington, et al., 2012; Khine & Areepattamannil, 2016). In addition, researchers note that in order to facilitate noncognitive growth, students should be presented with authentic opportunities to overcome failure and work toward prolonged goals (Khine & Areepattamannil, 2016).

The overlap in agricultural education program components and potential implications for noncognitive growth are profound. Leadership or Career Development Events (LDEs/CDEs) in agricultural education are activities which can be interwoven into class time and allow students to work over time toward individual or team success in events designed to assess content or leadership knowledge and tangible skills (Croom, 2008). Students and teachers can spend a great deal of time in and out of the classroom preparing for CDEs, and increased time practicing relates to higher levels of team and individual performance (Ball, et. al, 2016; Rayfield, et. al, 2009). CDEs and LDEs, when incorporated into a total agricultural education programs provide opportunities for students to work with a caring mentor, fail positively with opportunities for additional learning, and work persistently toward a task (Croom, 2008).

Although there may be numerous opportunities for students to enhance their noncognitive skills in an agricultural education program, little is known about the overlap between noncognitive factors and SBAE. Examining the role of noncognitive skills in CDE/LDE participants, who through their preparation have experienced components related to developing noncognitive skills, could provide a starting point to begin the discussion about opportunities that exist for development of noncognitive skills within SBAE.

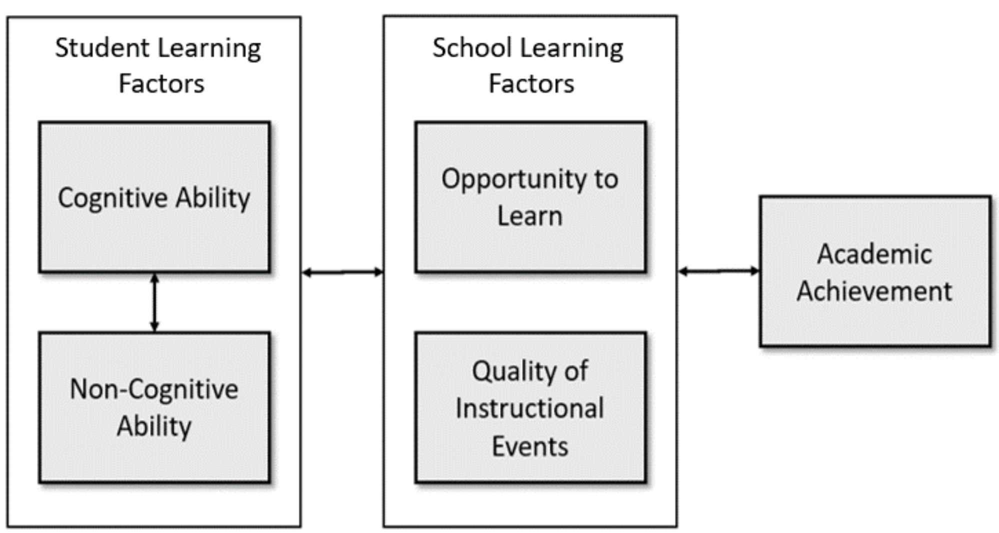
Theoretical/Conceptual Framework

The theoretical base for this study stems from existing models of school success and academic achievement. Carroll (1963) proposed that academic success can be achieved based on both school and student learning factors. According to Carroll (1963), student natural ability to learn (aptitude) is filtered through the student factors of ability to understand instruction and perseverance and school factors including opportunity to learn and quality of instruction to determine the output of academic achievement. Benjamin Bloom's work in taxonomy of learning led him to publish a subsequent model for school learning in 1976. The model included student characteristics of cognitive behaviors and affective behaviors as student input factors and quality of instruction as the school input factor to yield student level of achievement, rate of learning, and affective outcomes (Bloom, 1976).

The conceptual framework for this study draws from Bloom (1976) to describe student factors for learning including cognitive ability, reclassifying Bloom's "affective behaviors" as noncognitive factors based on the recommendation of Farrington, et al. (2012). In addition to student factors, school factors including opportunity to learn and quality of instructional events is included. Academic performance is noted as the outcome of the interaction between student learning factors and school learning factors (Figure 1).

Figure 1

Conceptual model of cognitive and noncognitive factors affecting learning.



Note. Adapted from Bloom (1976)

Purpose & Objectives

Building upon the framework for this study provided a unique opportunity to examine the role of noncognitive factors in student performance within school-based agricultural education (SBAE). The purpose of this exploratory study was to examine the noncognitive traits of state-level CDE and LDE participants and to examine associations between noncognitive factors and performance. To meet this purpose, we were guided by the following research objectives:

1. Describe the noncognitive skills of Idaho CDE and LDE participants (self-efficacy, grit, optimism)
2. Describe noncognitive skills between demographic categories (gender, grade, CDE/LDE)
3. Examine differences in noncognitive skills (self-efficacy, grit, optimism) between participants competing in CDEs and those competing in LDEs.
4. Examine differences in noncognitive skills (self-efficacy, grit, optimism) between participants receiving higher (gold) ratings in their respective event and those not receiving gold ratings.

Methods

This portion of a larger study was conducted through descriptive survey methods to gather self-reported noncognitive scores, along with use of performance data collected from the Idaho FFA. The population for this study was a census of students ($N = 413$) who participated in LDE or CDEs at the Idaho FFA State Leadership Conference in April 2018. University of Idaho IRB approval was obtained prior to this study, and students were required to provide parental consent, which was collected in conjunction with student registration for the event. All event participants ($N = 413$) completed the parental consent process. The on-site orientation for each event included a University of Idaho research team member who provided information about the study, collected student assent forms, and administered the survey instrument. Following registration and orientation, 92.9% of participants ($n = 382$) completed consent, assent, and survey instruments and were included in the analysis. A limitation of this study is the use of a specialized population. We caution against the generalization of the findings from this study to other populations, as this census is not representative of all SBAE students.

Instrumentation

Participants in this portion of a larger study completed a paper survey instrument prior to competing. The questionnaire included four sections. Section one allowed participants to provide demographic information including name, gender, age, year at school and FFA chapter. Section two was the short form of Duckworth's (2015) grit scale which included 10 Likert-type response items, on a scale from 1-5, where 5 was the highest level of agreement. The third section related to optimism was a modified version of the 10-item life orientation test (LOT-R). Scheier, Carver, and Bridges (1994) designed the LOT-R to allow respondents to rate levels of agreement with statements on a scale from 1-5. We followed the recommendation of Bandura (1986) in fourth section to measure self-efficacy. Bandura (1986) posited that self-efficacy is situational and recommended self-reported self-efficacy instruments be both situational and inclusive of a tangible outcome. The self-efficacy section of the instrument allowed participants to rate how confident they were situationally related to the outcome of their event and rate their efficacy on a scale from 1-10, with ten being completely confident they would perform better than other competitors.

The instrument was examined by three faculty members in agricultural education with experience in both mentoring students for CDEs and LDEs and coordinating state-level

CDE/LDE events to determine readability and content validity. The instrument was also piloted to a group of undergraduate students *n* = 12 enrolled in a research methods course. Students provided feedback related to formatting and semantics which resulted in minor changes to three items to increase clarity. Previously reported estimates of reliability for included instruments in adolescent populations were α = 0.82 for the grit scale (Duckworth & Quinn, 2009) and α = 0.88 for the LOT-R (Scheier, et al., 1994). A post hoc analysis of reliability for this population yielded α = 0.72 for grit and α = 0.87 for optimism.

Data Collection

Data were collected at the event orientation for each of the CDE and LDE events for the pre-event survey. Participants were incentivized with candy for those who completed consent, assent, and survey instruments.

There are ten state-level events held at the Idaho FFA Leadership Conference. These events include both Career Development Events and Leadership Development Events. Some of the events require qualification at the district/area level, while others are open to one team per FFA chapter. A description of the student events included in this study along with participant numbers is included in Table 1.

Table 1

Descriptions for 2018 Idaho CDE/LDE Events (n =382)

Event	*n*	Event Type	Eligibility
Agricultural Issues Forum	45	CDE	One team per chapter
Agricultural Sales & Service	38	CDE	District winning team advances (4)
Creed Speaking	10	LDE	District winner advances (1)
Employment Skills	10	LDE	District winner advances (1)
Extemporaneous Public Speaking	10	LDE	District winner advances (1)
Farm Business Management	40	CDE	District winning team advances (4)
Floriculture	107	CDE	One team per chapter
Nursery/Landscape	53	CDE	One team per chapter
Parliamentary Procedure	60	LDE	District winning team advances (6)
Prepared Public Speaking	10	LDE	District winner advances (1)

Gold-ranked individuals include the top three scoring individuals for individual events and the members of the top three placing teams for team events. Gold rankings also extend to any participants placing in the top five individuals in team events regardless of their team's ranking. Within the population were *n* = 11 participants who competed in more than one event. These students were identified prior to data collection and asked to complete the entire survey instrument at their first orientation, and only the self-efficacy section at a second orientation. Students were duplicated in data analysis for grit and optimism and had event specific self-efficacy scores recorded. Analysis revealed inclusion or exclusion of the *n* = 11 duplicate cases had negligible impact on results for all analyses, and duplicate cases were included.

Data Analysis

Responses were manually entered in an MS Excel workbook. At random, 10% of instruments were selected and used to validate data entry. Descriptive results were calculated using IBM

SPSS v 23 to describe the frequencies and percentages for demographic information and the mean and standard deviation for grit, optimism, and self-efficacy scores. To compare differences between gender, event type, and event ranking, Pearson Chi Square was calculated for each combination of variables. Data were analyzed using independent samples *t* test to determine if differences existed between interest area (type of event performance, rating level) based on grit, optimism and self-efficacy scores. An independent samples *t* test is the appropriate tool to use when examining differences between dichotomous categorical or ordinal dependent variables and a continuous independent variable (Lakens, 2013). The level of significance for *t* tests was determined *a priori* at $p \leq 0.05$.

Subject Characteristics

The ages of participants were $M = 16.38$ ($SD = 1.17$) with an age range of 13 to 18 years old. Upon further analysis, 91.9% ($n = 332$) of participants were between 15 to 18 years old. The bulk of participants were juniors ($n = 128$, 33.5%) or seniors ($n = 111$, 29.1%). Only two participants were noted at the junior high level. The descriptive analysis of gender yielded 32.4 % ($n = 117$) male and 66.8% ($n = 241$) female respondents, and $n = 3$ respondents preferred to not answer the question regarding gender classification. With regard to event participation and accomplishment, $n = 130$ participants received gold rankings, while $n = 253$ participants failed to reach the gold level ranking in their respective event. Subject characteristics are included in Table 2.

Table 2

Subject Characteristics for Idaho CDE/LDE Participants (n = 382)

Characteristic	*f*	%	Min	Max	*M*	*SD*
Age			13	18	16.38	1.17
Grade						
7th	1	0.3				
8th	1	0.3				
9th	55	14.4				
10th	86	22.5				
11th	128	33.5				
12th	111	29.1				
Gender						
Male	117	32.4				
Female	241	66.8				
Prefer not to say	3	0.8				
Event Type						
CDE	238	62.3				
LDE	144	37.7				
Event Ranking						
Gold	130	34.0				
Non-Gold	252	66.0				

Results

Our first objective was to describe the noncognitive scores of students participating in 2018 Idaho FFA CDE and LDE participants. Participant grit scores ranged from 1.8 to 4.9 on a five-point scale, with a mean of $M = 3.66$ ($SD = 0.51$). Optimism scores for participants ranged from 0.0 to 5.0 with a mean of *M* = 3.44 (*SD* = 0.71). Self-efficacy scores ranged from 1 to 10 with a scores of *M* = 6.18 (*SD* = 1.51) on a ten-point scale. Noncognitive scores for participants are shown in Table 3.

Table 3

Noncognitive Scores for 2018 Idaho CDE/LDE Competitors (n =382)

Noncognitive Category	Min	Max	*M*	*SD*
Grit	1.8	4.9	3.66	0.51
Optimism	0.0	5.0	3.44	0.71
Self- Efficacy	1.0	10.0	6.18	1.51

Note. Grit and optimism scores reported on a 1 – 5 scale, self-efficacy on a 1 – 10 scale

Descriptive results of noncognitive skills related to demographic and event were examined prior to exploring differences between scores related to performance rank. An examination of demographic and event factors related to noncognitive skills is shown in Table 4.

Table 4

Noncognitive Scores for 2018 Idaho CDE/LDE Competitors Based on Event and Demographic Characteristics (n = 382)

	Grit		Optimism		Self-Efficacy	
Characteristics	*M*	*SD*	*M*	*SD*	*M*	*SD*
Gender						
Male	3.62	0.46	3.36	0.67	6.43	2.53
Female	3.69	0.53	3.49	0.70	6.05	2.49
Prefer not to say	3.59	0.47	3.14	0.70	7.00	2.70
Grade						
9th	3.60	0.58	3.42	0.72	5.78	2.67
10th	3.58	0.51	3.46	0.61	6.05	2.64
11th	3.69	0.51	3.50	0.63	6.37	2.41
12th	3.73	0.47	3.42	0.70	6.26	2.44
Event Type						
CDE	3.66	0.46	3.38	0.65	5.46	2.42
LDE	3.69	0.58	3.56	0.70	7.36	2.51
Event						
Agricultural Issues Forum	3.71	0.50	3.44	0.57	7.10	2.04
Agricultural Sales & Service	3.88	0.54	3.48	0.85	7.15	2.52
Creed Speaking	4.00	0.49	3.90	0.49	8.40	1.54
Employment Skills	4.43	0.25	3.92	0.82	8.50	0.91
Extemporaneous Public Speaking	3.90	0.58	3.25	0.89	7.45	2.19
Farm Business Management	3.61	0.37	3.25	0.59	4.51	2.13
Floriculture	3.62	0.48	3.40	0.58	5.10	2.36
Nursery/Landscape	3.62	0.40	3.41	0.69	5.87	2.13
Parliamentary Procedure	3.51	0.58	3.42	0.69	7.12	2.44
Prepared Public Speaking	3.48	0.59	4.13	0.51	7.63	2.14

Note. Grit and optimism scores reported on a 1 – 5 scale, self-efficacy reported on a 1 – 10 scale. Single respondents for both 7th and 8th grade were not included in reporting.

Differences in noncognitive scores were examined for gender using independent samples *t* tests. No differences existed in this population based on male or female grouping for grit ($t(379) = -1.11$, $p = 0.26$), optimism ($t(379) = -1.73$, $p = 0.24$), or self-efficacy ($t(379) = 1.39$, $p = 0.16$). Differences between gender and performance type were examined using a Pearson Chi-square analysis. The low number of respondents ($n = 3$) reporting "prefer not to answer" related to gender resulted in their exclusion from difference testing with regard to gender. Results indicated no difference between male and female participants with regard to performance rank ($\chi^2(1, N = 379) = 0.02$, $p = 0.88$) Differences were also examined between event type (CDE or LDE) and performance, no differences were observed ($\chi^2(1, N = 382) = 2.87$, $p = 0.09$).

We next examined differences between noncognitive scores for those competing in the events categorized as Career Development Events (Agricultural Issues Forum, Agricultural Sales & Service, Farm Business Management, Floriculture, Nursery/Landscape) and those competing in events categorized as Leadership Development Events (Creed Speaking, Employability Skills, Extemporaneous Public Speaking, Parliamentary Procedure). The descriptive data for noncognitive scores differentiated by CDE/LDE group is shown in Table 5.

Table 5

Noncognitive Scores for 2018 Idaho CDE/LDE Competitors Based on Event Type (n =382)

		Grit		Optimism		Self-Efficacy	
Event Type	*n*	*M*	*SD*	*M*	*SD*	*M*	*SD*
CDE	238	3.66	0.46	3.38	0.65	5.46	2.42
LDE	144	3.69	0.58	3.56	0.70	7.36	2.51

Note. Grit and optimism scores reported on a 1 – 5 scale, self-efficacy reported on a 1 – 10 scale

Results of an independent samples t test resulted in no significant differences found between type of event for either grit ($t(381) = -0.54$, $p = 0.59$) or optimism($t(381) = -1.15$, $p = 0.16$). Differences were noted for event self-efficacy based on event type, with LDE participants having significantly higher ($t(381) = -7.760$, $p = 0.02$) event self-efficacy than those competing in CDEs.

To examine differences between gold-ranked and non gold-ranked participants based on noncognitive scores, we first examined the means for both groups relative to each of the noncognitive factors of interest. Descriptive results of noncognitive scores based on performance factor are included in Table 6.

Table 6

Noncognitive Scores for 2018 Idaho CDE/LDE Competitors Based on Ranking (n =382)

		Grit		Optimism		Self-Efficacy	
Ranking Level	*n*	*M*	*SD*	*M*	*SD*	*M*	*SD*
Gold-Ranked	130	3.74	0.51	3.51	0.68	7.54	1.95
Non Gold-Ranked	252	3.62	0.51	3.40	0.67	5.48	2.01

Note. Grit and optimism scores reported on a 1 – 5 scale, self-efficacy reported on a 1 – 10 scale

To determine if differences in noncognitive skills were observed between gold and non-gold ranked participants, a *t* test was conducted to compare gold and non-gold groups for each of the noncognitive factors. Results of the *t* test revealed differences in performance rank for both grit and self-efficacy while revealing no differences between performance ranks based on optimism score. Participants who received a gold rank had higher grit scores than those not receiving a gold ranking ($t(381) = 2.11$, $p = 0.03$). Gold-ranked students also exhibited higher self-efficacy scores than non-gold ranked students ($t(381) = 8.22$, $p = 0.01$). The calculated effect sizes using Cohen's *d* were small for grit and medium for self-efficacy (Lakens, 2013).

Table 6

t Test for Noncognitive Factors and Event Ranking

Independent Variable	*t*	*df*	Sig.	Mean difference	*SE* difference	Cohen's *d*
Grit	2.11	381	0.03	0.12	0.05	0.24
Optimism	1.63	381	0.10	0.13	0.08	0.11
Self-Efficacy	8.22	381	0.01	2.07	0.25	0.54

Note. Grit and optimism scores reported on a 1 – 5 scale, self-efficacy reported on a 1 – 10 scale

Conclusions & Discussion

This study provided a snapshot view of noncognitive skills in secondary agricultural education students who participated in state-level LDEs/ CDEs. Results allow us to establish baseline data for noncognitive skills in state-level participants, examine differences in noncognitive traits based on demographic factors, and discuss differences in noncognitive skills between levels of CDE and LDE performance. Based on these conclusions, we can also make recommendations for the integration of noncognitive skill development within agricultural education programs and suggest areas for continued examination of the role of noncognitive factors within SBAE.

Descriptive data analysis in the population for noncognitive skills revealed grit mean at $M = 3.66$ ($SD = 0.51$). According to Duckworth et al. (2007), the average normative grit scores for adolescents is 3.4 on a scale from 1 to 5 (Duckworth, et al., 2007). The participants in this study had self-reported scores above the adolescent average. Students participating in CDEs and LDEs, especially those which require qualification at the district/area level have likely encountered obstacles on their preparatory path (Rayfield, et al., 2009). According to Duckworth and Yeager (2015), adolescents with increased grit are more likely to seek opportunities for challenging their knowledge and skills. In agricultural education, CDE and LDE experiences may therefore attract students who already have the ability to overcome challenges. In this population there were no differences between grit scores for males and females, which aligns with the conclusions of Duckworth and Quinn (2009). Students who received gold-rankings had higher levels of grit than those with lower rankings. While we are cognizant of the low effect size and cautious in our interpretation of these differences, this conclusion allows us to suggest continued examination of grit and the development of grit in agricultural education programs. Many of the activities related with preparing for CDE and LDE events align with recommendations for building grit and academic perseverance in adolescents (Farrington, et al., 2012; Khine & Areepattamannil, 2016; Lambert, Ball, & Tummons, 2011; Rayfield, et al., 2009).

Respondent optimism scores were $M = 3.44$ ($SD = 0.71$). Across competitive events, previously reported optimism on the LOT-R for adolescents is 3.7 on a five-point scale. Rosen et al. (2010) noted the importance of optimism as a noncognitive factor, but caution that optimism is often tempered in higher stakes environments and may decrease in adolescents when situations increase in pressure or prestige. There is a possibility that student pressure for state-level events influenced the outcomes expected by participants. Optimism scores were not different between males and females or event type. Scheier and Carver (1994) suggest stable situational optimism across event participants could be indicative of students relying on self-efficacy rather than optimism to set outcome expectations.

Self-efficacy in this population was $M = 6.18$, $SD = 1.51$, with a wide range of scores between different events, which is to be expected for students who have prepared for a state-level competition (Rosen, et al., 2010). In analyzing optimism and self-efficacy for this study, it is interesting to note that Duckworth, et al. (2007) suggested experiences in which adolescents have strong beliefs in their own ability (self-efficacy) but do not expect overly high outcomes (optimism) are particularly effective in helping students develop grit. In these cases, if the outcome is positive, students may increase their overall perception of self and be motivated to pursue more challenging activities in the future; if they fail, adolescents have the opportunity to build grit through a reflection on their abilities and performance and the development of a plan for improvement and overcoming the failure (Duckworth, et al., 2007).

Differences were observed between self-efficacy scores for students competing in CDEs and those competing in LDEs. The nature of events at the Idaho FFA Leadership conference provides some insight into this finding. All LDE participants qualified to compete at the state-level event, while most CDE participants could enter at-large. Prior success is a key factor in building adolescent self-efficacy (Rosen, et al., 2010), which could account for increased LDE participant self-efficacy. Gold-ranked students had higher self-efficacy than their non-gold ranked competitors, which substantiates previous research indicating a strong relationship between increased self-efficacy and increased performance (Rosen, et al., 2010). No differences were observed between male and female participants for self-efficacy. Rosen, et al. (2010) cited gender equality in self-efficacy as a factor to determine if gender stereotypes exist related to the examined event. It is therefore promising that neither male nor females emerged as more efficacious with regard to this investigation.

Overall, participants in this study demonstrated their competency related to solving practical problems with tangible solutions through the CDE and LDE process. By treating CDE and LDE performance as an assessment of student success, we determined that differences did exist between student performance categories based on noncognitive factors, substantiating much of the previous literature related to noncognitive skills in adolescents. With this study coming to an end, we have evidentiary support for continued examination of the role of noncognitive factors in the total agricultural education program.

Recommendations

This exploratory examination of noncognitive skills in agricultural education allow us to make several practical recommendations for agricultural educators interested in heightening the noncognitive skills of students in their programs, along with promising directions for continued examination of noncognitive factors in SBAE.

We have several recommendations for developing noncognitive skills in students through SBAE. The design of the three-component model for agricultural education allows for a natural expansion of classroom content into individualized exploration through Supervised Agricultural Experiences (SAEs) and into authentic, real-world assessments of skills through CDE and LDE events (Croom, 2008). We recommend a holistic approach to integrating noncognitive skills into SBAE. Much of the noncognitive development potential in agricultural education occurs in the places where the three-components of an agricultural education program interact.

Classroom instruction may include the opportunity for students to encounter practical problems, the opportunity for true extension into noncognitive skill development occurs when students participate in a CDE or LDE as the assessment for the content learned in class. Reports of time spent by agricultural educators indicate much of CDE and LDE preparation happens outside of regular class time (Lambert, et al., 2011; Rayfield, et al., 2009). Jones and Edwards (2019) suggested revisiting the purpose of competition in agricultural education, we agree. When only a handful of students are provided the opportunity to prepare for CDE and LDE events, the bulk of students are robbed of the critical noncognitive development that could stem from purposeful use of these educational tools. We recommend teacher educators highlight the importance of CDE and LDE participation as educational tools embedded within curriculum and integrated in instruction to help increase not only content knowledge, but also noncognitive skills.

Another component of facilitating noncognitive growth is the opportunity to overcome failure and work toward prolonged goals (Khine & Areepattamannil, 2016). We recommend allowing students opportunities to experience CDE and LDE components in the classroom while working toward a local, district/area, or state-level competition. Competitive events can provide tangible situations for students to anticipate outcomes and weigh skills (Khine & Areepattamannil, 2016). Our recommendation is to expose as many students as possible to assessment of skills within a CDE/LDE environment. Agricultural educators could set up and allow students to participate in invitational events if district or area events limit the number of participants, or create chapter events which are held within class time, using the same evaluation procedures or outside evaluators to increase the authenticity of assessment and likelihood of increasing noncognitive skills (Farrington, et al., 2012; Khine & Areepattamannil, 2016).

Our recommendations for future research include a continued examination of noncognitive factors within a total agricultural education program. General data related to noncognitive factors of secondary agricultural education students is not prevalent in the literature base. We recommend replicating the study with broader agricultural education populations, to determine baseline scores for noncognitive skills in SBAE students. We also recommend tracking noncognitive skills of SBAE students longitudinally to observe if changes exist in students from time of entry to completing the program. Another recommendation is comparing noncognitive factors between post-secondary students based on past SBAE enrollment and participation levels to determine if differences exist between those with strong participation in SBAE and those with little or no SBAE background. There are numerous other noncognitive skills which warrant investigation through an agricultural education lens. We recommend identifying noncognitive factors which align to the AAAE national research agenda, and pursuit of studies to examine noncognitive factors as predictor variables for student academic performance, participation in programs, and taking on leadership roles within agricultural education.

There is more to a student than their cognitive ability, and there is more to agricultural education than a classroom. This study allowed us to scratch the surface relative to examining noncognitive factors in agricultural education and yielded promising results. By purposefully integrating noncognitive skills in the existing agricultural education model, we may have the potential to not only enhance student performance in school, but also to enhance their ability to be productive members of our communities and our world.

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