

ENGAGEMENT, ACADEMIC ACHIEVEMENT, AND GRIT AS COMPONENTS OF
COLLEGE FRESHMAN SUCCESS

by

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ABSTRACT

The purpose of this study was to examine the association between freshman first semester retention and intelligence, involvement, and the non-cognitive construct of grit. There was also interest in illustrating these relationships in freshmen students enrolled in the West Texas A&M University Department of Agricultural Sciences.

The best known predictors of student retention are academic performance and grades (Burton & Ramist, 2001). However, with these variables yielding low and moderate correlations, the contribution of non-cognitive factors have been considered (Chang, 2014). Specifically, grit has been touted as a potential tool for predicting student success (Credé et al., 2017). Grit measures passion and perseverance over long terms goals (Duckworth et al., 2007).

The target population was the 2018/2019 freshman cohort, with a specific interest in capturing agricultural science majors. Data for the grit and involvement portions of this study was collected via a survey instrument, administered both online and in person. Duckworth's (2007) 12 question grit scale determined grit and academic information was obtained through the institution. The study yielded 342 qualifying responses. Responses indicated grit and involvement were not significantly associated with retention between the first and second semester. ACT scores were significantly correlated with retention ($r = .178, p < .01$). Grit expressed a positive, significant correlation to both high school GPA and first semester GPA.

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“When my heart is overwhelmed, lead me to the rock that is higher than I.”
- Psalm 61:2

If asked to sum up my graduate experience in a word, I would say, “overwhelmed.” Over the past year and half, I have been overwhelmed with busyness, research, and growing up. I have also been overwhelmed with love, friendship, encouragement, laughter, peace, opportunity, growth, and, more than anything, with grace. I am so incredibly thankful for the place and people who have made this the most rewarding experience of my life thus far.

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CHAPTER I

INTRODUCTION

In 2018, nearly 1,200 students enrolled at West Texas A&M University to start as first-time, full-time freshmen. However, past trends show almost a third of these students will likely not persist into their second year. This raises questions and concerns as to why incoming students seem unprepared to succeed in the first, and most pivotal, year of the college pathway. This problem is not unique to this institution, as hundreds of thousands of first-year college students will depart nationally between the first and second year (National Center for Education Statistics, 2018).

College admissions standards are meant to help colleges and universities determine the ability and likelihood of applicants to successfully complete a program of study (Evans, 2015). These standards often include college aptitude test scores (ACT/SAT), high school GPA, and class rank; all of these are believed to be strong indicators of intelligence or cognitive constructs. Yet, intelligence tests alone are not strongly correlated in determining a student's likelihood to persist, let alone complete, tertiary school programs, despite obvious cognitive ability (Burton & Ramist, 2001).

Although a greater number of students are enrolling in higher education than ever before, the number of college graduates is not increasing at the same rate (Chang, 2014). It was not until the 1970s that sustained growth in higher education began to plateau and

taper off (Hossler & Bean, 1990). In 2013, the United States Department of Education, National Center for Education Statistics, and the Integrated Postsecondary Education Data System reported the degree completion rate within six years of initial enrollment at a four-year institution was approximately 55% in 1996. This figure only marginally increased to 59% in 2005. A college degree can improve the quality of life for individuals and society, but students are not persisting through graduation despite these perceived benefits (Akos & Kretchmar, 2017).

Over the years, a number of non-cognitive constructs have emerged as potential explanations for the variance in student success. These constructs range from measuring social skills, to determination, to perseverance, to several other personality traits that are less focused on intelligence and academics. Research by Duckworth (2007) on *grit* has touted this trait as a more accurate way to predict a person's success in the pursuit of long-term goals (e.g., the completion of a college degree) and supporting research has suggested it as a potential tool in academia. Duckworth's research on this concept, which pairs both the level and the consistency of an individual's interest in a goal, is not necessarily new. The Merriam-Webster Dictionary defines grit as strength of character in response to seemingly insurmountable challenges. Other educators, psychologists, and researchers in the past have posited the importance of such determination in personal achievement (Cox, 1926; Duckworth et al., 2007; Galton, 1892; Goldberg, 1990; Terman & Oden, 1947).

In terms of defining and measuring this personality construct of grit as a potential ingredient to predicting academic success, grit is a relatively novel concept (Credé, Tynan, & Harms, 2017). Wecshler (1940) in addition to RB Cattell and Butcher (1968)

recommended researchers seriously consider non-cognitive ability when assessing potential for success. This research asserted the independent study of either non-cognitive or cognitive individual differences, to the exclusion of the other, would be impoverished (Duckworth et al., 2007). While the study of individual traits might illustrate a person's specific strengths, these limit the ability to holistically illustrate why a person might be successful. According to Howe (1999) there are simply too many factors, like perseverance, outside of intelligence alone that might contribute to, or moderate, an individual's predisposition for success.

Cognitive ability in college-bound students is well defined and measured through the use of high stakes admissions testing, such as the ACT or SAT; however, non-cognitive ability is not measured or ranked on a standardized scale (Duckworth et al., 2007). Duckworth's 2007 study reviewed literature dating back over 100 years concerning the practice of using traits that may be hard to define, but might be worth considering when attempting to inventory a person's holistic abilities. Duckworth asserted many soft-skills may hold more value in some professions over others. This indicated the need for a measure that is independent of intelligence, vocation, gender, and other demographic factors. Decades of research have developed personality inventories that attempt to measure these non-cognitive traits, such as Lufi and Cohen's Perseverance Scale (1987), Vallerund et al.'s Passion Scale (2007), and the Conscientiousness facet of the Big Five model (Goldberg, 1990). However, Duckworth (2007) asserted the Grit Scale as unique in what it measures and in its ability to be relatively unaffected by gender, background, vocation, and age. The results indicated grit was able to predict academic performance better than intelligence (Duckworth et al., 2007).

Institutions are ultimately held responsible for increasing the retention and graduation rates in the students enrolled (Burton & Ramist, 2001). Retention applies to student departure from an institutional standpoint and has become a major focus of attrition research when universities attempt to address the issue (Chang, 2014). Although retention is a universal concern in higher education for institutions with open enrollment policies, retention rates are relatively lower than those of private and highly selective universities (First-Year Persistence and Retention Rates, 2016). According to Tinto and Cullen (1973), offering robust academic support in the form of free group and individual tutoring, as well as other academic resources, can help with the academic challenges of the freshman experience. Bolstering the campus community with outreach programs, student organizations, and other similar entities on campus also impact a student's dropout decision (Astin, 1984; Braxton et al., 1997; Kuh et al., 2010; Tinto, 1975).

This increased push for involvement has been coined as “student engagement,” and its value in growing the human capital of college students has been recognized by those in higher education. Students develop meaningful connection and belonging to the university through both academic and social support (Astin, 1984). Focused efforts of institutions to provide appropriate academic supports and purposeful involvement opportunities are most effective in the first year, impacting retention and subsequent graduation rates (Tinto & Cullen, 1973). However, this research clearly states academic rigor alone does not account for the wide variance of student success. Both cognitive and non-cognitive factors must be utilized in order for these students to successfully reach graduation.

In the realm of student retention, the grit construct might be particularly appealing as a way to intervene in the dropout decision. Although intelligence, as measured by admission criteria, might indicate ability to understand rigorous academic coursework, it does not adequately account for overall college success. Involvement, too, only paints a part of the picture. Mainstream grit literature suggests this non-cognitive construct could prove to be a contributing predictor of success among groups of cognitively similar students (Duckworth et al., 2007).

Statement of the Problem

West Texas A&M University is an open enrollment institution, and retention rates are a concern in providing students with the success they enroll to gain. It is believed if a student meets admissions criteria they have the ability to be successful. However, the National Center for Education Statistics (2018) showed the 2017/2018 reported first year retention rate for the West Texas A&M University was 65%. In 2018, the reported national retention rate was 71% (National Center for Education Statistics, 2018). With this disparity, a need arises for increased retention efforts, which benefit both the institution and its students. This study sought to use research concerning intelligence, involvement, and the non-cognitive trait of grit to determine where resources might be dedicated effectively.

The Department of Agricultural Sciences at West Texas A&M University strives to make important connections with incoming agricultural science students through faculty/peer interactions, student organizations, service learning opportunities, and with required freshman seminar/leadership courses (Gammill, 2016). These provide real and

meaningful opportunities for the department to implement change. However, the specific areas of focus must first be identified.

Purpose and Questions

The purpose of this study was to determine which measured factors had the strongest association with student retention in the first semester. Within the 2018/2019 cohort, there was also interest in illustrating the retention relationships in students enrolled in the Department of Agricultural Sciences. Specific research questions for this study include:

- 1) What grit scores were expressed by students in this study?
- 2) Were students involved on campus? If so, at what level did the student commit to purposeful involvement activities?
- 3) Were students employed? If so, how many hours did students spend working in the week?
- 4) How did students perform on college readiness exams?
- 5) How did students perform academically in the first semester?
- 6) How many students departed from the university, and what were the characteristics of this group?
- 7) What relationships exist between the identified variables of grit, intelligence, involvement, and retention?

Definition of Terms

In order to help the reader better understand the context and applications of this study, the following terms must first be defined and understood.

Grit – a personality construct measuring an individual’s passion and perseverance for long-term goals.

Non-cognitive ability – aptitude in areas that relate to an individual’s personality, temperament, and attitude.

Retention – the ability of an institution to keep/maintain student enrollment from term to term.

Involvement – the act of participating and engaging in purposeful educational activities.

Intelligence – the cognitive ability of an individual.

Department of Agricultural Sciences – a department within the College of Agriculture and Natural Sciences at West Texas A&M University, whose focus is teaching and researching areas related to the agricultural industry.

Student Success – completion of a program and high academic performance, particularly in regards to course grades received.

GPA – Grade Point Average, a calculation used to determine overall academic performance.

Freshman – a student enrolled for the first time as a full-time college student post-high school.

Departure – used to describe a student’s choice to leave an institution, but not necessarily their decision to persist.

Attrition – generally understood in workforce reduction, refers here to the reduction of students enrolled, which are irreplaceable in regards to their cohort; often used synonymously with departure.

Open enrollment – an institutional policy that allows for on-demand enrollment of students irrespective of individual qualifications.

Limitations

The limitations of this study remain consistent with those of all self-reported responses; the accuracy of the information provided can only be assumed, not wholly guaranteed. Several studies have examined the actual reliability of self-reported data (Baird, 1976; Berdie, 1971; Filson, 2013). Baird's 1976 study discussed the value of self-reported data in predicting student success. This review indicated inconsistencies might arise when the participant does not understand the question or is unsure of the information they are asked to provide (Baird, 1976). However, Baird's (1976) study found students were still relatively willing to provide accurate information to sensitive questions.

The grit questionnaire's transparency also makes it susceptible to social desirability bias. Duckworth (2007) noted concern with social desirability bias, in educated populations especially, stating there is a strong chance that "the observed association between grit and age is a consequence of cohort effect" (p. 1092).

Additionally, self-reported data may be subject to the halo effect, which explains the phenomenon of respondents inflating certain features of behavior or performance. Despite this, Pike's 1999 study reported while this may impact individually reported educational outcomes, its constant effect across all categories makes it a consistent, and therefore inconsequential, distortion of data.

Another limitation is the generally perceived tendencies of college freshman in terms of engagement and academic performance. The first semester may be critical to

student success (Astin, 1984; Levitz & Noel, 1989; Tinto & Cullen, 1973). However, this is not always indicative of students' performance patterns for the rest of their college careers. One study at Brigham Young University found upper division classes had a significantly higher GPA than lower division classes (Thompson, 2015). Additionally, Astin's (1984) theory of involvement implies many college freshman may have shallow, but varied involvement and atypical academic performance in the first semester as they settle into life as a college student. However, by students' sophomore year, level of involvement may be more limited and focused, and grades may level out. A study over student involvement in the College of Agriculture and Life Sciences at a large university in the Southwest reported the highest level of involvement and engagement occurred during the student's sophomore year (Hegedus & Knight, 2002). Simply put, looking at a single semester's performance, particularly the first semester when individuals are still adjusting, may not be generalized enough to be indicative of students' ability to succeed.

A final limitation is the short time scope this study is conducted over. The study measures the characteristics and retention of incoming freshmen students in the first semester. A longer study might moderate academic performance and involvement, providing more accurate and generalized information on the true character of the cohort. Additionally, the effect of grit would be best measured in tracking the cohort to graduation, as it is built to predict long-term success more accurately.

Assumptions

In this study, the researchers assumed all self-reported information was given accurately. It was also assumed survey participants understood the verbiage, vocabulary, and content of the questionnaire. Additionally, literature regarding first-semester

retention and intervention supports the assumption that measuring retention and academic performance between the first and second semester holds value to institutional efforts. The assumption that students also started college with the earnest intent to obtain a degree is held to support the facet of grit regarding the attainment of long-term goals. With varying opinions and verdicts on the significant difference between grit and other psychological variables, such as conscientiousness, it must also be assumed that grit is able to uniquely define a personality construct that other personality inventories cannot.

Significance of Study

The implications of this information can change how West Texas A&M University and the Department of Agricultural Sciences assist students in retention and college completion. Understanding the needs of each cohort is critical for a university's ability to retain students and support them in achieving academic goals. If a grit score can consistently identify the students who are more likely to struggle with success, the institution has a chance to intervene by providing that individual with tools to help build grittiness along with intellectual rigor. Credé, Tynan, and Harms (2017) admitted when criticizing the grit construct that intervention efforts on even small to moderate effect sizes toward student success can have large and valuable positive impacts. This meta-analysis presented the example that if grit intervention was able to increase the retention rate in college by even a single percentage point, it could potentially benefit thousands of college students (Credé et al., 2017). Such a benefit would be substantial if the variable in question, in this case grit, reflected information about individuals that was distinct from the information reflected from other well-known predictors of performance and retention.

On the same token, pedagogy can shift in the classroom itself in order to teach students the skills needed to achieve success in the academic realm. Students in higher education change generationally. It is the responsibility of the institution to foster the human capital it is entrusted with and reinvest it into society for posterity. Duckworth and other grit researchers suggest each successive generation of Americans, for social and cultural reasons, has grown up less gritty than the one before as a result of cohort effect (Twenge, Zhang, & Im, 2004 as cited by Duckworth et al., 2007). Therefore, being able to accurately predict what motivates each generation of students to become high achievers is the best way to ensure the skills needed for success are being effectively transferred.

While this study is intended to provide a picture of the cognitive and non-cognitive predispositions of the 2018/2019 freshman class at West Texas A&M University, it can also be useful in developing intervention efforts in subsequent cohorts. This information has the potential to shape not only the Department of Agricultural Sciences' and the university's retention efforts, but can provide information to similar colleges and universities nationwide that are seeking to improve freshmen retention. Information collected and analyzed herein can provide a wider knowledge base to institutions that are considering using non-cognitive supports in addressing retention, involvement, and overall student success.

CHAPTER II

REVIEW OF LITERATURE

Overview

The previous chapter introduced the topic of retention and potential predictors of this institutional goal in relation to this study. The following chapter will discuss relevant research regarding this national, institutional, and individual concern. Insight towards non-cognitive factors, such as grit, is provided, along with intelligence and involvement research as related to retention research. Additionally, intelligence, involvement, and grit, specifically in agricultural science students, will be reviewed.

Current State of Retention Predictors

As access to higher education increases, there is valid concern that graduation rates have not been increasing at nearly the same rate (Chang, 2014). Data shows a 37% increase in enrollment in degree-granting post-secondary institutions in the past decade. However, several national databases reported the degree completion rate within six years of initial enrollment at a four-year institution was approximately 55% in 1996 (Chang, 2014). This only raised marginally to 59% in 2005. It was not until the 1970s that sustained growth in higher education began to plateau and taper off (Chang, 2014; Hossler & Bean, 1990). Completing a college degree benefits both the individual and society, yet, as data shows, students are starting college, but not persisting through graduation (Akos & Kretchmar, 2017). Higher education institutions have shifted their

focus from the recruitment of students to include efforts that retain students (Chang, 2014). Tinto (1975; 1988; 2012a), Braxton (1997), and Astin (1984) posit these purposeful retention and persistence efforts are best focused on the student's first year in college. Nonetheless, the National Center for the Education Statistics reported the national average for graduation rate was 59% for public institutions (2016). The retention rate in the same year was 81% for all institutions, and 62% for public institutions with open enrollment policies. Due to the general assumption that admissions standards should adequately indicate the ability to succeed, institutions began to consider measuring the effect of non-cognitive factors, such as grit, on retention, and how to harness these for student achievement (Credé et al., 2017).

Retention and Academic Success in Higher Education

College persistence is defined as a student's likelihood to continue from the first to the second year of college (First-Year Persistence and Retention Rates, 2016). This definition includes retention, which is the number of students who continue into the second year at the same institution. It is important to note that while persistence is measured from the student perspective, retention is assessed from the institution's perspective (Chang, 2014). The national average for persistence is 73.4% and retention is 61.1% (First-Year Persistence and Retention Rates, 2016).

Tinto's Model of Student Departure

Following Tinto's 1973 study on student retention and success, college attrition was more effectively defined and the understanding of student motivation was measurably grounded in data. Tinto (1973; 1975) developed the Model of Student Departure, which stands as a primary foundation for retention and persistence research.

Relevant to this study was Tinto's research on goal commitment, which is synonymous with grit in this context. According to this research, "once the individual's ability is taken into account, it is the person's commitment to the goal of college completion which is most influential in determining college persistence" (Tinto & Cullen, 1973, p. 51).

Ultimately, it is how the person feels toward the college experience that really matters in terms of persistence and retention. This includes both academic integration, which is best measured by grade performance, and social integration (Chang, 2014; Tinto, 1975).

Tinto's model consists of three main constructs within the theoretical framework applied here. Separation is when the student leaves their previous environment, such as their hometown, family, and social group, which can be a stressful event for students (Tinto, 1988).

Transition is defined here as passage between past and present as students learn to adjust to the new social norms and behaviors in order to assimilate into the new campus community. Tinto justified that while most individuals are equipped to handle this transition, some may still drop out in this stage, regardless of academic and social integration. Tinto described how some students will "stick it out" even under the situations of extreme stress, while others may depart despite relatively low-stress levels (1988). It is the student's response to stress factors, such as separation and transition, which affect the person's decision to depart. Chang (2014) summarized "some students have the necessary skills to work hard and figure out the transition to others, whereas other students do not put forth the effort necessary to adjust" to the college experience (p. 12). Chang suggests this is where grit fits best in Tinto's model.

The third stage of Tinto's student departure model is incorporation. This is the goal of the institution, as it indicates the student is connected with the campus community and has developed the ability to perform adequately in academic areas.

This model is based on Durkheim's (1961, as cited by Tinto, 1975) sociological concept of suicide, where suicide is more likely to occur when individuals are inadequately integrated into society. The academic parallel here gives students two outcomes as a result of integration into the campus community, to persist or to depart. According to Tinto's (1975) research, student academic integration is best measured by both course grades and intellectual development during college. Students who are not integrated into both the social and academic structures of higher education, at least to a certain degree, are more likely to exhibit dropout behavior, which is characterized by a longitudinal process of interactions (Tinto, 1975). Chang (2014) putting it plainly stated "students' experiences with the institution affects their goals and institutional commitment, which leads to persistence or dropout" (pg. 10).

From an academic integration standpoint, Tinto (1975) suggested college dropout is more related to academic grade performance than intellectual development. However, the validity of this claim is challenged by Braxton et al.'s 1997 study (Chang, 2014).

Student experiences during the first year of college greatly shape subsequent persistence, both academically and socially (Chang, 2014). The first year is when dropouts are the highest and institutional interventions are most effective (Chang, 2014; Tinto & Cullen, 1973; Tinto, 1975). This opens an equally short, but critical gap where students should receive higher levels of monitoring and support. Ultimately, institutional efforts are best focused on monitoring commitment levels in students. Levels of academic

and social integration can modify a student's commitments; a strong commitment to the goal of persisting through graduation and a low commitment to the institution can lead to drop out, and vice versa (Chang, 2014; Tinto & Cullen, 1973). Figure 1 illustrates the dropout decision posited by Tinto in 1975.

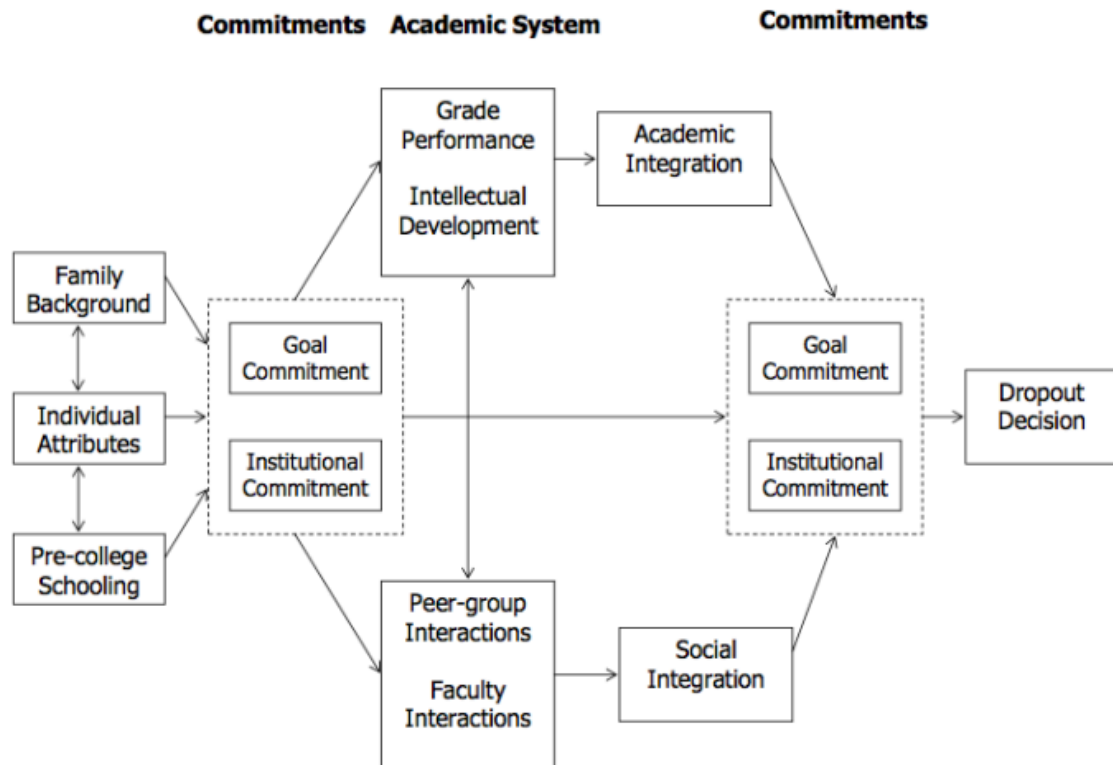


Figure 1 A Conceptual Schema of Dropout from College (Tinto & Cullen, 1975)

In 2012, Tinto expanded on previous research to include more toward the institution's role in student retention. This framework over institutional action lists four conditions for student success. The first condition is high expectations. High expectations are both what the student expects from themselves and what they perceive the institution to expect out of them. Clear, consistent communication of these standards are key to student success (Chang, 2014).

The second condition is support. This can include academic, social, and financial support (Tinto, 2012a). Tinto stated “at no time is support, especially academic support, more important than during the critical first year of college, when student success is... still very responsive to institutional intervention” (p. 7). High expectations without the tools for success cannot be made a reality; it is critical for institutions to provide the appropriate support for the expectations they hold students to.

The third component is assessment and feedback. Institutions should use appropriate and timely opportunities to determine student performance in order for the institution to adjust to the needs of students. Tinto (2012a) emphasized this as especially important within the first year as students are adjusting.

It should be noted there are factors that affect students which the institution does not have control over. These factors are known as external impacts. The effects of these on the attrition decision can also be measured, but are more difficult to generalize. While the external event might not directly impact the interaction between the student and the institution, it does impact the students’ commitment to educational goals (Chang, 2014; Tinto, 1975).

Braxton et al. Modifications

Braxton et al. (1997) presented 13 modifications to Tinto’s theory, particularly as researchers questioned the empirical internal consistency of the Model of Student Departure. Proposition 8, that academic integration is positively associated with goal commitment, and 9, that greater social commitment is related to institutional commitment, hold particular importance for this study. Braxton et al. (1997) asserts the validity of Tinto’s model relies on these two having strong empirical support. However,

in regards to Proposition 8, academic integration only received moderate empirical support, challenging the validity of one of Tinto's foundational constructs (Braxton et al. 1997). Therefore, the commitment of higher education institutions to solely utilize this measure to predict success, and support retention efforts, becomes a concern (Chang, 2014).

Theories of Involvement in Relation to Retention

Astin (1984) and Kuh, Kinzie, Schuh, and Whit (2010) focused research efforts outside of academic integration and instead emphasized the importance of involvement in its relationship with student retention. These are outlined further in Chapter Two and the positive relationship between involvement and retention is discussed in more detail.

Traditional Measurements of Intelligence

Intelligence, as measured by college readiness exams, has been generally accepted as the best indicator of potential for academic performance (Akos & Kretchmar, 2017). Many studies have used admission test scores to quantify cognitive ability for several reasons (Credé et al., 2017). This is primarily due to the increased validity of intelligence tests administered in high stakes settings. According to Duckworth et al. (2011), low participation and low motivation in cognitive ability tests administered in research settings have significantly lower validity. Additional research indicated the best known variables to predict student persistence through graduation is academic performance and grades (Burton & Ramist, 2001; Credé et al., 2017; Duckworth et al., 2011; Komarraju et al., 2013). These variables can be broken into several different indicators (ACT, SAT, High School GPA), which are commonly used in college admission requirements (Komarraju, et al., 2013). However, with college admissions standards being based

almost solely off measurements that are traditionally thought of as intelligence tests, relatively low persistence and retention rates can become problematic (Burton & Ramist, 2001; Credé et al., 2017; Komarraju et al., 2013). Theoretically, accepted applicants should have the cognitive ability to succeed in college, and yet many do not (Evans, 2015). Still, educational professionals use this factor to determine an individual's predisposition to succeed in the first year of postsecondary education.

Burton and Ramist reviewed literature regarding the SAT and high-school GPA, from the 1980s until the publication of their research in 2001 to determine the predictive validity of these two common admissions standards. Results showed "SAT scores and high school records predict academic performance, non-academic accomplishments, leadership in college, and post-college income," (Burton & Ramist, 2001, p. 1). However, it should be noted the correlation between the combined high school record and SAT (or converted ACT) score, and eventual graduation, was not quite moderately correlated. It can be assumed, then, that students with higher entrance exam scores, like the SAT or ACT, are not necessarily better prepared for college (Komarraju et al., 2013). Still, the researcher can confidently use these college readiness exams to accurately describe individual intelligence, due to the increased performance motivation as a result of the gravity these have on future endeavors (Duckworth et al., 2011).

While college readiness exams combined with GPA provide the most accurate prediction of first-year academic success in a most retention studies, GPA is the best standalone predictor of success (Chang, 2014; Duckworth et al., 2007; Dyer, Breja, Wittler, & Haase, 2002; Garton, Ball, & Dyer, 2000; Kuh et al., 2010). Meriac (2015) suggested GPA demonstrates more than outright intelligence, which is solely what

aptitude tests measure. It can be assumed that hard work and perseverance are required to maintain and achieve high cumulative marks in high school. While this variable has a high predictive validity consistently across literature, it is important to note that Duckworth only asserted that grit predicts success above and beyond talent, or natural intelligence, not necessarily just GPA. Academic performance as measured by GPA is logically correlated to grit in many cases because it also reflects student follow-through. Duckworth (2007) found grit and GPA were positively correlated, unlike the orthogonal relationship found between IQ and grit.

Intelligence in Agriculture Specifically

Several studies have been conducted to measure retention in students declaring agriculture majors. According to Garton, Dyer, & Ball (2000) the current criteria for college admissions has little value in predicting the retention rate for students of agriculture. The only variable between ACT, high school class rank, and high school GPA that could significantly and substantially predict a student's likelihood to be retained was GPA (Garton et al., 2000). While the predictive validity of these factors remains similar to studies that are not exclusive to students of agriculture, the actual measured intellect of these students does differ from non-agriculture major selections. According to the 2014 SAT Report, Agricultural Science majors ranked in the bottom 30% of all majors in terms of combined total SAT scores.

Involvement and Engagement

The term "student engagement" is conventionally defined as students' involvement in practices that positively affect academics, whether inside or outside of the classroom (Kuh, Cruce, Shoup, Kinzie, & Gonyear, 2008). Research conducted in recent

decades has shown a positive correlation between involvement and academic success. This has led to many institutions bolstering the social aspect of the campus community. The clubs, organizations, and social programs that have been augmented as result of this push have created the university culture that is known today.

Astin's Student Involvement Theory

Astin's (1984) study evaluated how several inputs were impacted by the collegiate environment in order to produce certain non-cognitive and cognitive outcomes. In terms of measuring the impact of learning experiences outside of the classroom, Astin's Theory of Student Involvement becomes a psychological and behavioral foundation. Astin (1984) defined involvement as "the amount of physical and psychological energy that the student devotes to the academic experience" (Astin, 1984, p. 297). The theory works off of the following assumptions:

1. Involvement is invested energy.
2. Involvement is a continuous sequence of varied levels over time.
3. Involvement has both qualitative and quantitative aspects.
4. The amount of learning is parallel to both the quality and quantity of time invested.
5. The success of any institutional effort is directly related to its capacity to increase involvement.

As a student increases time spent outside of the classroom in activities that intensify campus involvement, individuals will benefit academically as well (Astin, 1984). This is a limited observation, however, as time is a finite resource. The student may also dedicate time to friends, family, jobs, and other activities that limit involvement

and time toward individual studies. Astin (1984) emphasized involvement is both the institution's *and* the student's responsibility; activities must be purposeful and students must choose to participate. Astin viewed retention and success as outcomes that are a result of a series of inputs affected by the student's environment. These inputs include gender, high school GPA, ethnicity, and other factors. The inputs are then put through the higher education environment and should be theoretically transformed into desirable psychological, behavioral, affective, and cognitive outcomes, as seen in Figure 2.1 (Astin, 1984).

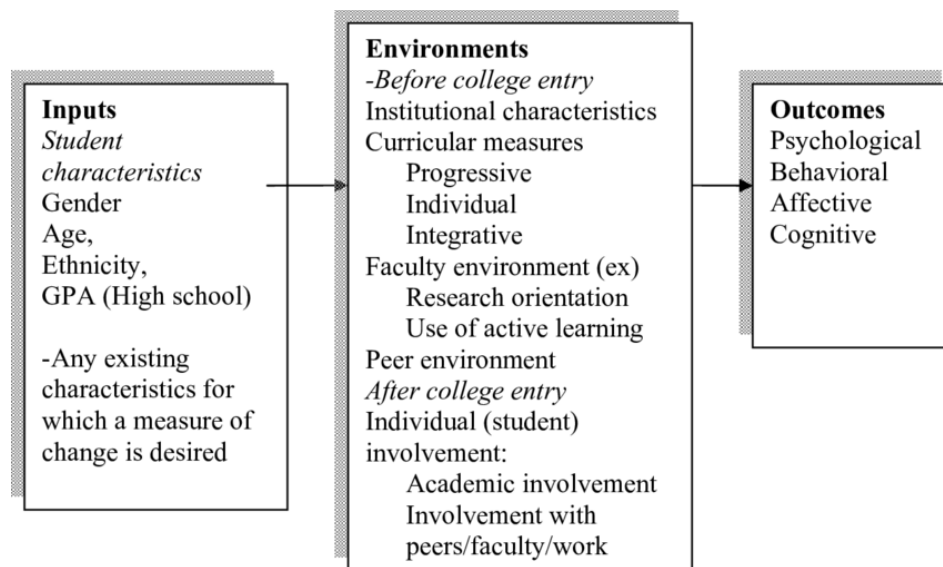


Figure 2 *Astin's Theory of Involvement: Inputs-Environments-Outcomes Model*
(Astin, 1984)

Kuh et al.'s Expansion on Involvement

Kuh et al. (2010) expanded on Astin's theory of student involvement, honing in on student engagement and its effects on student success. This theory focused on five educational actions the institution can take that might positively influence retention rates (Kuh et al., 2010):

1. Academic Challenge
2. Active and Collaborative Learning
3. Student-Faculty Interactions
4. Enriching Educational Experiences
5. Supportive Campus Environments

According to this research, student engagement consists of two fundamental constructs that affect success (Kuh et al., 2008; Kuh et al., 2010). First is the amount of time and energy a student puts towards academic and other educationally geared pursuits. Second is regarding the level and distribution of resources the institution provides to the student. This might include experiential learning opportunities, academic supports, and other purposeful activities. The partnership for student success in this model relies on both student engagement and institutional outreach (Kuh et al., 2010).

Student Involvement in Agricultural Majors

Involvement outside of the classroom helps fulfill many aspects of Kuh et al.'s (2008; 2010) and Astin's (1984) theories regarding student engagement. According to a 2002 census of undergraduate student involvement in the College of Agricultural and Life Sciences at a university in the Southwestern United States, extracurricular activities contributed to engagement in the learning process, as students connected with faculty, networked with peers, and strengthened leadership and communication skills (Hegedus & Knight). This same study affirmed extracurricular involvement is a valuable part of the college experience. The survey of undergraduate students found 66% of the sample agreed organizations helped them strengthen their leadership skills and that students who were involved were more likely to have a high GPA. Additionally, agriculture related

majors reported high participation rates (80% or higher) for all majors except Agricultural Resources and Economics (Hegedus & Knight, 2002). While it is important to note this participation is often reliant on the institution's emphasis, provision, and culture of involvement, another study reported the best predictor of completion of a degree in agriculture was high school extra-curricular involvement in programs such as 4-H and FFA (Dyer et al., 2002).

Chang (2014) explored the potential relationship between grit and involvement, positing a student's aptitude for the successful pursuit of challenges dictates their engagement and consequent academic performance. If one were to assume grittier students are more integrated into campus life, then these individuals will also be more likely to persist (Chang, 2014). In short, the research concluded a student's grit might affect individual participation in the student-institutional partnership necessary for successful retention efforts.

Grit

Grit, as a trait, is not a new concept. In the context to which it is applied here, it is defined as a "firmness of mind or spirit; unyielding courage in face of danger or hardship" (Grit, n.d.). However, it was suggested this trait could be the common denominator amongst successful individuals (Duckworth et al., 2007). Duckworth (2007) used research conducted by Wechsler (1940) and Cattell and Butcher (1968) to defend the decision to seriously consider non-cognitive ability in assessing potential for success. These individuals asserted the independent study of either non-cognitive or cognitive individual differences, to the exclusion of the other, would be diminished (Duckworth et al., 2007). Simply put, each may accurately describe separate abilities, but can rarely

holistically illustrate the individual's predisposition for successful endeavors. While cognitive ability is well defined and measured, non-cognitive ability is not so distinct. Duckworth identified several pieces of literature that defined a non-cognitive trait that might attribute to an individual's success. "In addition to cognitive ability, a list of attributes of high-achieving individuals would likely include creativity, vigor, emotional intelligence, charisma, self-confidence, emotional stability, physical attractiveness, and other positive qualities. A priori, some traits seem more crucial than others for particular vocations" (Duckworth et al., 2007, p. 1087).

Therefore, isolating a measure which can be applied across intelligence, vocation, and other demographic factors becomes the goal. Duckworth et al. (2007) identified grit and its synonyms as the common denominator through surveying experts in diverse fields. The idea that grit is essential for high achievement evolved during interviews with professionals in various fields, where grit (or a synonym) was cited as much as talent. Grit, which Duckworth (2007) defined as perseverance and passion over long-term goals differs from other personality traits that have been previously identified. By comparing previously accepted psychological measures, such as the Big Five Personality factor conscientiousness, Duckworth posited a new trait separate and unique from the rest, primarily because of its criteria of "focused effort and interest over time" (p. 1089). "Grit, more than self-control or conscientiousness, may set apart the exceptional individuals who made maximal use of their abilities" (Duckworth et al., 2007, p. 1089). Grit entails working strenuously toward challenges, maintaining effort and interest despite failure, adversity, and plateaus in progress.

Grit is measured on a 12-question Likert scale that was validated in six studies by Duckworth's (2007) publication for its reliability in predicting an individual's success. This instrument uses self-reported ratings on several questions over consistency of interests and perseverance of efforts to develop a "grit score" (Duckworth et al., 2007). The development of this instrument needed to fulfill four criteria:

1. Evidence of psychometric soundness,
2. Face validity for adolescents and adults pursuing goals in a variety of domains (e.g. not just work and school)
3. Low likelihood of ceiling effects in high achieving populations
4. A precise fit with the construct of grit.

Duckworth (2007) used a common factorial analysis to determine the efficacy of each question in meeting these requirements and a Multiple Regression to determine the results and accuracy. The final 12-item questionnaire measured the two subscales as positively correlated. The individual factors, and scale as a whole, demonstrated a high internal consistency. Results showed grit is related to performance, especially academic performance. For the purpose of this study, special interest was paid to Study Three in Duckworth's 2007 research because of its pertinence to academic performance. Study Three in Duckworth's experiment predicted the GPA's of undergraduate students at the University of Pennsylvania, where gritty students outperformed less gritty peers in obtaining higher GPAs. This relationship was shown to be stronger when SAT scores were held constant. SAT's were related to GPA as well, but interestingly, lower SAT scores were associated with higher grit scores. This indicated that among elite students, gritty individuals might be less intelligent. Duckworth (2007) suggested "... among

relatively intelligent individuals, those who are less bright than their peers compensate by working harder and with more determination” (p. 1093). This is supported across grit research, as grit scores are empirically orthogonal to intelligence, as measured by college readiness exams (Credé et al., 2017).

In a 2017 study measuring non-cognitive predictors of success, Akos and Kretchmar found gender, SAT scores, race, and the perseverance subscale score of grit measured by Grit-S (the short grit scale) were found to be significant in predicting first-year GPA. The data obtained was from first year students at a private, highly selective institution and was analyzed using Hierarchical Multiple Regression analysis. However, Duckworth et al. (2007) opt to use the full grit scale rather than the perseverance subscale alone. “In most cases, the two together were more predictive than either alone” (Duckworth et al., 2007, p. 1091). In developing the instrument, both subscales are needed to fit the psychometric requirements of the measurement, considering that the Perseverance Scale developed by Lufi and Cohen (1987) was not face valid for adults (as cited by Duckworth et al., 2007).

Similarly, the Tenacity Scale by Baum and Locke (2004) was not face valid in youth populations (as cited by Duckworth et al., 2007). Other synonymous scales, such as Lynn and Cassidy’s (1989) need for achievement questionnaire and Hollenbeck, Williams, and Klein’s (1989) goal commitment scale did not perfectly fit the psychometric requirements that Duckworth et al. (2007) were looking for. In the field of academia, grit could explain the between-person differences in people of similar intelligence levels with success disparities (Credé et al., 2017; Duckworth et al., 2011). It could be theoretically assumed this is because higher-achieving individuals are less

distracted by short-term goals and are less likely to abandon long-term goals when facing challenges and setbacks that often occur in higher education.

Grit Construct Criticisms and Limitations

With the widespread attention that grit has received in the academic community, Credé, Tynan, & Harms (2017) advocate using caution when relying on the validity of grit, as results have been inconsistent. A meta-analysis of current grit research, published in 2017 in the *Journal of Personality and Psychology*, offers criticisms regarding everything from the construct itself to conflicting statistical reporting. The study analyzed dozens of published and unpublished grit studies, yielding 73 total studies that represented 88 unique samples and 66,807 individuals (Credé et al., 2017). This analysis focused on five core theoretical features of grit research:

1. The proposed hierarchical structure of grit;
2. The relation of grit with performance;
3. The distinction of grit from conscientiousness;
4. The distinction of grit and cognitive ability;
5. Lack of group differences in grit;

Grit was able to empirically predict the success as well as most cognitive traits, although not necessarily as well as some other non-cognitive traits that were analyzed. Concern was voiced over the fit index of grit and its subscales, citing the significant, but relatively low Comparative Fit score reported in Duckworth's 2007 study. It was posited that grit as a higher-order trait was exaggerated due to this poor fit and the higher predictive validity of the perseverance subscale in many cases (Credé et al., 2017). Credé, Tynan, & Harms found while many inconsistencies exist throughout the diverse usage of

Duckworth's grit scale, in the context of retention and academic achievement, there is still value in using grit intervention to positively impact students. The association between grit and retention in this study shows a strong tendency, if not a significant relationship (Credé et al., 2017).

In Chang's 2014 study and in Bazelaïs, Lemay, & Doleck's 2016 study, grit was not found to be a significant predictor of success in college freshman. It was assumed this was primarily due to the low predictive validity of grit in younger populations and the likelihood that unstable interests in first year students made the benefits of focused interests unapparent to these individuals (Bazelaïs et al., 2016). However, in measuring grit in younger populations, one can refer to Duckworth's (2007) study on spelling bee participants. Duckworth determined participants with more grit, at the very least, worked harder and longer than less gritty peers, which resulted in better performance at the National Spelling Bee contest. This indicated that even if grit is less directly correlated with ultimate achievement, it may contribute to an individual's drive to take necessary actions to be successful. This is displayed in Figure 3.

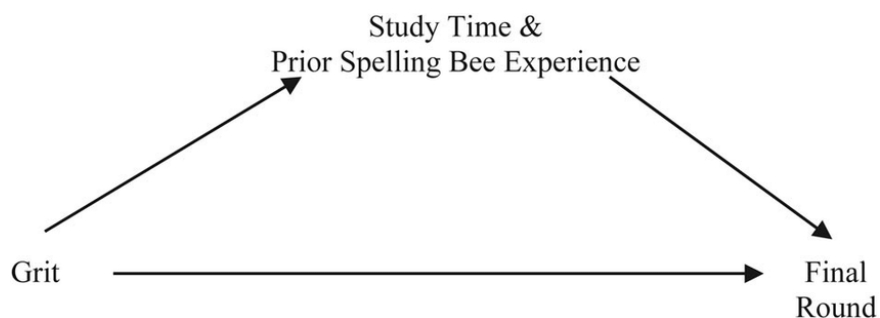


Figure 3 *Grit as a Mediator in Spelling Bee Performance (Duckworth et al., 2007)*

Duckworth (2007) admitted limitations to the grit instrument as well, listing four major concerns. Firstly, as with all self-reported questionnaires, there is always concern

as to the honesty and validity of the measurable responses. It is possible when evaluating one's ability to stay focused on goals, overcome setbacks, etc., personal accomplishments were particularly salient and therefore spuriously inflated grit scores (Duckworth et al., 2007). Specifically, this refers to social desirability bias, which causes respondents to rank themselves somewhat above or below their actual performance due to the social expectations of the peer group a person is surrounded by. In Duckworth's (2007) initial research, there is a possibility that in Study One, self-reporting caused positive associations to be the consequence of social desirability bias.

Secondly, the retrospective nature of the instrument's questions illicit complaints about grit masquerading as a measure of consistency of behavior over time. A term used in the Credé, Tynan, & Harm's (2017) meta-analysis was "old wine in new bottles," meaning the proposed concept is not new at all. This is further evaluated in following sections. Thirdly, studies three through six had sample populations that possessed a clear IQ range that can be criticized as misrepresentative of the general population and skewing the significance of this concept. In a more generalized representation of the population, grit may have a lower relative impact on success.

Lastly, current research does not show how grit relates to other variables known to predict achievement, like self-efficacy, optimism, locus of control, etc. However, over the last decade, several studies have been conducted to eliminate the weight of this limitation, as discussed in Credé, Tynan, & Harm's (2017) meta-analysis. It is suggested, however, the grit definition is similar to the self-discipline facet proposed by Costa and McCrae (1992), which is defined as the capacity to begin tasks and follow through to

completion despite boredom or distractions. It should be noted this definition still misses the passion trait that clearly differentiates Duckworth's scale.

Similar Personality Traits to Consider

The most prevalent criticism of the grit scale is that it falls victim to the “old wine, new bottle” anecdote, a concern which is supported by grit's tendency to be strongly correlated to several different, yet similarly constructed trait-specific inventories (Credé et al., 2017; Duckworth et al., 2011). Credé (2017) cited Kelly's 1972 “jangle fallacy” to diagnose the conceptual similarities between grit and other constructs. This is the belief that two things are different simply because they have different names. The correlations found throughout literature showing strong relationships between grit and other like personality traits are described briefly here.

Most notable is the conscientiousness facet of the Big Five model, which is strongly correlated to grit (Duckworth et al., 2007; Duckworth & Quinn, 2009). Duckworth asserted conscientiousness might be similar to grit because of its focused effort over time, and its ability to reliably predict accomplishment. The Big Five Model is a foundational personality inventory in its cotemporary use for predicting success (Goldberg, 1990). Duckworth (2007) concluded isolating particular facets of the model allowed researchers to more robustly predict achievement. In comparing and contrasting conscientiousness from grit, Duckworth found the two were highly associated. However, grit was proved to have incremental predicative validity over and above conscientiousness, particularly in number of career changes. Duckworth et al. (2007) found in a binary logistic regression predicting high versus low career changes using grit, age, and all Big Five traits, that grit was the only significant predictor. However, Credé,

Tynan, & Harms (2017) asserted the incremental predictive validity of grit over conscientiousness in forecasting academic performance is low at best. While grit as a hierarchical construct and the consistency facet of the construct had little effect on the predictive validity, the perseverance facet has an important and explanative power (Credé et al., 2017). One of the limitations Duckworth points out is that Big Five may omit some contributing personality factors in the development of the instrument. On the same token, this can be seen as a limiting factor in most personality inventories, including the grit scale.

Self-control is another factor often compared with grit. This is illustrated in the West Point Military study, where grit predicted retention in the cadet program significantly, unlike self-control and West Point's established Whole Candidate Score (Duckworth et al., 2007). In order to measure this, Duckworth used the Brief Self-Control Scale from Tangney, Baumeister, and Boone's 2004 study. Grit and self-control were related (Duckworth et al., 2007). Additionally, Credé, Tynan, & Harms (2017) asserted self-control is often seen as a facet of conscientiousness, and the meta-analysis reported a strong relationship between grit and this construct.

Yet another personality construct explored in the wide range of grit literature is Meriac's 2015 study regarding grit's relationship with work ethic. This study found grit and work ethic were moderately correlated, although both of these constructs were highly associated with conscientiousness. Work ethic, which has been traditionally applied to vocational domains, was strongly related to job satisfaction, whereas grit, which has been conventionally applied in academic arenas, was related to overall life satisfaction (Meriac, 2015). As a whole score, grit was related to work ethic and to the perseverance

subscale of grit (Meriac, 2015). However, Meriac's conclusions indicated that work ethic and grit, although related, are empirically distinct (2015).

Duckworth (2007) equates grit to follow-through in discussing the potential for grit in academia. The Personal Qualities Project identified follow-through to evidence "purposeful, continuous commitment to certain types of activities versus sporadic efforts in diverse areas" to predict academic success in a sample of 3,500 students (p.1099). In this, follow-through predicted student's likelihood to attain a leadership position, individual accomplishment in science and sports, and high achievement in several other areas. Additionally, like grit, follow-through was orthogonal to IQ (Duckworth et al., 2007). There is no data supporting a difference in the two constructs, although follow-through is paired with a larger personality inventory, whereas grit is a standalone measure of the perseverance and passion a person might possess.

Duckworth (2007) asserted while there is certainly overlap between this construct and others, such as conscientiousness and self-control, grit as an individual trait still significantly predicted an individual's achievement of challenging goals when other traits were held constant. Weighing both the proponents and the criticisms, there is reason to use caution when implementing grit intervention to improve college retention, but value in using this emerging concept as a tool to potentially benefit students.

Conceptual Framework

Considering the research regarding the effect of intelligence, involvement, and grit on retention, there was interest in determining how West Texas A&M University and the Department of Agricultural Sciences can determine these relationships within the 2018/2019 freshman cohort. In order to do this, the following conceptual framework was developed from the theoretical frameworks presented above. In Figure 3, it is shown that

grit influences an individual's passion and perseverance toward the long term goal of retention, as well as its effect on both academic and social integration. These in turn affect retention.

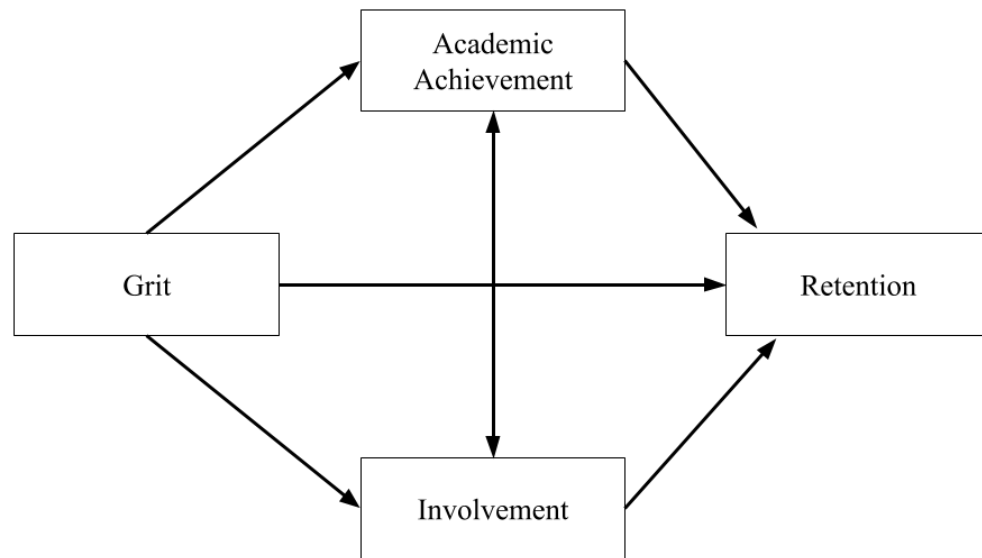


Figure 4 *Grit's Direct and Mediating Effect on Factors Influencing Retention*

Summary

Existing research showed a consistent need to identify the “x-factor” in student retention. When student attrition is on the line, the need to explain the variance between admissions standards and student achievement is a priority for institutions. While high school GPA is the most reliable single variable for predicting freshman success, the correlations reported are often moderate at best (Chang, 2014; Duckworth et al., 2007; Garton et al., 2000; Kuh et al., 2010;). Aptitude tests are unable to adequately explain the variance in student attrition. Promising research in the field of individual personality constructs gives hope to the issue of student retention. Grit, the focus of this study, may

be able to uniquely give the individual insight as to their predisposition for subject mastery.

In terms of applying this construct to the academic arena, the challenge of inconsistent reliability amongst differing and diverse populations arises. The research herein will look to survey the 2018/2019 freshman class in to characterize intelligence, involvement, and grit, and these traits' relevance to retention. Investigating the effects of non-cognitive constructs like grit may provide insight on how to improve the institutional and national issue of freshmen attrition, particularly when paired with the known effects of admission criterion and student engagement.

CHAPTER III

METHODOLOGY

Overview

The previous two chapters discussed the history and context behind retention, intelligence, involvement, and grit. Chapter I introduced the topic of retention and potential predictors of this institutional goal in relation to this study. Chapter II discussed relevant research regarding this national, institutional, and individual concern. Insight towards non-cognitive factors, such as grit, was provided, along with intelligence and involvement research as they related to retention research. Additionally, intelligence, involvement, and grit in agricultural science students specifically was reviewed. This chapter will describe the research design, target population, instrumentation, data collection, and statistical analysis. These will describe the processes utilized to satisfy the purpose and questions of this study.

Purpose and Questions

This research sought to determine if success in the first semester of college is better predicted by the generally accepted construct of cognitive ability versus non-cognitive ability. Additionally, students' involvement was determined, and the relationship between involvement and student success was examined. In order to determine the success of the students, the researchers measured retention and academic

performance. The characteristics and associations were determined using the following research questions:

- 1) What grit scores were expressed by students in this study?
- 2) Were students involved on campus? If so, at what level did the student commit to purposeful involvement activities?
- 3) Were students employed? If so, how many hours did students spend working in the week?
- 4) How did students perform on college readiness exams?
- 5) How did students perform academically in the first semester?
- 6) How many students departed from the university, and what were the characteristics of this group?
- 7) What relationships exist between the identified variables of grit, intelligence, involvement, and retention?

The conceptual framework of this study was based on the grit research presented by Duckworth et al. (2007), Astin's (1984) theory of involvement, and Tinto's (1973; 1975) research on retention.

Research Design

This quantitative, non-experimental study was built to gather more information about the 2018-2019 freshman cohort at West Texas A&M University and used a descriptive-correlation research design. The study was designed to measure the cognitive and non-cognitive factors that might influence the attrition decision of the 2018/2019 freshman class. The three overarching independent variables measured were grit, involvement, and intelligence. Grit, expressed in a single numerical figure, was

determined using Duckworth's (2007) 12 question higher-order personality inventory.

Involvement was determined using 10 questions in the distributed survey, however, two questions were used to determine overall level of involvement.

While information on intelligence can be gathered using several different college readiness measures, ACT scores were utilized to determine intelligence for the purposes of this study. The ACT test was the most widely expressed value amongst the sample population. According to the 2018/2019 Freshman Profile compiled by the university, 66% of students submitted ACT scores for admissions, whereas 50% submitted SAT scores. The College Board's 2018 concordance table was used to convert all SAT scores to ACT scores, where the higher score (when both test scores were provided) was selected for comparison in the study.

The dependent variable measured in this study was first-semester success. First semester success was measured using retention and first semester GPA, which was obtained through institutional data on the spring semester census day.

Population Sample

The target population for this study was the 2018/2019 freshman cohort, with specific emphasis on capturing the demographics of agriculture majors. The 2018/2019 cohort consisted of 1,170 students, with 519 males and 651 females. The average age was 18.8 years old. The students were distributed by academic college as follows:

1. College of Agriculture and Natural Sciences – 333 Students
2. College of Business – 131 Students
3. School of Engineering, Computer Science and Mathematics – 138 Students
4. College of Education and Social Sciences – 110 Students

5. College of Fine Arts and Humanities – 169 Students
6. Nursing and Health Sciences – 211 Students
7. Undeclared/General Education – 78 Students

It should be noted the College of Agriculture and Natural Sciences also included natural science majors, such as biology, chemistry, and physics. The Department of Agricultural Sciences alone housed 208 students. Although the target population included all majors, there was specific interest in filtering out and examining the characteristics of agricultural science students in addition to the entire freshman class.

The survey was developed in Qualtrics, a widely used research platform that allows the researcher flexibility and specificity in designing the instrument. It was administered through an online link via email to the entire freshman class, as well as in captive freshmen leadership and cornerstone classes. Specifically, the researchers obtained instructor approval to survey three separate Freshman IDS classes and seven AGRI 2300 classes, which totaled to 225 responses. After excluding incomplete surveys, surveys without identification numbers, and duplicates from email, this left 197 clean responses. The rest of the surveys were filtered for completion and provided the other 145, which made the entire sample size (n=342).

While all students in the 2018/2019 freshman cohort at West Texas A&M University were administered the survey, there was specific interest in characterizing agricultural science students. Therefore, extra effort was made towards capturing this as many individuals in this population as possible. Freshmen IDS 1071 and AGRI 2300 classes were selected for captive participant recruitment because of their potential relevance to student success and support curriculum.

In order to prevent students of differing classifications from taking the survey and skewing the study, any responses from students who did not meet the population criterion were excluded from the study. This was first done by request in the informed consent of the survey and then reinforced through deleting any responses that did not meet the classification requirements.

Instrumentation

Using research and information from the other aforementioned constructs of intelligence, grit, and involvement, a process was developed that aimed to answer the following questions of participants. A survey was built around Duckworth's (2007) 12-Question Grit Scale instrument. Approval was obtained from the University of Pennsylvania to utilize the questionnaire within the instrument. Much like other personality tests, the hope was that the provision of participant results, or grit scores, from the questionnaire was a motivating factor for participants to complete the survey and answer questions honestly. In addition to the grit scale, involvement was surveyed using 10 questions to determine how students spent time outside of the classroom. To keep the format consistent with the Duckworth's survey, additional questions regarding involvement and employment are presented in a similar multiple choice format. Obscure data, such as hours worked, was divided by natural, logical breaks into multiple choice questions. These provided five reasonable ranges for numerical responses and five ranked responses for other questions.

The survey was distributed in classroom presentations and via email. The IDS classes were administered a hard copy of the survey in order to accommodate for any technological issues students might have encountered in accessing the online survey. The

AGRI 2300 students were asked to access the online survey via an anonymous link or a secure QR code, both provided by the Qualtrics website. The survey was then sent to the freshman class via email in order to give the entire population an opportunity to participate in the study.

The remaining information concerning intelligence and the dependent variable of retention was collected via institutional data. Intelligence was determined using ACT scores. High school GPA was also considered. The dependent variable measured in this study was first-semester success. First semester success was measured using retention and first semester GPA, which was obtained through institutional data on the spring semester census day.

Validity and Reliability

The survey was reviewed by a panel of experts from the West Texas A&M University Department of Agricultural Sciences for face validity and clarity. Modifications were made according to recommendations from the panel. The Institutional Review Board (IRB) required review of the survey. It was approved October 18, 2018.

Reliability for the first section of the survey was determined using Duckworth's (2007) measure of validity and reliability. The instrument was developed and validated over the six studies published in the 2007 document. To isolate grit as a variable in individual success, a self-reported questionnaire consisting of 27 questions relating to grit was distributed to adults aged 25 years and older ($N = 1,545$; $M = 45$ years old). From these responses, item-total correlation and internal reliability analyses eliminated 10 items from the questionnaire. A factorial analysis and promax loading test was applied to

the remaining items to simplify the instrument into the 12 most grit-relevant items. Refer to Appendix F to review item total correlations and promax loading scores for the 12-question instrument. After the instrument was developed, Duckworth (2007) used Multiple Regression in subsequent studies to determine the results and accuracy of the questionnaire. The final 12 question questionnaire measured the two subscales as positively correlated. The individual factors, and scale as a whole, demonstrated a high internal consistency ($\alpha = .85$). Additionally, Duckworth (2007) found higher validity and reliability in the grit scale instrument by using polarized questions that had both positive and negative associations, theoretically and statistically making the answers more consistent and honest.

The second part of the survey was deemed valid for characterizing the level and type of student involvement by the aforementioned panel of experts. These questions determined the perceived level of involvement of participants, the actual hours of involvement outside of class, and the types of activities respondents dedicated this time too. Questions were formatted as scaffolded multiple choice questions, where specific responses yielded additional questions. For example, if the student answered “yes” to the question of employment status, they would be asked to answer hours of employment next. If the individual responded “no,” the question regarding hours of employment was skipped.

The student identification numbers used to pull academic information for students were also utilized to track and determine first semester retention and GPA. To maintain confidentiality, the information collected from the university’s system was scrubbed of identifying information outside of those identifiers needed to define the population

adequately. These included major, gender, and age. This academic information was pulled on the 12th class day of the spring 2019 semester and included fall 2019 GPA, academic standing, major, and spring semester enrollment information. The 12th class day was selected as the official census day to report university enrollment per term.

Data Collection

The target population was informed that participation in the study was voluntary and all information would be confidential. Respondents were provided contact information for the researchers and the university's IRB to address any questions regarding voluntary participation in the study. In order to collect responses, permission was requested from freshmen IDS 1071 and freshmen AGRI 2300 course instructors to administer the survey. Seven AGRI 2300 instructors granted this request, along with three IDS 1071 instructors. Throughout the month of October, the researchers presented to these classes. Upon concluding classroom presentations and surveys, the instrument was sent to the entire freshman class via email. The survey was open in Qualtrics for email responses from November 8 to 26.

Institutional data was requested in one batch from the university on the census date on January 14, 2019. This included age, gender, ACT/SAT scores, high school GPA, declared major, first semester GPA, and spring semester enrollment status.

Data Analysis

The purpose of this study was to compare the perceived effect of intelligence, grit, and involvement on an individual's first-semester performance. In order to measure this, description and comparison tests were run in the Statistical Package for Social Sciences (SPSS) Version 25. Data was imported into Excel from Qualtrics to organize prior to

utilizing SPSS. The descriptive measures used here were percentages, frequencies, means, standard deviations, and were applied to questions 1-6. These illustrated group differences and helped determine the cognitive and non-cognitive capabilities of the 2018/2019 freshman cohort. Pearson's correlation coefficient was used on the 7th research question to obtain r -values between retention and grit, intelligence, and involvement, as well other potential influencing factors.

CHAPTER IV

RESULTS

Overview

The previous chapters discussed the history and context behind retention, intelligence, involvement, and grit. Chapter I introduced the topic of retention and potential predictors of this institutional goal in relation to this study. Chapter II discussed relevant research regarding this national, institutional, and individual concern. Insight towards non-cognitive factors, such as grit, was provided, along with intelligence and involvement research as related to retention research, in the general population and in agricultural science student specifically. Chapter III described the research design, target population, instrumentation, data collection, and statistical analysis. This chapter reports the findings from the instrument and research design in order to satisfy the purpose and questions of this study. Descriptive statistics are reported in research questions one through six. Findings from research question seven reported on significant and other valuable associations that were found.

Purpose and Questions

The purpose of this study was to determine which measured factors had the strongest association with student retention in the first semester. Within the 2018/2019 cohort, there was also interest in illustrating the retention relationships in students

enrolled in the Department of Agricultural Sciences. Specific research questions for this study include:

- 1) What grit scores were expressed by students in this study?
- 2) Were students involved on campus? If so, at what level did the student commit to purposeful involvement activities?
- 3) Were students employed? If so, how many hours did students spend working in the week?
- 4) How did students perform on college readiness exams?
- 5) How did students perform academically in the first semester?
- 6) How many students departed from the university, and what were the characteristics of this group?
- 7) What relationships exist between the identified variables of grit, intelligence, involvement, and retention?

Respondent Information and Demographics

This research included both inferential and descriptive statistics in order to illustrate the results of the research questions. The following items were used to describe the target population of this study. The average age of participants was $M = 18.61$ years old. Of the 342 respondents, 245 (71.6%) were female, 97 (28.4%) were male. Although the number of respondents varied widely in terms of specific major, there were 196 (57.3%) non-agriculture majors and 146 (42.7%) agricultural science majors. Within the College of Agricultural and Natural Sciences, the most commonly recorded major was Animal Science ($n = 66$, percent of all majors = 19.3%, percent of agriculture majors = 45.2%). Amongst non-agricultural science majors, the most common major was Pre-

Business ($n = 20$, percent of all majors = 5.8%, percent of non-agriculture majors = 9.8%). Eight respondents were Undeclared at the time of this study.

The survey was distributed via three methods. The first method was with hard copies to IDS 1071 classes. Through this method, 87 surveys were distributed and collected and 65 surveys were complete and valid for use. The response rate for this method was 74.7%. AGRI 2300 classes were able access the survey through Qualtrics via an anonymous link or a secure QR code. There were 146 responses using this method, 134 of which were complete and valid for use, resulting in a response rate of 91.8%. The instrument was then sent to the entire freshman class ($N = 1170$) via email. From this distribution method, 247 students started the survey, but only 197 completed it. The response rate for this distribution was 17.0%; however, several of these responses were duplicate responses from participants already surveyed in the classroom. There were 145 useable surveys from the email distribution. All duplicate and incomplete responses from the entire sample were deleted, bringing the representative sample for this study to $n = 342$. The average response rate for the entire study between the two collection methods was 29.2%.

Freshman Grit Snapshot

Findings Related to Research Question One

Research Question 1: What grit scores were expressed by students in this study?

To determine Research Question 1, the grittiness of the 2018/2019 freshman cohort, the researchers asked students to complete Duckworth's (2007) full 12-question instrument. Grit is measured on a scale of 1.00 (not very gritty) to 5.00 (extremely gritty). The results indicated the average grit score of the freshman class was 3.61, with the most

frequent scores being a 3.67. The reported standard deviation of this average was a .49. The minimum grit score reported was a 2.25, the highest was a perfect 5.0. Agricultural science students reported a higher average grit score and lower standard deviation ($M = 3.75$, $SD = .44$) than non-agriculture majors ($M = 3.51$, $SD = .50$). These figures are displayed in Table 1.1.

Table 1.1

Participant Grit Snapshot (n = 342)

	<i>M</i>	<i>SD</i>	<i>Min</i>	<i>Max</i>	<i>Agriculture n = 146</i>		<i>Non-Agriculture n = 205</i>	
					<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Grit Score	3.61	.49	2.25	5.00	3.75	.44	3.51	.50

Note: Grit Scale: 5.0 = extremely gritty; 4.0 = very gritty; 3.0 = moderately gritty; 2.0 = somewhat gritty; 1.0 = not very gritty

Student Involvement and Engagement

Findings Related to Research Question Two

Research Questions 2: Were students involved on campus? If so, at what level did the student commit to purposeful involvement activities?

Although the researchers asked several questions in the instrument about individual student engagement within the freshman class, the student's actual hours involved and the perceived involvement scale were used to gauge overall level of involvement. The perceived involvement scale asked how involved the student was, or wanted to be, on campus. This scale was not used to answer the second research question, but still adds value to painting a broad picture of the cohort. The rating ranged from 1.00 (not involved at all) to 5.00 (heavily involved in several activities across campus). The mean involvement rating was a 3.09 and had a standard deviation of 1.12. With a median

involvement rating of “3,” 115 (33.6%) of students selected this as the level of perceived actual and/or desire for involvement. Generally, most students either were, or wanted to be, at least somewhat involved on campus, if not very involved. These figures are displayed in Table 2.1 below. Nearly a quarter of agricultural science students indicated they were/wanted to be at least somewhat involved with a 2.0 rating (24.0%), and a large proportion wanted to be heavily involved with a 4.0 rating or higher (39.0%).

Conversely, the percentage of non-agriculture students who were/wanted no involvement on campus (12.8%) was more than double that of agricultural science students (5.5%).

Nearly twice as many agricultural science students indicated a 5.0 involvement rating (13.7%) compared to non-agriculture students (7.1%).

Table 2.1

Perceived Student Involvement (n = 342)

Perceived Involvement	<i>M</i> 3.09	<i>SD</i> 1.12	<i>f</i>	<i>%</i>	<i>Agriculture</i> <i>n = 146</i>		<i>Non-Agriculture</i> <i>n = 205</i>	
					<i>f</i>	<i>%</i>	<i>f</i>	<i>%</i>
1.0			33	9.6	8	5.5	25	12.8
2.0			66	19.3	35	24.0	31	15.8
3.0			115	33.6	46	31.5	69	35.2
4.0			94	27.5	37	25.3	57	29.1
5.0			34	9.9	20	13.7	14	7.1

Note: Students were asked to rate their level of involvement from 1 to 5. 1= not involved at all; 5 = heavily involved in several extra-curricular activities across campus

Actual Hours Outside of Class

Respondents indicated actual hours varied from the perceived involvement that was reported. Participants were asked to select an hour range they believed were spent on out-of-class activities. These hour ranges were made on logical assumptions by the researcher. Most students indicated that out-of-class involvement took 1-3 hours (44.2%), although several also indicated that 4-6 hours (21.9%) were dedicated towards

involvement every week. Agriculture science students reported more time was spent involved in campus activities than did non-agriculture science students. Only 10.3% of agricultural science students indicated zero hours of involvement, versus the 22.4% of non-agriculture students who reported no involvement on campus. These frequencies of involvement hours are displayed in Table 2.2.

Table 2.2

Actual Hours Involved in Campus Activities (n = 342)

Hours Involved on Campus Outside of Class per week	<i>f</i>	<i>%</i>	<i>Agriculture</i> <i>n = 146</i>		<i>Non- Agriculture</i> <i>n = 196</i>	
			<i>f</i>	<i>%</i>	<i>f</i>	<i>%</i>
0 Hours	59	17.3	15	10.3	44	22.4
1-3 Hours	151	44.2	69	47.3	82	41.8
4-6 Hours	75	21.9	29	19.9	46	23.5
7-9 Hours	33	9.6	22	15.1	11	5.6
10 or more Hours	24	7.0	11	7.5	13	6.6

Findings Related to Research Question Three

Research Question 3: Were students employed? If so, how many hours did students spend working in the week?

The researchers acknowledged the fact that student employment can affect the finite amount of time that students have to dedicate to such pursuits. In fulfilling third research question, the researchers surveyed the employment status of the 2018/2019 freshman class. This was measured through a selected hour range, which the researchers developed using logical assumptions. There were 213 (62.3%) respondents who were not employed. Of those who were employed ($n = 129$), most students worked more than 20 hours per week (34.1%). The aggregate reported frequency of employment is reported in

Table 3.1, whereas the frequencies of employed students are displayed in Table 3.2.

Additionally, while a lower proportion of agricultural science students were employed (See Table 3.1), the percentage of students working more than 20 hours per week was similar amongst both groups (See Table 3.2). Agricultural science students worked a higher proportion of 10-15 hours per week, while non-agricultural science students worked a higher proportion of 15-20 hours per week. Both groups showed over 30% of employed students worked more than 20 hours in a week.

Table 3.1

Employment Status of Freshman Class (n = 342)

Are you employed?	<i>f</i>	<i>%</i>	<i>Agriculture n = 149</i>		<i>Non-Agriculture n = 196</i>	
			<i>f</i>	<i>%</i>	<i>f</i>	<i>%</i>
Yes	129	37.7	48	32.9	81	41.3
No	213	62.3	98	67.1	115	58.7

Table 3.2

Actual Hours for Employed Students (n = 129)

How many hours do you work per week?	<i>f</i>	<i>%</i>	<i>Agriculture n = 48</i>		<i>Non-Agriculture n = 81</i>	
			<i>f</i>	<i>%</i>	<i>f</i>	<i>%</i>
0-5 hours	8	6.2	2	4.2	6	7.4
5-10 hours	19	14.7	6	12.5	13	16.1
10-15 hours	28	21.7	16	33.3	12	14.8
15-20 hours	30	23.3	9	18.8	21	25.9
20+ hours	44	34.1	15	31.3	29	35.8

Intelligence

Findings Related to Research Question Four

Research Questions 4: How did students perform on college readiness exams?

To answer Research Question 4, the researchers used ACT scores from the freshman class. Although both SAT, ACT, and TSI scores were provided for most students, the appearance of all three of these college preparedness measures were not consistently provided across the sample. Per the recommendation of the institution's admission criteria, TSI was disregarded from consideration and SAT scores were transformed to the ACT equivalent. Additionally, if a student's SAT and ACT score were both provided, researchers opted to use the higher of the two scores after transformation. The possible range for ACT scores is 1 to 36, reported in discrete, whole numbers to participants. The average ACT score of the 2018/2019 freshman cohort sample was $M = 21.61$ with a standard deviation of 3.63. Agricultural science students indicated a mean ACT score that was slightly higher than the sample average ($M = 21.77$), although the standard deviation amongst the group was wide ($SD = 3.77$). Non-agriculture students reported slightly lower average than the total group score ($M = 21.49$), but also had a lower standard deviation ($SD = 3.53$). These measures of central tendency can be found in Table 4.1.

It should be noted one ACT score was missing from the data set. This was entered as a missing data point in the analysis, rather than excluding all data points from that participant.

High School GPA Analysis

The average high school GPA reported for survey respondents was $M = 3.63$ and had a standard deviation of .36. High school GPA is reported at West Texas A&M University on a four point scale (0.00 to 4.00) for admissions criterion. The high school GPA of this group ranged between a 2.26 and 4.00. There was almost no difference

between agriculture science and non-agriculture students in terms of reported high school GPA amongst the sample. The figures for both college readiness exams and high school GPA are displayed below in Table 4.1.

Table 4.1

Intelligence as measured by Admissions Criteria

Measures of Intelligence:			<i>Range</i>		<i>Agriculture n = 146</i>		<i>Non-Agriculture n = 196</i>	
	<i>M</i>	<i>SD</i>	<i>Min</i>	<i>Max</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
ACT (<i>n</i> = 341)	21.26	3.61	13.00	34.00	21.77	3.77	21.49	3.53
High School GPA (<i>n</i> = 342)	3.63	.36	2.26	4.00	3.62	.36	3.64	.37

Note: ACT scores are measured on a scale of 1 to 36 and is reported to individuals as discrete, whole numbers. All reported GPA's were measured on a four-point scale, ranging from 0.0 to 4.0.

First Semester Performance and Retention

Findings Related to Research Question Five

Research Question 5: How did students perform academically in the first semester?

Research Question 5 determined how students performed academically in the first semester. The average first semester GPA of 2018/2019 freshman sample was $M = 3.07$, and reported a standard deviation of 0.94. Although the average first semester GPA was only marginally different between agricultural science and non-agriculture students, the standard deviation within non-agriculture majors was higher ($SD = .97$).

Table 5.1

*First Semester Performance – GPA (*n* = 342)*

			<i>Range</i>		<i>Agriculture n = 146</i>		<i>Non-Agriculture n = 196</i>	
	<i>M</i>	<i>SD</i>	<i>Min</i>	<i>Max</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
First Semester GPA	3.07	.94	0.00	4.00	3.09	.91	3.05	.97

Findings Related to Research Question Six

Research Question 6: How many students departed from the university, and what were the characteristics of this group?

Although retention is generally best measured between the student's freshman and sophomore year, this study analyzed first semester retention, between the student's first and second semester. This addressed Research Question 6. Within the group surveyed, 25 students departed from the university. The retention rate for the first semester, then, was 92.7%. Agriculture students consisted of 36.0% ($n = 9$) of the students who departed. Of the eight students who were Undeclared, two departed. Although literature indicated high school GPA is the best predictor of attrition, the average for this departed students was 3.49. Additionally, the group scored an average of 3.507 on the grit scale. Average ACT scores for the group were 19.32. However, the first semester GPA for this group was a 1.97. These descriptive statistics are indicated below in Tables 6.1, 6.2, and 6.3.

Table 6. 1

First Semester Retention ($n = 342$)

Was the student retained?	<i>f</i>	<i>%</i>	<i>Agriculture n = 146</i>		<i>Non-Agriculture n = 205</i>	
			<i>f</i>	<i>%</i>	<i>f</i>	<i>%</i>
No	25	7.31%	9	6.57%	16	7.80%
Yes	317	92.69%	128	93.43%	189	92.20%

Table 6.2

First Semester Departures by Major (n = 25)

	<i>M</i>	<i>SD</i>	<i>Min</i>	<i>Max</i>	<i>Agriculture</i> <i>n = 9</i>				<i>Non-Agriculture</i> <i>n = 16</i>			
					<i>M</i>	<i>SD</i>	<i>Min</i>	<i>Max</i>	<i>M</i>	<i>SD</i>	<i>Min</i>	<i>Max</i>
HSGPA	3.49	0.34	2.58	4.00	3.56	0.24	3.07	4.00	3.45	0.39	2.58	3.91
ACT*	19.32	3.01	15	28	18.78	1.99	16	21	19.63	3.48	15	28
Grit	3.51	0.52	2.42	4.75	3.64	0.31	3.17	4.08	3.43	0.60	2.42	4.75
Perceived Involvement	2.64	1.35	1.00	5.00	2.56	1.33	1.00	5.00	2.68	1.40	1.00	5.00
First Sem. GPA	1.97	1.23	0.00	4.00	2.49	1.07	1.00	4.00	1.67	1.24	0.00	4.00

*Missing one data point

55

Table 6.3

Snapshot of First Semester Attrition and Retention, Compared (n = 342)

Comparison of Departed versus Retained Students	<i>Departed Students</i> <i>n = 25</i>				<i>Retained Students</i> <i>n = 317</i>			
	<i>M</i>	<i>SD</i>	<i>Min</i>	<i>Max</i>	<i>M</i>	<i>SD</i>	<i>Min</i>	<i>Max</i>
High School GPA	3.49	0.34	2.58	4.00	3.65	0.36	2.26	4.00
ACT – Transformed*	19.32	3.01	15	28	21.79	3.62	13	34
Grit Score	3.51	0.52	2.42	4.75	3.62	0.49	2.25	5.00
Perceived Involvement	2.64	1.35	1.00	5.00	3.12	1.09	1.00	5.00
First Semester GPA	1.97	1.23	0.00	4.00	3.15	0.86	0.00	4.00

*Missing one data point

Relationships of Variables

Findings Related to Research Question Seven

Research Question 7: What relationships exist between the identified variables of grit, intelligence, involvement, and retention?

Ultimately, the purpose of this study was to determine the best of the three proposed predictors of success. Research Question 7 sought to determine if a relationship exists with retention through the use of Pearson's correlation coefficient calculations. According to the conceptual framework of this study, the primary focuses of this correlation were intelligence (expressed through ACT scores), grit, and actual hours of involvement outside of class. Other potential influencing factors were explored as well. These included whether or not the student was an agricultural sciences major, high school GPA, employment hours, and first semester GPA. Literature indicated the researchers should expect a strong relationship to be shown between GPA measures and retention.

Due to the low predictive validity of nearly all factors used in retention research, the researchers set the significance level at .05 ($p = .05$). Credé, Tynan, and Harms (2017) admitted even low effects and predictive power of factors in retention research hold value when exploring intervention techniques. Additionally, moderate, low, and negligible correlations still have importance in reporting and intervening in retention efforts, are therefore displayed in Table 7.1. Davis's (1971) theory on the relevance of correlation coefficients in social science outlined guidelines for determining the strength of associations as negligible, low, moderate, substantial, and very strong.

In regards to the main focus of this study, determining the relationship between retention and intelligence, involvement, and grit, Pearson's correlation provided low and

negligible results. Grit and hours of involvement were positively, but negligibly correlated, at $r = 0.060$ and $r = 0.084$, respectively. ACT scores provided the only significant correlation to retention within the main constructs of this study ($r = .178, p < .01$).

First semester GPA provided the strongest association to retention with a moderate correlation of $r = .329$ ($p < .01$). Additionally, ACT and grit scores were both significantly related to first semester GPA. ACT shows a moderate correlation coefficient at $r = 0.340$ ($p < .01$), whereas grit shows a low correlation coefficient of $r = .217$ ($p < .01$). Grit was also positively and significantly correlated with hours of involvement ($r = 0.219, p < .01$). High school GPA showed a significant, low association with retention ($r = 0.113, p < .05$, but a moderate and nearly substantial relationship first semester GPA ($r = 0.489, p < .01$) and a nearly moderate association with ACT scores ($r = 0.311, p < .01$). Whether or not a student was an agriculture major was only significantly correlated with grit and with hours of involvement, showing little association, either positive or negative, to any other factors, particularly retention. Employment hours had little association with most variables in the correlation model. The only significant relationship was a negative, low association between involvement hours and employment hours ($r = -0.193, p < .01$).

Table 7. 1

Pearson's Correlation of Variables (n = 342)

	1	2	3	4	5	6	7	8
1. Agriculture Major	—							
2. Grit Score	.232**	—						
3. High School GPA	-0.026	.146*	—					
4. ACT	.038	0.065	.311**	—				
5. Hours of Involvement	.136*	.219**	0.010	0.083	—			
6. Employment Hours	-0.085	0.043	0.103	0.050	-.193**	—		
7. First Semester GPA	0.020	.217**	.489**	.340**	0.104	-0.072	—	
8. Retention	.038	0.060	.113*	.178**	0.084	0.025	.329**	—

Note: Missing one ACT score from data set

*Significant at .05

**Significant at .01

CHAPTER V

RECOMMENDATIONS AND CONCLUSIONS

Summary

The previous chapters developed the context behind retention, intelligence, involvement, and grit, as well as the methodology and findings in regards to this study specifically. Chapter I introduced the topic of retention and potential predictors of this institutional goal in relation to this study. Chapter II discussed relevant research regarding this national, institutional, and individual concern. Insight towards non-cognitive factors, such as grit, was provided, along with intelligence and involvement research as related to retention research. Additionally, intelligence, involvement, and grit in agricultural science students specifically was reviewed. Chapter III described the research design, target population, instrumentation, data collection, and statistical analysis. Chapter IV reported both descriptive and correlational findings for the 2018/2019 freshman cohort in regards to first semester retention and related variables. This chapter will discuss the findings and make recommendations for applying this research.

Retention is a nationwide concern for institutions of higher education (Akos & Kretchmar, 2017; Chang, 2014). At West Texas A&M University, admissions follows an open enrollment policy. Subsequently, retention rates hover between 65% and 70%,

keeping with the state average (National Center for Education Statistics, 2018). Retention is of concern to not only the university, but also to the Department of Agricultural Sciences. In addressing this issue, literature suggested relying on the assertions of retention experts like Tinto (1975) and Astin (1984), as well as exploring the contribution of specific non-cognitive traits to retention. This study used Duckworth's (2007) grit scale, performance on the ACT, and self-reported hours of involvement to describe the 2018/2019 freshman cohort, as well as to determine which factors are most related to student retention between the fall and spring semesters. Understanding the cognitive and non-cognitive characteristics of incoming students can help the department and the institution allocate retention efforts and interventions appropriately.

Purpose and Questions

The purpose of this study was to determine which of the measured factors had the strongest association with student retention in their first semester. Amongst the 2018/2019 cohort, there was also interest in illustrating the retention relationships in students within the Department of Agricultural Sciences. Specific research objectives for this study include:

- 1) What grit scores were expressed by students in this study?
- 2) Were students involved on campus? If so, at what level did the student commit to purposeful involvement activities?
- 3) Were students employed? If so, how many hours did students spend working in the week?
- 4) How did students perform on college readiness exams?
- 5) How did students perform academically in the first semester?

- 6) How many students departed from the university, and what were the characteristics of this group?
- 7) What relationships exist between the identified variables of grit, intelligence, involvement, and retention?

Population

The target population for this study was the 2018/2019 freshman cohort of West Texas A&M University. The researchers attempted to capture an accurate representation of the student population through recruitment in IDS 1071 and AGRI 2300 classes. In order to generalize the results, the instrument was also sent out via email. The characteristics of the participant group were deemed acceptable for this study as it gave equal opportunity for the freshman cohort to complete the survey. The number of female respondents is skewed more than in the total population. Additionally, while 42.6% ($n = 146$) of respondents were agricultural science students, only 18% ($n = 208$) of the entire cohort is housed in the Department of Agricultural Sciences.

Discussion and Conclusions

Conclusions from Research Question 1

This question sought to determine the overall “grittiness” of the 2018/2019 freshman cohort. To illustrate grit in the sample of 2018/2019 freshmen at West Texas A&M University equates to national averages, these grit scores were compared to Duckworth’s large inventory of grit data collected from 2006 to 2007 and is used in providing feedback to online participants of Grit-S (Duckworth & Quinn, 2009). The average reported grit score indicated the freshman class is consistent with the average grit score of 3.60 in most Americans, according to Duckworth’s nationally available grit scale

($M = 3.61$, $SD = .488$). Agriculture science majors were shown to be grittier than other majors ($M = 3.74$, $SD = .46$, $M = 3.51$, $SD = .49$). It took a 4.25 grit score for majors in the Department of Agricultural Science to get into the 90th percentile. However, according to Duckworth's nationally available grit score, these students were in the 80th percentile of Americans.

Conclusions from Research Question 2

In determining student involvement, researchers opted to focus primarily on the student's reported hours of involvement in on-campus activities. However, there is still value in the student's perceived involvement ranking. Individuals were asked to rate their involvement, or their desire for involvement, on a five-point scale. Because this survey was distributed early in the first semester, it is important to understand the student's intent to become involved, despite the fact that individuals may not yet have had the opportunity to be as involved their desire indicated. The desire to be involved is an important part of students actually participating. Astin's theory of involvement asserts that involvement is varied, but sequential, in nature over a period of time (1984). Hegedus & Knight's (2002) study may also indicate that a student's desire for involvement leads to increased hours of commitment into an individual's sophomore year. The mean involvement rating reported and the frequency of high involvement indicated that most students wanted to be at least somewhat involved on campus, if not very involved ($M = 3.08$).

Researchers used actual hours of involvement as the involvement variable in the correlations for Research Question 7. In describing the time commitment of the freshman cohort, it is important to note that although the largest proportion of students only spent

1-3 hours participating in on-campus activities outside of class, this was not indicative or related to the perceived involvement rating. Therefore, this is a more accurate measure of involvement for the purposes of this study. Astin (1984) affirms time as a finite resource that students must dedicate to family, friends, and hobbies, along with academic responsibilities and involvement opportunities. Therefore, the actual time students dedicate to purposeful education activities outside of the classroom more accurately depicted involvement than did perception of involvement. A majority of students fall within one to six hours of involvement (66.1%).

Conclusions from Research Question 3

Keeping with Astin's (1984) assertion of time as a fixed resource, employment and actual hours worked were surveyed. Researchers hypothesized employment would have an effect on a student's ability to devote time to academic pursuits and student engagement. The selected hour range utilized in this survey used assumed logical ranges. Only 34.1% of respondents were employed, and of those employed, the amount of hours worked showed an upward trend. The largest proportion of students who were employed in the first semester worked more than 20 hours per week. Gleason's 1993 study examined the effects of employment on academic performance and observes that students who were employed versus those who were not had a slightly higher GPA. However, the amount of hours worked by a student negatively impacts grades (Gleason, 1993). With this and Astin's (1984) assertions in mind, the researchers found concern in the propensity of employed students to take an upward trend in hours worked. Still, a majority of student indicated the total hours of employment to be less than 20 hours. Of

the students who were employed, the percentage of students that limit their work hours to less than 20 hours per week was 65.9%.

Another interesting finding was agricultural students had a lower rate of employment than students in other academic areas. In Research Question 1, agricultural science students were grittier than non-agriculture major counterparts. Meriac's (2015) study regarding grit's relationship with work ethic indicated a relationship exists between the two constructs. This might be interpreted as a predictor that gritty students have a predisposition to work harder, and are therefore more likely to be employed. When observing the higher average grit score of agricultural science majors, researchers expected employment, too, would be higher in this subgroup. A possible explanation for this falls in line with Astin's (1984) theory that involvement in the new social structure of an institution is sequential. Because the survey was administered in the first semester, it is likely that many students that might desire to seek employment had yet to secure a job.

Other factors that might affect a student's actual employment hours are the hours dedicated to the pursuit of academic achievement and involvement in campus activities. Logic follows that as a student decides to devote more time to academic pursuits and to student engagement opportunities there is less actual hours available to devote towards employment opportunities.

Conclusions from Research Question 4

This section sought to gauge the intelligence of the 2018/2019 freshman cohort as measured through ACT scores. High school GPA was also taken into consideration due to its relatively higher predictive validity when compared to other variables used here. However, aptitude tests were assumed to accurately indicate cognitive ability made the

ACT score the most logical and relevant way to measure actual intelligence. According to the 2018 ACT Profile Report, the national average composite score for the 2018 high school graduating class was 20.8 ($N = 1,914,817$). West Texas A&M University reported a majority of students (59.28%) scored between 18 and 23 ($N = 1,170$). On average, the students in this sample scored 21.61 ($n = 342$, $SD = 3.63$). It can be assumed this sample is representative of institutional and national averages in terms of intelligence, as measured through this instrument.

High school GPA was also analyzed aggregately. Reported GPAs were a relatively narrow group when compared to other measures, particularly intelligence. The average GPA was on the upper end of the 4.0 scale ($M = 3.63$, $SD = .361$). The institution reported a majority of students in the 2018/2019 freshman class (61.86%) achieved a 3.50 or higher in high school. The average GPA for the cohort was 3.54. Reported GPAs for the institution displayed an upward trend, which was consistent with the sample. While ACT scores had a wide range, high school GPA did not. However, the wider scale used in measuring aptitude versus the narrower scale that measures academic performance likely contributed to these differences.

Additionally, grades are not simply intelligence measures. Duckworth (2007) pointed out while talent (in this case intelligence) contributes to success, overall achievement is more impacted by grit, or other traits. A high GPA is also influenced by student effort. For example, a brilliant and superbly intelligent student who does not devote the time and energy to study content for an exam might perform poorly, despite apparent cognitive ability to understand the material. Conversely, a student who is relatively less intellectually talented, but devotes hours to studying content and practicing

conceptual skills related to the exam could pass with flying colors. Academic achievement requires student effort *and* intellectual talent.

Conclusions for Research Question 5

The purpose of this question was to determine how students performed academically in the first semester. The first semester GPA reported the average as 3.07 ($SD = .939$). This may indicate that some students adjusted well to the academic challenge of college level coursework while other did not. Retention experts referred to the “culture-shock” many students experience on entering college. Tinto & Cullen (1973) outlined the importance of the first two stages of retention: separation and transition. Separation occurs when a student leaves what was previously known and enters the unknowns of college experience. Transition is the process of the student adjusting to the expectations of a new environment; this includes both academic and social integration (Tinto & Cullen, 1973). It can be concluded the lower sample mean paired with the larger standard deviation in relation to high school grade performance is indicative of individual response to, and navigation of, these two stages of Tinto’s Model for Student Departure.

Conclusions from Research Question 6

This research question sought to analyze the main dependent variable of the study: retention. In order to understand the effects of the other variables discussed, one must first understand retention as related to the sample independently.

It has been previously mentioned retention is conventionally thought of, and best measured, between students’ freshman and sophomore year. Therefore, the picture of retention these figures paint is limited if they are viewed through the traditional lens of

retention. Because of its likely moderated depiction of the 2018/2019 freshman cohort's intent to persist at West Texas A&M University, careful attention should be paid to how this specific section of data is utilized. The reported first semester retention rate is 92.7% ($SD = .261$). If this retention rate is taken at face value and applied to retention between the first and second year as well, it would grossly warp any conclusions and interventions that might be implemented. Between the first and second semester, only 25 students departed from the university. If previous years' retention rates, about 65%, are applied to this sample size, approximately 120 students would hypothetically leave of West Texas A&M University between freshman and sophomore year. However, understanding early departure decisions in freshmen still holds value as it gives the institution an opportunity to react sooner. Tinto (1975) strongly emphasized institutional support and intervention early on is critical for retention, persistence, and ultimately graduation.

Literature suggests GPA and intelligence might have an effect on retention (Tinto, 1975; Astin, 1984; Credé et al., 2017; Burton & Ramist, 2001). The researchers analyzed the descriptive characteristics of retained and departed students as discrete groups. In attrition affected students, 9 (36%) were in agriculture students and 16 (64%) were non-agriculture students. Since agricultural science students make up 42.6% of the sample size, attrition is relatively representative of the sample population. Researchers expected to see lower academic performance, both in high school and in the students' first semester, in departed students versus retained students. As noted in the previous chapter, this was found to be true, but not necessarily substantial at face value. High school GPA was generally very similar, both in mean and in standard deviation, between the departed and retained groups ($M = 3.49$, $SD = 0.34$; $M = 3.65$, $SD = .36$). With high school GPA

as the best standalone predictor of success throughout literature, these close measures of central tendency were surprising (Chang, 2014; Duckworth et al., 2007; Garton et al., 2000; Kuh et al., 2010). However, the observed differences between the groups' first semester GPA was more in line with the hypothesis of lower academic performance in departed students. The average first semester GPA of attrition affected students was a 1.97, whereas the average GPA of retained students was 3.15. The large standard deviation of departures, though, indicates academic performance alone did not affect every individual's decision to persist. It can be assumed that despite high marks, some students decided to either transfer to another institution or withdraw regardless. Students who transfer out of the university may technically persist in pursuing a college degree, but the scope of this study is unable to adequately determine this, and therefore only measures retention from the university standpoint. Drop out from higher education as a whole, despite academic performance, may have been caused by several factors, including those out of the institution's control. However, the low academic performance of these students compared to relatively high performance in high school indicated a failure of the student to cope with the stress of Tinto's (1975) construct of separation or to adjust appropriately during the transition process. It should be noted the standard deviation of retained students was 0.86, which was still large considering that GPA is measured on a 4-point scale. This indicated while some students were successful in the first semester, there were also those who were not successful, but chose to continue anyways.

Between majors, there are several differences to discuss and draw conclusions from. It should be noted that dividing this small sample size even further into groups

offers challenges to the validity and reliability of the information. Agricultural science majors in the sample reported the lowest ACT scores and the lowest perceived involvement rating amongst departed students. Both the agriculture and non-agriculture groups reported a wide range in perceived involvement, indicating some of the departed students had no intention or desire to engage with the campus community, while other individuals had a strong inclination to be involved on campus. Retention literature admitted while the institutions have an obligation to students to provide appropriate supports, the student must also agree to participate in order for these policies to be effective (Astin, 1984; Tinto, 1975). However, if students indicate intent to be involved, it is critical the university meets the individuals where they are in order facilitate the social integration that is necessary for retention.

Conclusions from Research Question 7

The final research question sought to identify the types of relationships that exist between retention and grit, intelligence, and involvement. Pearson's correlation coefficient was used to measure the potential effect that variables might have on retention and define each one's relationship with each other. The framework of this study asserted a relationship exists between retention and intelligence (expressed through ACT scores), grit, and actual hours of involvement outside of class. The relationship between these and other potential influencing factors were explored as well.

In the Pearson correlation, 29 relationships were defined. Of these, eight relationships were statistically significant at a level of .01 ($p < .01$.) Three other relationships were found to be statistically significant at a level of .05 ($p < .05$). Strength of associations was determined using Davis's 1971 guidelines for determining the

statistical importance of correlations. Retention was only significantly correlated to ACT scores ($r = .113, p < .05$). Hours of involvement and grit were positively correlated, but only at negligible levels. However, there is potential for this relationship to be underrepresented in this sample due to the relatively low level of attrition.

Although grit was not significantly related to retention, it was significantly correlated to whether or not the student was an agricultural sciences major ($r = .232, p < .01$), to actual hours of involvement ($r = .219, p < .01$), to high school GPA 9 ($r = .137, p < .05$), and to first semester GPA ($r = .217, p < .01$).

Other variables analyzed expressed significant relationships with retention. High school GPA was consistent with literature's suggestion that it is related to retention, although the relationship expressed here was a low association ($r = .113, p < .05$). ACT expressed a stronger relationship to retention, contradicting most of the assertions cited within this study. However, ACT and high school GPA were unsurprisingly moderately correlated ($r = .311, p < .01$). First semester GPA held the strongest correlation to retention ($r = .329, p < .01$). This may have indicated students who feel academically unequipped for the rigor of college-level course work allow grade performance to impact the drop-out decision. This was supported by Tinto's (1975) research which asserted that academic integration is key to retention and that grades earned have a larger effect than actual cognitive ability. First semester GPA held the strongest correlation within the test to high school GPA ($r = .489, p < .01$). This nearly substantial association displays a logical relationship. First semester GPA also had a Pearson r -value of .340 ($p < .01$) when compared with ACT scores. Major choice and employment had little effect on retention.

Interestingly, major choice showed the weakest correlation to ACT scores, and students in the Department of Agricultural Sciences had a negatively correlated relationship with high school GPA, indicating a lower incoming GPA. However, these students did have a small positive relationship with first semester GPA. This could be indicative of many things. One possible cause of this relationship shift is that as students pursue a goal they are passionate about, in this case a college degree in the agricultural industry, they perform better. However, because these differences are not significantly expressed on either side, this supposition cannot be made to support the consistency of interest subscale of Duckworth's grit scale. Another potential indication of this upward trend in academic performance could be that appropriate supports offered by the Department of Agricultural Sciences are resulting in a positive effect. Once again, though, this change is not significant, and therefore these assumptions may not be valid.

However, the choice to be an agricultural science major was positively and significantly correlated to grit and involvement ($r = .232, p < .01$; $r = .136, p < .05$). Conventional wisdom and popular opinion suggests individuals with a rural background and with rural interests might be more invested in the community and might be more predisposed to hard work. The Department of Agricultural Sciences focuses on student retention through the development of an involved culture, as evidenced by the various student programs offered. Therefore, researchers were not surprised that a positive association existed between the choice to be an agriculture major and involvement, as this indicated agricultural science majors were more likely to be involved in meaningful campus activities. Grit is synonymous with work ethic in this context. Popular culture in the agriculture industry and in the Department of Agricultural Sciences puts a high value

on work ethic. Additionally, students from agricultural backgrounds likely had to practice persevering through obstacles in daily life. These two assumptions could explain the increased grit score in agricultural science versus non-agriculture students. First, this might be inflated due to the social desirability bias which might be present in an industry that places so much emphasis on hard work. Secondly, if grit as a personality trait is as dynamic as Duckworth (2007) asserted, then there is the potential that individual experiences have allowed students in the Department of Agricultural Sciences to grow grit.

As previously discussed, hours of involvement was significantly and positively correlated to grit and major selection. However, hours of employment expressed the only significant negative correlation. The comparison of actual hours of involvement and employment hours produced a Pearson r -value of -0.193 ($p < .01$). While this is still a low negative association, it is supported by Astin's assertion of time's finite characteristics within the 1984 Theory of Involvement. If students devoted a certain amount of time to a job, those hours cannot be devoted to campus involvement or academic pursuits.

Implications

Understanding the characteristics that might influence freshmen attrition is critical to implementing appropriate and effective supports to students. These characteristics might help West Texas A&M University and the Department of Agricultural Sciences flag students who could require more support to prevent drop-out and attrition.

Criticisms in literature concerning the relatively low predicative validity of college admissions criterion to retention were disproved within the scope of this study. High school GPA and ACT scores were the two admissions criterion analyzed. High

school GPA is thought to be influenced by both cognitive ability and by non-cognitive factors, such as grit and other traits mentioned within this study (Duckworth et al., 2007). For this reason, it was not considered a true measure of intelligence alone. This variable also acts as the best standalone predictor of retention in several studies (Chang, 2014; Duckworth et al., 2007; Garton et al., 2000; Kuh et al., 2010). While high school GPA was significantly correlated at $r = .113$ ($p < .05$), it was not the strongest association.

The highest correlation to retention was found in ACT scores, which was used to determine intelligence ($M = 21.61$, $SD = 3.63$). Considering freshmen at West Texas A&M University scored in accordance with national averages, it can be assumed these students are relatively intelligent. Duckworth (2007) hypothesized amongst relatively intelligent individuals, students compensate by working harder, and therefore, develop a greater aptitude for grit.

The researchers had anticipated that grit might be significantly related to retention. However, the relationship found within this study was negligible and non-significant ($r = .06$, $p = .27$). Credé, Tynan, & Harms's (2017) meta-analysis indicated that in general, grit is moderately associated with retention and academic achievement (p. 502). There is reason to believe that because this study utilized first semester retention rather than the generally accepted measure of retention from a student's first to second year, the attrition rate is too low to accurately depict grit's effect on the 2018/2019 freshman cohort's intent toward to persist. Still, there is value in determining and understanding a student's grit score, for both the individual and the institution.

Duckworth (2007) asserted grit can be grown. Students with low grit, then, have the ability to improve this non-cognitive facet. Marginal improvements in a person's

predisposition to overcome setbacks in the attainment of goals may influence the decision to persevere (Credé et al., 2017). Policies that support these types of improvements in a higher-education setting may have the potential of positively impacting thousands of college students. Educating students about individual tendencies toward long-term goal attainment is the first step in helping students address potential gaps in their ability to overcome adversity.

Involvement is an important facet in predicting retention. Tinto (1973; 1975), Astin (1984), Braxton (1997), Kuh (2010), and several others have affirmed social integration is key to the attrition decision. Hegedus and Knight (2002) listed the benefits of involvement as opportunities for students to connect with faculty, network with peers, and strengthen leadership and communication skills. However, involvement is a sequential process and occurs over time (Astin, 1984). The survey instrument was distributed early in the semester and asked several questions about the participant's involvement. Therefore, the two artifacts utilized in this study reported 1) actual hours involved in campus activities and 2) the individual's perceived level of involvement, or desire to be involved in campus activities. The first indicated actual amount of time that a student devoted to student engagement activities. The second indicated a student's desire to be involved on campus. The researchers felt both of these measures were important to accurately illustrate the involvement of 2018/2019 freshman cohort. The assumption was made that upon the time of survey distribution, students may not have had the opportunity to be as involved as desired, so the perceived involvement rating was used for descriptive purposes. This rating was not determined as face valid, though, so was excluded from the correlation test amongst other variables.

In examining the correlation between actual hours involved and retention, the two were not significantly correlated. While the association found was positive, it was negligible and almost low, according to Davis's 1971 correlation guidelines ($r = .084$, $p = .119$). Although hours involved was not significantly correlated, these invested hours can still lead to an increased feeling of belonging, which is an important factor in the drop-out decision (Tinto, 1975). Additionally, if students are not involved enough for this factor to have a statistically significant effect on retention, the question then becomes whether this is due to a lack of student initiative for engagement or lack of the institutional offerings of valuable opportunities for involvement. The significant correlation between involvement hours and if the individual is an agricultural science major may show that the Department of Agricultural Sciences offers such opportunities. The culture of purposeful student engagement and the various number of student organizations tailored to academic interest areas supply freshman students with ample opportunities, and even an expectation, to be involved.

Despite grit's lack of significance, a striking phenomenon was observed between influencing variables not considered in the main constructs of this study. Grit was significantly correlated to hours of involvement and to first semester GPA. First semester GPA also expressed the strongest association to ACT scores and to retention, and was significantly correlated to both at a level of $p < .01$. Although grit did not have a directly significant effect on retention between the first and second semester of West Texas A&M University's 2018/2019 freshman class, there is reason to believe that it might have a mediating effect on retention if measured between the first and second year of the cohort.

Recommendations

It should be noted, first and foremost, the results of this study were primarily descriptive and utilized correlations to determine relationships between identified variables. Any application or generalization of the findings and assertions determined herein should be applied with caution. The following are recommendations for such applications of the research, as well as for continued research over the topic of retention at West Texas A&M University and within the Department of Agricultural Sciences.

1. In order to more accurately depict the potential effect that variables like intelligence and involvement might have on freshmen attrition, retention should be determined between the first and second year of college for the 2018/2019 freshman cohort. This will also align the findings and assertions of this study with mainstream retention research, allowing it to be utilized by other institutions interested in exploring freshman retention.
2. Due to the transparency of the grit scale, caution should be exercised in using grit in high-stakes settings. Additionally, personality inventories as a whole are tools that should be used to help individuals and interested parties mature and develop non-cognitive aptitude. Using these instruments in high-stakes settings, such as admissions or hiring decisions, is not always a reliable way to determine consistent results.
3. In spite of these precautions, grit and related curriculum can provide a valuable tool in helping students realize personal tendencies and grow passion and perseverance in the pursuit of goals. The Department of Agricultural Sciences has the unique opportunity to pilot these types of supports in AGRI 2300 leadership classes. Adding grit to the curriculum of these courses could benefit students, the

department, and the institution if even marginal improvements were made. The benefit of incorporating grit development within curriculum may also be realized without obtaining every student's individual grit score. While this may be an important tool for effective instruction, it is not a necessity for the overall development of character in freshmen students. Growing grit could improve student propensity for focused perseverance, campus involvement, and, ultimately, retention rates.

4. The initial anticipation of grit's effect on student success was moderated by the limited amount of time the study was conducted over. The construct of grit measures success in regards to long-term goals. It can be assumed students enroll in institutions of higher education in order to receive a degree. Retention and persistence are relatively short-term goals that are a subset of the long-term goal of graduation. Therefore, in order to accurately determine grit's effect on academic achievement, this study should be extended throughout the 2018/2019 freshman cohort's college career to graduation. Additionally, Duckworth suggested grit grows with age as individual personalities solidify and they have more opportunities to learn from overcoming setbacks (2007). As students progress in their college career, grit scores are likely to grow and better predict academic prowess.
5. In continued research and the further application of this instrument, it is recommended a more effective measure of involvement be utilized. Such a measure should have face validity and tested reliability in measuring both a desire

for involvement and actual time spent involved in meaningful educational activities outside of the classroom.

6. The most striking variable not considered in the constructs of this study was first semester GPA. However, this variable had the strongest relationship to retention and was a critical part of describing the first-year experience for 2018/2019 freshman class. Further research should explore the effects of first semester GPA on retention and its value in developing purposeful and appropriate intervention policies in regard to freshman retention rates.
7. Although this study sought to identify factors that influence retention in order to provide effective supports, current supports and intervention policies offered by West Texas A&M University and the Department of Agricultural Sciences should be examined first. This might help identify the best way to implement the findings of current and future research on student intelligence, involvement, and grit. Institutions have an obligation to deliver students opportunities to be successful in higher education, both in and out of the classroom. Therefore, the implementation of such retention efforts must add real value to the college experience through effective programming and the provision of meaningful experiences.

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APPENDIX A

Survey Instrument

Informed Consent

This study will further explore relationships of “grit”, which is defined as passion and perseverance over long-term goals, to academic achievement and engagement, two constructs which are currently relied upon to increase freshman first semester retention at West Texas A&M University.

Procedures: Participants will be asked to complete approximately 20 questions pertaining to personality traits and student involvement, on and off campus. The questionnaire will take approximately 10 minutes. This questionnaire will be conducted with an online Qualtrics-created survey. Below is a number of questions and statements that may or may not apply to participants; the student simply ranks how the statement or question appropriately applies to them. Questions are designed to determine the relationship between how “gritty” the individual is and their success during this first semester. There are no right or wrong answers, so the subjects will be asked to answer honestly how they feel they perform in comparison to other people. Additionally, students will be assigned a random number that will be recorded within the survey instrument so university data can be compared to their responses. At the end of the survey, you’ll get a score that reflects how passionate and persevering you see yourself to be. By completing the survey, the subject has provided consent to the participation in the study. The informed consent will be accessible in the original e-mail sent out to students.

Risks/Discomforts: There are no direct risks for participants.

Benefits: The participant will be assigned a grit score, which, like most other personality tests, is meant to help the individual become more self-aware. Hopefully, the student can use this information to take on a growth mindset and develop “grit” in their pursuit of success throughout their college career. Additionally, it is hoped that through your participation, researchers will be able to better understand what motivates students to be successful and teach them the skills they need to be achieve their goals and complete their college career.

Confidentiality: All data obtained from participants will be kept confidential and will only be reported in an aggregate. All questionnaires will be concealed, and no one other than then primary investigator and assistant researchers listed below will have access to them. All personal, identifying, and academic information will be protected and remain undisclosed. The data collected will be stored in the **FERPA**-compliant, Qualtrics-secure database until it has been deleted by the primary investigator.

Compensation: There is no compensation outside of the receipt of a grit score.

Participation: Participation in this research study is completely voluntary. You have the right to withdraw at any time or refuse to participate entirely. If you desire to withdraw, please close your Internet browser. If under the age of 18 years old, please exit out and close you Internet browsers.

Questions about the Research: If you have questions regarding this study, you may contact Janine Johnson, jjohnson@wtamu.edu , or Dr. Kevin Williams, kwilliams@wtamu.edu.

Additional questions may be addressed to Dr. Angela Spaulding, Vice President for research and compliance and Dean of graduate studies.

Questions about your Rights as Research Participants: If you have questions you do not feel comfortable asking the researcher, you may contact the West Texas A&M University Institutional Review Board for the Protection of Human Subjects, Office of Research Services, or call (806) 651-2732. As a research participant if you would like access to the findings of this study please e-mail Janine Johnson, jjohnson@wtamu.edu, or Dr. Kevin Williams, kwilliams@wtamu.edu.

1. Buff ID Number: _____
 - a. This number will not be disclosed outside of this study and will be kept entirely confidential.

Below is a number of questions and statements that may or may not apply to you; simply rank how the statement or question appropriately applies to you.

2. I have overcome setbacks to conquer an important challenge.
 - a. Very much like me
 - b. Mostly like me
 - c. Somewhat like me
 - d. Not much like me
 - e. Not like me at all
3. New ideas and projects sometimes distract me from previous ones.*
 - a. Very much like me
 - b. Mostly like me
 - c. Somewhat like me
 - d. Not much like me
 - e. Not like me at all
4. My interests change from year to year.*
 - a. Very much like me
 - b. Mostly like me
 - c. Somewhat like me
 - d. Not much like me

- e. Not like me at all
- 5. Setbacks don't discourage me.
 - a. Very much like me
 - b. Mostly like me
 - c. Somewhat like me
 - d. Not much like me
 - e. Not like me at all
- 6. I have been obsessed with a certain idea or project for a short time but later lost interest.*
 - a. Very much like me
 - b. Mostly like me
 - c. Somewhat like me
 - d. Not much like me
 - e. Not like me at all
- 7. I am a hard worker.
 - a. Very much like me
 - b. Mostly like me
 - c. Somewhat like me
 - d. Not much like me
 - e. Not like me at all
- 8. I often set a goal but later choose to pursue a different one.*
 - a. Very much like me
 - b. Mostly like me
 - c. Somewhat like me
 - d. Not much like me
 - e. Not like me at all
- 9. I have difficulty maintaining my focus on projects that take more than a few months to complete.*
 - a. Very much like me
 - b. Mostly like me
 - c. Somewhat like me

- d. Not much like me
- e. Not like me at all

10. I finish whatever I begin.

- a. Very much like me
- b. Mostly like me
- c. Somewhat like me
- d. Not much like me
- e. Not like me at all

11. I have achieved a goal that took years of work.

- a. Very much like me
- b. Mostly like me
- c. Somewhat like me
- d. Not much like me
- e. Not like me at all

12. I become interested in new pursuits every few months.*

- a. Very much like me
- b. Mostly like me
- c. Somewhat like me
- d. Not much like me
- e. Not like me at all

13. I am diligent.

- a. Very much like me
- b. Mostly like me
- c. Somewhat like me
- d. Not much like me
- e. Not like me at all

The previous questions were related to your personal preferences and tendencies. The following questions are in regards to your general busy-ness as a college student. The questions will range from extra-curricular involvement to employment.

14. Please rate how involved you are/want to be involved in extracurricular activities on campus?

- a. 1 (not involved at all)
- b. 2
- c. 3
- d. 4
- e. 5 (heavily involved in several extra-curricular activities across campus)

15. How many clubs/organizations are you involved in?

- a. 0
- b. 1
- c. 2
- d. 3
- e. 4+

16. Are you involved in any co-curricular programs? (e.g. Buff Mentor, Honors, Theater, The Prairie, etc.)

- a. Yes
- b. No
 - i. [If participant answered “yes” to the previous question] How many programs are you involved in?
 - 1. 1
 - 2. 2
 - 3. 3
 - 4. 4+
 - ii.

17. Are you on any competitive or athletic teams?

- a. Yes
- b. No
 - i. [If participant answered “yes” to the previous question] How many hours per week do you commit to your team?
 - 1. _____

18. How many **total** hours per week are you committing to campus activities, outside of class?

- a. 0
- b. 1-3
- c. 4-6
- d. 7-9
- e. 10+

19. Are you currently employed?

- a. Yes
- b. No

i. [If participant answered “yes” to the previous question] Are you employed on campus?

- 1. Yes
- 2. No

ii. [If Yes to Question 19) How many hours per week do you work?

- 1. Less than 5
- 2. 5-10
- 3. 10-15
- 4. 15-20
- 5. More than 20

If you would like your grit score emailed to you, along with more information about improving grit, please provide you **WTAMU student email address:**

APPENDIX B



WTAMU Institutional Review Board for Human Subjects

Closeout Letter

May 6, 2019

Kevin Williams
2901 4th Ave.
Canyon, TX 79016

Dear Dr. Williams,


IRB Committee Close-Out Study No: 06-09-18
Titled: "Engagement, Academic Achievement, and Grit as Components of College Freshman Success"

The above referenced study has been reviewed and approved for final close-out by the West Texas A&M University Institutional Review Board for Human Subjects (IRB). This close-out is based on your report that the study was completed on March 15, 2019. The IRB has determined that you have fulfilled the requirements of your IRB proposal.

If you need additional time to complete your research, you must resubmit the study by submitting a new application as outlined in Standard Operating Procedure 15.99.05.W1.01AR WTAMU Institutional Review Board.

Thank you for your cooperation with the IRB and we wish you well in your research.

Sincerely,



Dr. Gary Bigham
Chair, WTAMU IRB

APPENDIX C

Panel of Experts:

Dr. Kevin Williams, Ed.D.
Associate Professor of Agricultural Education
Department of Agricultural Sciences
West Texas A&M University

Dr. Tanner Robertson, Ph.D.
Associate Professor of Agricultural Communication
Department of Agricultural Sciences
West Texas A&M University

Dr. Troy Tarpley, Ph.D.
Associate Professor of Agricultural Communication
Department of Agricultural Sciences
West Texas A&M University

APPENDIX D

Communication to Students

Initial Email:

Hello Buffs!

Below is the link to a survey that is being conducted to improve our students' freshman year experience. We feel that it is important to understand our students in order to help them be successful, and that's what this study aims to do!

I have attended and presented to several of your freshman IDS and AGRI 2300 classes about this topic. If you completed the survey in that class, I simply ask that you not take the survey again in order to keep the answers more accurate. If you are unsure if you completed this survey, please feel free to complete it again!

Participation in this research study is completely voluntary. You have the right to refuse or withdraw entirely, at any time without any jeopardy to your academic status or university standing. If you desire to withdraw, please simply close out the internet window that the survey is located on.

Please take 5-10 minutes to complete this survey and help us serve our students better!

Please Note: The survey will close on November 21st at 5:00PM.

Follow this link to the Survey:

[Take the Survey](#)

Or copy and paste the URL below into your internet browser:

https://wtamuw.az1.qualtrics.com/jfe/form/SV_bqhL9WU3N5vWTQ1?Q_DL=0GStH4B06sBwtJb_bqhL9WU3N5vWTQ1_MLRP_3DGzoiPoKKI4UXH&Q_CHL=email

Please remember that once all surveys have been collected, I will be sending out your grit scores! For more information on Grit, click [here](#).

Many thanks in advance,

Janine Johnson

Reminder Email:

Subject: Have You Completed the "Grit" Survey?

Hello!

I know that most of us are gearing up for Thanksgiving Break right now, however, I would like to remind you that the grit survey that I distributed on November 8th closes **tomorrow at 5:00 PM**. If you haven't had a chance to complete the survey yet, please take a moment to do so now.

Participation in this research study is completely voluntary. You have the right to refuse or withdraw entirely, at any time without any jeopardy to your academic status or university standing. If you desire to withdraw, please simply close out the internet window that the survey is located on.

Please take 5-10 minutes to complete this survey and help us serve our students better!

Follow this link to the Survey:

[Take the Survey](#)

Or copy and paste the URL below into your internet browser:

https://wtamuw.az1.qualtrics.com/jfe/form/SV_bqhL9WU3N5vWTQ1?Q_DL=0GStH4B06sBwtJb_bqhL9WU3N5vWTQ1_MLRP_3DGzoiPoKKI4UXH&Q_CHL=email

Please remember that once all surveys have been collected, I will be sending out your grit scores! For more information on Grit, click [here](#).

Thank you again for your time and participation!! Enjoy your Thanksgiving Break!

Janine Johnson

Thank you Email:

Happy Thanksgiving Buffs!

This year, I am thankful for you! I truly appreciate your time and participation in helping

me complete my research measuring "grit" within the freshman class. I am hoping to have grit scores to you in the next week.

If you want to learn more about grit as a personality construct, please click [here](#).

Please take advantage of this short break to get ready for the end of the semester! You are in the final stretch of your *very first* semester as a freshman; finish it strong!

Thank you again, and Happy Holidays!

Janine Johnson

Sample Score Email:

Hello Buffaloes!

You may remember seeing an email from me several months ago, or I might have come in and talked to your IDS or AGRI 2300 class in the fall. Since it's been a while, let me re-introduce myself. My name is Janine Johnson and I am a Master's student in Agriculture Education. For my thesis, I am conducting a study on grit as a personality trait, and comparing it to involvement and intelligence in the 2018/2019 freshman cohort. Over the past several months, I've been collecting and analyzing data, researching more literature about grit, involvement, and intelligence, writing all about my study, and trying to pass classes! I had wanted to provide each student with their grit scores at the end of the study, along with some support on how to better develop a "growth mindset" and grow their grit. However, the survey process was so successful, and you were all so good about responding to my survey, that I have been swamped simply analyzing scores. That being said, I have FINALLY calculated all the grit scores of respondents, and wanted to reach out to give you your grit score range, along with appropriate information.

Due to time and privacy constraints, I cannot disclose your exact score. **For an exact score, please click [here](https://angeladuckworth.com/grit-scale/) (link: <https://angeladuckworth.com/grit-scale/>) and complete Angela Duckworth's short grit scale** – it will take less than 5 minutes, and you never know, maybe you've become "grittier" since last fall!

Your Score: 4.00-4.50

Congratulations! You scored higher than at least 70% of Americans in a recent study, and have the fundamental dedication necessary to overcome setbacks as you pursue long term goals. However, while your grit score is relatively high, plateaus in progress, or boredom, might negatively impact your "stick-to-it-ness". Look for ways to stay motivated when things become mundane to develop true content mastery! **For more**

information about grit, and how this can play into your life and your impact on the world, click the link below:

<https://angeladuckworth.com/qa/>

Thank you again for your help in my research; I'm hoping to channel some of your grit to help me get it completed!

APPENDIX E

Classroom Presentation Outline:

1. Introduction of study (1-2 Minutes)
2. Read Informed Consent (1 Minute)
3. Administer Survey (10-15 Minutes)
4. Grit Presentation (10 Minutes)
 - a. Angela Duckworth TEDTalk
 - b. Thought questions:
 - i. What are some other words for grit?
 - ii. Do you know talented people who don't have grit?
 - iii. Do you think you have talent? What are you talented at?
 - c. Developing a grit score
 - d. Ways to grow grit
 - e. Expert Practice video
5. Memory Game
6. Celebrate Success
7. Apply in Think-Pair-Share activity

APPENDIX F

Common Factor Analysis of Grit Scale With Promax Rotation

	Factor and Grit Scale item	Promax loading	Item-total <i>r</i>
Consistency of Interests			
	I often set a goal but later choose to pursue a different one. ^a	.61	.51
	New ideas and new projects sometimes distract me from previous ones. ^a	.77	.54
	I become interested in new pursuits every few months. ^a	.73	.59
	My interests change from year to year. ^a	.69	.51
	I have been obsessed with a certain idea or project for a short time but later lost interest. ^a	.66	.44
	I have difficulty maintaining my focus on projects that take more than a few months to complete. ^a	.47	.62
Perseverance of Effort			
	I have achieved a goal that took years of work.	.65	.62
	I have overcome setbacks to conquer an important challenge.	.68	.53
	I finish whatever I begin.	.54	.68
	Setbacks don't discourage me.	.58	.59
	I am a hard worker.	.44	.70
	I am diligent.	.64	.82

Note. The last column displays the corrected item-total correlations for each item with its respective factor (i.e., either Consistency of Interests or Perseverance of Effort).

^a Item was reverse scored.