# THE CHALLENGE OF COMMUNITY COLLEGE STUDENT ACADEMIC MOTIVATION: THE *GO FOR GROWTH!* INTERVENTION

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## ABSTRACT

Jonathan Clark Wright: The Challenge of Community College Student Academic Motivation: The *Go for Growth!* Intervention
(Under the direction of Steve Knotek and Judith Meece)

The community college student population has been found to be less academically prepared than their four-year counterparts. This relatively at-risk group is argued to struggle with academic motivation in the college setting. Researchers studying student implicit theories of intelligence have found that students who struggle in academia may do so because of maladaptive beliefs about the nature of their own intelligence. Students who struggle tend to believe their intelligence is stable (i.e. have a "fixed" mindset) whereas students who see their intelligence as malleable (i.e. have a "growth" mindset) have been found to have more adaptive behaviors that are more conducive to learning. Students' goals in the academic context are important, as students with "mastery" orientations (who set goals for learning) had greater persistence and success than students with "performance" orientations (who set goals for *showing* learning or *not showing* a lack of learning). The present study was designed to assess whether an intervention targeting community college students' implicit theories of intelligence was effective in a large southeastern community college at increasing students' academic success, level of growth mindset, and level of mastery goal orientation. Results following implementation of the Go for Growth! intervention suggested that instructors found the intervention easy and worthwhile to implement and found some indications that students receiving the intervention have greater academic success in the course containing intervention, although the theory suggesting that this occurs through improving levels of growth mindset and

mastery orientation was not supported. It was also noted that instructors had a significant influence on their student's grades, which might indicate that the intervention may also have impacted the perceptions of the instructors regarding student grades.

To my loving wife, Allie Arpajian, thank you for your endless joy, love, and support. To my parents, Denis Wright and Nancy Wright, and my sister, Meredith Wright thank you for your love, passion for learning, and encouragement.

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# CHAPTER 1: INTRODUCTION AND LITERATURE REVIEW

Community college students comprise a large portion (45%) of the undergraduate students in the United States (Knapp, Kelly-Reid, & Ginder, 2012), with approximately 40% enrolled full-time and 60% enrolled part-time (Knapp et al., 2012). This represents a total of 12.3 million students enrolled in community colleges (in fall 2014) (American Association of Community Colleges [AACC], 2016). These students have less academic success as measured by degree attainment and retention than their four-year college counterparts. Community college staff have employed programming to improve success for students, but academic success rates for students remain low (Jaggars & Xu, 2010; Jaggars & Xu, 2011; Shapiro, Dundar, Yuan, Harrel, & Wakhungu, 2014).

Two widely used methods designed to combat community college students' disproportionate academic difficulties include remedial education (Bailey, Jeong, & Cho, 2010; Kolajo, 2004), which are efforts colleges make to bring students from below necessary academic standards to meet them, and new student orientation activities (Hollins, 2004; Hollins, 2009; Sidle & McReynolds, 1999) designed to help new college students adjust to the college setting. However, these efforts have been found to be insufficient to promote academic success for all (or even most) students (Bailey et al., 2010; Hollins, 2009; Jaggars & Xu, 2010; Jaggars & Xu, 2011; Shapiro et al., 2014).

One factor that may contribute to the relatively poor academic performance of community college students is poorly developed social and emotional learning (Crick & Dodge,

1994; Elias et al., 1997; Weissberg, Durlak, Domitrovich, & Gullotta, 2015), which includes behaviors and cognitions that are not purely academic, but still contribute to student success (e.g. work habits, emotion regulation, and strength of interpersonal relationships). Of these "non-cognitive" abilities, academic motivation (starting and maintaining behaviors and cognitions relating to academic success) has been found to significantly predict student success (Becker, McElvany, & Kortenbruck, 2010; Robbins, Lauver, Le, Davis, & Langley, 2004), and is likely to be malleable in students (Bempechat, London, & Dweck, 1991; Blackwell, Trzesniewski, & Dweck, 2007; Mueller & Dweck, 1998). More specifically, interventions that target students' implicit theories of intelligence have yielded large effects on the level of growth mindset (the implicit belief that effort and time can improve intelligence in an area).

Researchers have also found that students who more greatly endorse growth mindsets tend to have greater academic success, although the majority of this research has been conducted with students in primary and secondary levels (McCutchen, Jones, Carbonneau, & Mueller, 2015; Mueller & Dweck, 1998; Romero, Master, Paunesku, Dweck, & Gross, 2014; Shively & Ryan, 2013). There has been little research on how growth mindset interventions may help to improve academic success in college-aged populations, despite the possibility that these interventions may provide another avenue to help community college students find academic success.

**Statement of the Problem**

Despite the large number of students enrolled in community colleges, a large portion of first-time community college students do not experience academic success, with national rates of certificate, associate's, or bachelor's degree attainment at 39.1% within six years (Shapiro et al., 2014). Community college students also struggle with persistence from one semester to the next

as 25% of first-time students enrolling in the fall do not persist to the spring semester, and of those who do enroll in the subsequent spring semester, approximately 20% do not return for the following fall semester, resulting in a net loss of 40% of the initial cohort of students from the first fall semester to the second fall semester (Jaggars & Xu, 2010; Jaggars & Xu, 2011). According to the National Center for Education Statistics [NCES] (2014a), approximately 57% of students enrolling for the first time at four-year institutions obtain bachelor's degrees within six years. A similar statistic for community college students shows that only 20% of students attain any degree or certificate within 150% of the time it normally takes to receive that degree (e.g., for a 2-year associate's degree, completion within 3 years; NCES, 2014b). The differences between graduation rates for community colleges and public four-year institutions are likely due in large part to the selectivity of the institution, as the majority of community colleges are open-access institutions (allowing all students who apply to attend) whereas the majority of public four-year institutions have at least some selectivity criteria. Data from NCES (2014a) found that even among four-year institutions, selectivity criteria predicted student graduation rates such that, among open-access four-year institutions 33% of students obtained a bachelor's degree within six years while 86% of students attending public four-year institutions with an acceptance rate lower than 25% received a bachelor's degree within six years. Interestingly, this figure still suggests that open-access four-year institutions have greater degree attainment (33%) than community colleges (20%).

Retention rates differ between community college and public four-year institutions as well, as retention rates from the first-fall to the second-fall averaged 79.1% at four-year institutions (compared to 60% at two-year institutions) (National Student Clearinghouse Research Center [NSCRC], 2014). This may be due in part to research suggesting that the

proportion of students who belong to groups that are particularly vulnerable to difficulties with transition to college, adaptation to the lifestyle of college, and eventual retention is much higher in community colleges than at four year institutions (Adebayo, 2008; Aspelmeier, Love, McGill, Elliot, & Pierce, 2012; Engle & Tinto, 2008; Petty, 2014; Smith & Zhang, 2011). These vulnerable groups include: minority students, first-generation college students (the first in their family to attend college), and students with disabilities. Approximately 52% of all low-income first-generation college students attend public two-year colleges as compared to 35% of students who are neither low income nor first-generation students (Engle & Tinto, 2008). First-generation, low-income students are also more likely to have a disability, which is another risk factor associated with transition and retention problems (Engle & Tinto, 2008). To further understand the difficulties faced by many community college students, it is important to understand who these students actually are.

**Characterizing community college students.** American community college students enrolled in credit-seeking programs are predominantly white (49%), followed by Hispanic (22%), black (14%), Asian/pacific islander (6%), other/unknown (4%), two or more races (3%), Native American (1%), and nonresident alien (1%) (AACC, 2016). Fifty-seven percent of community college students enrolled in credit-seeking programs are female, and the average age of a community college student is 28 (AACC, 2016). Approximately 62% of full-time community college students are employed (22% full-time), and 73% of part-time students are employed (41% full-time) (AACC, 2016). Fifty-eight percent of community college students receive financial aid to attend school, despite the average annual tuition and fees costing them $3,430 (compared to $9,410 for public in-state tuition costs at four-year colleges and universities) (AACC, 2016). Thirty-six percent of community college students are first-

generation college students, seventeen percent of community college students are single parents, and students with disabilities make up 12% of community college students as well (AACC, 2016). Clearly, community college students are a diverse group with many risk factors for academic failure. Many students who enroll at community colleges also find themselves underprepared for the academic expectations of the institutions. One of the primary methods that community colleges use to help students who are underprepared is through developmental (remedial) education.

**Developmental Education**. Developmental education is one strategy employed at colleges to help underprepared students as they enter their institutions. In order to assess the level of proficiency in math, reading, and writing of incoming college students, 92% of community colleges around the country use standardized placement exams. The most commonly utilized placement exams are the ACCUPLACER by the College Board and the COMPASS test by ACT (Hughes & Scott-Clayton, 2011). Students' scores on the standardized placement exam often determine whether they must take between zero and four remedial courses (in reading, writing, and mathematics) to reach "college level" coursework in many subject areas, including courses in subjects other than English and mathematics. In 2010, Bailey et al. published an article that found an average of 59% of entering community college students were referred for remedial (or "developmental") math and 33% were referred for remedial reading courses.

Students taking developmental courses have been shown to have reduced success rates, both in their overall GPAs and in the number of semesters taken to graduate (Bailey et al., 2010). Interestingly, however, there is some evidence that students only required to take developmental courses in one area (e.g., reading only) take longer to graduate, but have GPAs that are similar to those students not required to take any developmental courses (Kolajo, 2004). Students who are

required to take two or more developmental courses, however, show significantly decreased rates of success, taking, on average, three additional semesters to graduate, and having an average GPA of 2.86 compared to 3.25 for those not required to take any developmental courses or those taking only one course (Kolajo, 2004). Additionally, only 46% of students referred to developmental reading and 33% of those referred to developmental math actually complete their sequence of developmental education within three academic years (Bailey et al., 2010). Rates of referrals for developmental education are significantly lower in the four-year college student population, with approximately 30% of students referred to at least one developmental course (NCES, 2012).

Students taking developmental courses have also been shown to exhibit less adaptive forms of motivation (Morrison, 1999). Morrison (1999) found that students in developmental education exhibited lower willingness to sacrifice time and effort to succeed in their courses when compared to the entire freshman cohort. In addition, she found that a majority of students enrolled in developmental courses fell below the freshman mean on their enjoyment of the learning process, a measure synonymous with intrinsic motivation. Morrison (1999) also found that students' academic self-confidence (one's perception of one's ability to perform well in school, particularly in testing situations) was similarly below the freshman mean. Interest and confidence in one's ability have also been found to be important predictors of academic performance (Wigfield & Eccles, 2000). Thus, low levels of interest and confidence may partially explain the relatively weak academic performance of college students in developmental courses. Intervening with students as they enter the start of their community college education may promote their success, however, it does not appear that developmental education alone is sufficient to help foster academic success for many "at-risk" students.

**New Student Orientation.** Hollins (2009) described new student orientation as any efforts that are made by college support staff to aid students in transitioning from high school (or workplace) to college. College students may attend new student orientations, which have been found helpful for students who are academically underprepared (Cuseo, 1997; Glass & Garrett, 1995; Hollins, 2009). Two primary forms of orientation exist at colleges. Students may attend "assembly hall" events which last between 2-4 hours, and/or they may enroll in a preparedness "course", which is typically a one-credit course offered to freshman during their first semester. The major functions and goals of new student orientation are to improve academic readiness of students and assist students with social and life adjustments (Hollins, 2009).

Hollins (2009) found that students participating in new student orientation had better academic outcomes (GPA, retention) than students who did not. Other studies have supported these findings (e.g., Brunelle-Joiner, 1999; Busby, Gammel, & Jeffcoat, 2002; Starke, Harth, & Sirianni, 2001; Yarbrough, 1993), although the results of other studies have shown inconsistent results (e.g., Boudreau & Kromrey, 1994; Stewart, 1997; Green & Miller, 1998). This inconsistency may be a result of the variability in quality and type of orientation programs as well as whether institutions make new student orientation mandatory or optional for new students. It has been shown that students attending new student orientation are more likely to persist from semester-to-semester (e.g., Hollins, 2004; Hollins, 2009; Sidle & McReynolds, 1999). These findings suggest that new student orientation may be a viable vehicle for delivering important and useful information to help community college students adjust to the unique and novel challenges that college presents, and careful consideration must be made to determine what information should be included in these sessions and how this information should be presented. One such area that may be important to include in new student orientation

(though it is rarely formally included) and that has shown promise for students is through targeting their social and emotional learning (Crick & Dodge, 1994; Elias et al., 1997; Weissberg et al., 2015).

**Social and Emotional Learning (SEL)**

One area that has shown promise for improving academic success is through student social and emotional learning (SEL), which is defined as the acquisition of knowledge, skills, and attitudes that: enhance personal development, promote work habits that are ethical and productive, and help to create and maintain positive interpersonal relationships (Weissberg et al., 2015). SEL is a broad term that encompasses many academic behaviors. Specific SEL behaviors that relate to student academic motivation include: understanding one's own strengths and limitations, having realistic self-efficacy and optimism, and perseverance through challenges (Crick & Dodge, 1994; Elias et al., 1997; Weissberg et al. 2015). Most research on SEL has been conducted with students in K-12 settings, despite the fact that college students have been found to be one of the most vulnerable populations in terms of social and emotional adjustment (Adlaf, Gliksman, Demers, & Newton-Taylor, 2001; American College Health Association [ACHA], 2011; Stallman, 2010; Stewart-Brown et al., 2000). Moreover, SEL has been found to be significantly predictive of academic success in college students (Gerdes & Mallinckroct, 1994; Parker, Hogan, Eastabrook, & Wood, 2006; Pritchard & Wilson, 2003; Ramos-Sánchez & Nichols, 2007), highlighting its importance in this population.

The efforts made by college personnel to foster academic success have been insufficient at the community college level to create success for most students. SEL is not widely taught or focused on in the community college setting, despite its relatively strong adoption in the K-12 setting (Conley, 2015). The importance of social and emotional learning in the United States is

made clear in state policy, as all 50 states have adopted preschool-level social and emotional development standards, and many states have also developed more comprehensive social and emotional learning standards. One state, Illinois, has even developed standards for SEL that extend from preschool to high school. Direct evidence has been found suggesting that SEL interventions may be effective for college students (Jones, 2004; MacLeod, Coates, & Hetherton, 2008; Mattanah et al., 2010; Oman, Shapiro, Thoresen, Plante, & Flinters, 2008; Shapiro, Oman, Thorsensen, Plante, & Flinters, 2008). SEL interventions have been shown to be effective for students at all ages, and may be a particularly powerful addition to the community college setting.

**Malleable forms of social and emotional learning.** Five domains of social emotional competence have been proposed by researchers through the Collaborative for Academic, Social, and Emotional Learning (CASEL) (Weissberg et al., 2015). This theoretical framework for social and emotional learning was based on prior research on SEL (Durlak, Weissberg, Dymnicki, Taylor, & Schellinger, 2011; Durlak, Weissberg, & Pachan, 2010; Jennings & Greenberg, 2009; Jones & Bouffard, 2012; National Research Council [NRC], 2012; Zins, Weissberg, Wang, & Walberg, 2004). Two of these domains are of particular relevance to the current study, as they directly relate to student academic motivation. The first is the self-awareness domain, which involves the ability to understand one's own emotions, goals, and values (Weissberg et al., 2015). The specific SEL skills involved in the self-awareness domain include having positive mindsets, understanding one's own strengths and limitations, and having realistic self-efficacy and optimism. This domain is relevant to student academic motivation because students' thoughts and feelings about their own academic abilities directly contribute to their motivation (Bandalos, Finney, & Geske, 2003; Diseth, 2011; Dweck & Leggett, 1988;

Hoyert & O'Dell, 2009; McCutchen et al., 2015; Sakiz, 2011). The second is the self-management domain, which includes the abilities that are involved with the regulation of emotions and behaviors. Specific skills within the self-management domain include: delaying gratification, controlling impulsive behaviors, perseverance through challenges, and stress management (Weissberg et al., 2015).

Davis, Solberg, de Baca, and Gore (2014) found evidence that malleable forms of social and emotional learning can predict academic success. Specifically, they found that the perception of the importance of college in 8th grade was a meaningful predictor of both cumulative high school GPA and progress towards high school graduation. In addition, student motivation, classroom self-efficacy, health-related concerns, and academic stress (in 8th grade) also significantly predicted student progress towards graduation. Klem and Connell (2004) found that elementary school and middle school students who rate their teachers as providing classroom environments that are structured settings with high and clear expectations experience higher levels of academic engagement in school. In addition, they found that students who indicated that their teachers were more caring and friendly were also more likely to be more academically engaged. These findings suggest that SEL is a central component of academic success at the primary and secondary levels of education.

**Social and emotional learning in college students.** As stated by Conley (2015), the need for social and emotional learning does not end in high school, and SEL is an equally important part of the mission of institutions of higher education, since most colleges and universities strive to "educate students to be knowledgeable, responsible, socially skilled, healthy, caring, and contributing citizens" (Greenberg et al., 2003, p. 466). Compared to developmental and even clinical norms, students in higher education settings have been shown to

experience higher levels of stress, maladjustment issues, and mental health problems such as anxiety and depression (ACHA, 2011; Adlaf et al., 2001; Stallman, 2010; Stewart-Brown et al., 2000). This may be due to many characteristics of institutions of higher education, including: a lack of structure, increased academic demands, new social roles, and increased social and environmental pressures (Conley, 2015). More specifically, students usually transition away from externally focused responsibility (i.e., parent-guided) to more internally focused (i.e., self-guided) responsibility, and are also often adjusting socially to a new peer group, and are developing new kinds of relationships with faculty and staff, who may serve as parental figures (Conley, 2015).

Unsurprisingly, social and emotional learning has been shown to relate to student success in college. Parker et al. (2006) found a significant relationship between social and emotional factors (intrapersonal factors, interpersonal factors, adaptability, and stress) and rates of withdrawal from college. Pritchard and Wilson (2003) found that emotional factors (i.e. stress, self-esteem, and optimism) and social factors (i.e. use of alcohol, presence of romantic relationships, and membership in campus organizations) significantly predict student GPA, and that some emotional factors also predicted student retention (although to a lesser degree). Academic persistence has been found to be significantly related to social and emotional factors such as social support, self-beliefs, and comfort in the environment (Gloria & Ho, 2003). Moreover, student self-efficacy at the beginning of the first year of school has been shown to significantly predict college adjustment at the end of the first year (Ramos-Sánchez & Nichols, 2007). Gerdes and Mallinckroct (1994) found evidence that the social and emotional factors of personal adjustment of students to college as well as integration into the social "fabric" of the institution "play a role at least as important as academic factors in student retention" (p. 286).

For students who were not struggling academically, significant predictors of persistence have been shown to include: informal contact with professors, satisfaction with the quality of courses taken, and a sense of self-confidence (Gerdes & Mallinckrodt, 1994). For students who were struggling academically, significant predictors of retention were found to be: satisfaction with extracurricular activities, lack of anxiety, and an absence of thoughts about dropping out (Gerdes & Mallinckrodt, 1994). Social and emotional skills have been shown to have additional impact for students beyond academic outcomes, including: success at work, better mental health outcomes and well-being, and more positive interpersonal relationships (Bar-On, Handley, & Fund, 2006; Jordan & Ashkanasy, 2006; Lopes, Salovey, Coté, & Beers, 2005; Mayer, Salovey, & Caruso, 2004). Social and emotional learning is clearly an important factor in determining student success in college, but is it possible for educators to influence SEL in their students?

**Social and emotional learning interventions.** Although we know that social and emotional learning is vitally important to academic success, it is equally important to determine if it is possible to influence SEL in students through intervention. Social and emotional learning interventions are those that attempt to foster SEL behaviors using explicit instruction and student-centered learning in order to help students engage in the learning process. Through these techniques, students are supposed to develop skills in communication and collaboration as well as analytical skills that theoretically help them to succeed in academic settings (Weissberg et al., 2015). One of the most often utilized and effective forms of SEL intervention is through explicit teaching of social and emotional skills to students, which is often accomplished through the imbedding of SEL material within the ordinary course curriculum or within the school environment itself. One factor that helps to determine the success of explicit teaching SEL interventions is the success of integration within the curriculum, such that broad changes to

pedagogy and curriculum that support SEL interventions are related to more significant improvements in academic success (Jones & Bouffard, 2012; Merrell & Gueldner, 2010; Yoder, 2013; Zins et al., 2004).

Durlak et al. (2011) conducted a large meta-analysis of school-based universal social and emotional learning interventions for students in kindergarten through high school. They found strong evidence that participants in SEL interventions showed many positive outcomes, including: improved social and emotional skills, improved attitudes about themselves, improved attitudes about others, improved attitudes about school, greater levels of prosocial behavior, reduced conduct behaviors, reduced internalizing problems, and improved academic performance compared to controls. In fact, students that participated in SEL interventions also exhibited an 11-percentile point gain in achievement level on average compared to controls. Durlak and colleagues (2011) found that, in the few reviewed studies that included follow-up data, participation in SEL interventions showed significant (although reduced) effects for students after six months or more. Most current research on SEL interventions has been with students in primary or secondary education, although there is some research that supports the use of SEL interventions at the post-secondary level.

**Social and emotional learning interventions for college students.** In a large scale meta analysis of universal mental health promotion and disorder prevention programs in higher education institutions, Conley, Durlak, and Dickson (2013) found evidence that skill-oriented programs utilizing practice with supervision, mindfulness training, or cognitive-behavioral techniques were effective in improving social and emotional skills, self-perceptions, and emotional distress in college students. Student mindfulness has been shown to be significantly related to coping styles as well as perceived stress in college students (Palmer & Roger, 2009),

which may impact how students respond when faced with academic or other "life" challenges while in school. There is also evidence that mind/body interventions (which are similar to mindfulness interventions) can help to reduce levels of stress and anxiety in college students (Deckro et al., 2002).

Psychoeducational techniques for improving social emotional learning have also been shown to have effectiveness, although less so than skills-training programs (Conley, Durlak, & Kirsch, 2015). One type of psychoeducational intervention technique, freshman seminar courses, has been found to have success in improving academic outcomes when utilizing an SEL-centered curriculum (Wang, Wilhite, Wyatt, Young, & Bloemker, 2012). Wang and colleagues (2012) found that, when compared with students taking a traditional freshman seminar course, students in the SEL seminar course exhibited greater social and emotional learning and had higher GPAs than students in the traditional course. This academic impact was shown to last for four semesters following the intervention, suggesting that the SEL intervention had a positive and enduring impact on student academic success.

Social and emotional learning is clearly an important factor for academic success in the college setting, and it is clear that interventions designed to improve social and emotional functioning have proven to be effective for this population, despite their underutilization in the college setting. One specific area for intervention within the broad SEL framework that has shown promising results in improving student outcomes is student academic motivation.

**Need for Focus on Motivation**

Motivation is a broad topic that is loosely defined as the process involved when a goal-directed activity is begun and sustained (Schunk, Meece, & Pintrich, 2014, p. 5). Motivation has

been shown to be important in academic settings ranging from primary school to postsecondary institutions. Motivation for reading was found to be positively related to later reading literacy, and this relation was mediated by reading amount, meaning that children who are motivated to read tend to read more frequently and then develop better literacy skills as a result (Becker et al., 2010). Robbins et al. (2004) conducted a large meta-analysis of motivational factors in college students and found that having strong academic goals and academic self-efficacy (defined as beliefs and attitudes about their own abilities) were strongly related to college retention. Robbins and colleagues (2004) also found that achievement motivation (motivation to achieve success, overcome obstacles, and complete tasks) was strongly related to college GPA. Some aspects of academic motivation have also been found to have an impact on how students respond to challenges and ultimately utilize adaptive or maladaptive academic strategies (Bandalos et al., 2003; Dweck & Leggett, 1988; McCutchen et al., 2015; Sakiz, 2011).

Motivation requires either physical actions and/or cognitions that lead an individual towards a specific goal, and it is through environmental changes in these actions and/or cognitions that an individual's motivation may be increased or decreased. Both instigation and sustainment of the activity are equally important, and challenges to either may have an impact on one's motivation (Schunk et al., 2014). One form of cognition that impacts whether students are motivated in the classroom is self-concept, which is defined as students' beliefs and attitudes about their own abilities, and includes how they perceive themselves as students (Hattie, 1992).

Wigfield, Eccles, Mac Iver, Reuman, and Midgley (1991) found evidence of a decline in student self-concept in the transition from elementary to junior high, particularly in the subjects of math, English, and social activities. In addition, students also liked math and English less after transitioning to junior high school. They hypothesize this was due to the lack of social and

emotional learning-rich environments in junior high school as compared to elementary school. More recently, Ryan, Shim, and Makara (2013) found that the transition from elementary to middle school was associated with a decline in GPA as well as a decline in intrinsic value for schoolwork. Self-concept and effort in schoolwork have also been shown to decline across school years (from 3rd through 11th grade) (Yeung, 2011). Intrinsic academic motivation, defined as motivation to learn in a classroom due to the enjoyment and valuing of the course content or task itself, is another factor that has been found to decrease through primary and secondary school (Lepper, Corpus, & Iyengar, 2005; Spinath & Steinmayr, 2008).

When considering the implications of motivation and self-concept for community college students, it is important to recognize that despite the relative novelty of the college setting to these students, they carry experiences with education that span 13 years or more and are often filled with negative and/or de-motivating experiences. Through this long history of experiences, community college students have had many prior opportunities to develop thoughts, feelings, and beliefs surrounding what education is, how confident they are in themselves to be successful in an educational setting, and how they fit socially into that environment. Where do these thoughts, feelings, and beliefs come from, and how might educators promote the adoption of adaptive forms?

**Mastery and Performance Goals**

Achievement goal theory was a direct evolution of much of the work by Carol Dweck on learned helplessness (Diener & Dweck, 1978), and was more formally developed by Dweck, Carole Ames (Ames, 1992) & John Nicholls (Nicholls, Cobb, Wood, Yackel, & Patashnick, 1990). This theory explains that motivation is influenced by the source of one's goals, and that the type of goal combined with a particular result in the task results in predictable behavior.

More specifically, the original achievement goal theory states that two types of goals exist: mastery goals, where the individual is motivated by learning and mastering the subject/task, and performance goals, whereby one is motivated by being able to prove that one is capable of performing the task. These goals, when combined with success or failure at a task, then produce predictable results (Ames, 1992; Covington & Omelich, 1979; Elliot & Harackiewicz, 1996; Elliot & McGregor, 2001; Elliot & Thrash, 2001; Harackiewicz, Barron, & Elliot, 1998).

Students who adopt performance goals who then experience failure have been found to avoid putting forth much effort in the task in the future, to protect their perception of their ability and their self-efficacy in the area (Covington & Omelich, 1979). Achievement goals have been found to relate to self-efficacy (Bandalos et al., 2003; Dweck & Leggett, 1988; Sakiz, 2011), affect (Ames, 1992; Jagacinski & Nichols, 1984; Jagacinski & Nichols, 1987), and academic success (Diseth, 2011; Hoyert & O'Dell, 2009). Educators may be able to utilize this knowledge to improve student learning through the use of strategies in the classroom (Ames, 1992; Deemer, 2004; Meece, Anderman, & Anderman, 2006; Young, 2005).

**Defining mastery and performance goal orientations.** Goals can be conceptualized as reasons for engaging in specific tasks (Weiner, 1986). In terms of academic goals, there are two possible goal orientations a student can have. The first is a *mastery goal orientation.* A student with a mastery goal orientation has goals that revolve around learning and mastering the task at hand. Students with a mastery goal orientation in a task will persist on the task even when it is difficult, will try to gain insight or understanding about the topic, and will more broadly seek knowledge about the topic than students without this type of orientation (Ames, 1992). The other type of goal orientation is a *performance goal orientation*. Students with performance goal orientations value the receipt of positive feedback (e.g., grades, praise), the *demonstration* of

competence on a task, avoiding negative peer or instructor evaluations, and/or public acknowledgment of academic success (Ames, 1992). Students using mastery goal orientation and students using performance goal orientation perceive ability and effort differently. Students using a mastery goal orientation see effort as a central feature of ability, such that increasing effort should lead to increased ability. Students using a performance goal orientation, however, see effort and ability as inversely related—they believe that students who *don't* put forth much effort to be successful must have innately higher abilities, and students who require extra effort to succeed in a task have less ability to do that task (Schunk et al., 2014). Indeed, students using a performance goal orientation may subsequently avoid putting in much effort into tasks to protect their perceptions of their own ability and self-worth (Covington & Omelich, 1979).

Within these two broad goal orientations there is considerable variability. In particular, research has found that students exhibit two different types of performance goals. Elliot and Harackiewicz (1996) found in their research that some students with performance orientations exhibit what they termed *performance approach* goals, wherein students are driven by their desire to outperform others in their abilities. On the other hand, they contend, some students with performance orientations exhibit *performance avoidance* goals, where they are motivated by a desire to avoid showing an inability to perform the task as compared to their peers (Elliot & Harackiewicz, 1996; Elliot & McGregor, 2001; Elliot & Thrash, 2001; Harackiewicz et al., 1998). Although most theorists discuss mastery orientation as being inherently "approach" focused (since in its most basic form this orientation requires students to be motivated by attempts to understand and grow their abilities), there has been some research into a "mastery avoidance goal" orientation, wherein students set very high standards for their own ability to understand and develop a skill, and are motivated to learn it to avoiding failing to meet their own

standard (Elliot, 1999; Pintrich, 2000a; Pintrich, 2000b). These theories can be conceptualized as the intersection of two dimensional constructs - "mastery versus performance" and "approach versus avoid." The "mastery versus orientation" dimension describes how the student compares themselves to peers and external sources (performance) or to an internal goal (mastery) and the "approach versus avoid" dimension describes whether the goal is to achieve success (approach) or avoid failure (avoid).

**Goal orientation and self-efficacy.** Students utilizing mastery goal orientations have also been found to exhibit higher levels of self-efficacy and competence, particularly when faced with difficult tasks (Bandalos et al., 2003; Dweck & Leggett, 1988; Sakiz, 2011). Findings on self-efficacy in students utilizing performance goal orientations have been mixed. Students utilizing performance approach goal orientations have been found to have higher self-efficacy and competence beliefs than students with performance avoidance goals in some research (Anderman & Midgley, 1997; Skaalvik, 1997; Wolters, Yu, & Pintrich, 1996). Middleton and Midgley (1997), however, found that having a performance goal orientation was unrelated to self-efficacy. Some researchers (Middleton & Midgley, 1997; Skaalvik, 1997) have also argued that performance avoidance orientations were negatively related to self-efficacy. The mechanism behind this argument is that students using performance approach orientations *who do well in their studies* may receive a boost to their self-efficacy, but students who use performance avoid orientations may have lower perceptions of self-efficacy since they are afraid that they may not succeed in the task or class. In either case, students who utilize mastery goal orientations have been found to be more likely to experience higher self-efficacy regardless of their actual performance on a task or in a class, whereas students utilizing performance

orientations may only experience high self-efficacy as long as their performance remains high (Schunk et al., 2014).

**Goal orientation and affect.** Having a mastery goal orientation has been associated with more positive affective states than having a performance goal orientation, particularly a performance avoid approach (Ames, 1992; Jagacinski & Nichols, 1984; Jagacinski & Nichols, 1987, Pekrun, Elliot, & Maier, 2006; Pekrun, Elliot, & Maier, 2009; Rawsthorne & Elliot, 1999). Mastery goals have been associated with higher levels of pride and satisfaction in completing tasks (Ames, 1992; Jagacinski & Nichols, 1984; Jagacinski & Nichols, 1987) as well as (in a meta-analysis of 23 experimental studies) self-reported interest, enjoyment, and choosing to continue the activity (Rawsthorne & Elliot, 1999). Mastery performance goals have also been associated with a range of positive emotional states such as hope, pride, and the enjoyment of learning (Pekrun et al., 2006; Pekrun et al., 2009). Mastery orientations have been theorized to yield better affective outcomes because those with mastery orientations tend to view doing poorly on tasks as opportunities for growth, whereas students with performance orientations tend to view doing poorly on tasks as indicators that they are not (and will not be) able to complete the task successfully in the future (Schunk et al., 2014).

**Goal orientation and academic success.** Researchers studying how goal orientations relate to academic outcomes have generally found an indirect link between goal orientation and academic achievement (Diseth, 2011; Hoyert & O'Dell, 2009). Diseth (2011) found that exhibiting a mastery orientation strongly related to using "deep learning strategies" in introductory psychology courses, which indicated a deeper understanding of the material. In addition, having either mastery orientation goals or performance-approach goals was found to be significantly related to receiving higher grades in the course than having no goals (although

mastery orientation was more strongly predictive of academic success). Hoyert and O'Dell (2009), however, found that student goal orientation is an important predictor of academic success, but only after failing an examination. They contend that students with mastery orientations who fail an exam are more likely to persist and eventually succeed in the course, whereas students with performance orientations tend to give up more easily (Hoyert & O'Dell, 2009). They also found that students who have success on an exam were found to succeed in the course, regardless of goal orientation. In addition, Hoyert and O'Dell (2009) looked at both traditional age and non-traditional (older) age students and found the effect to be consistent for both, although non-traditional students were found to be significantly more likely to endorse mastery orientations.

The reasons why students who utilize mastery goal orientations tend to have better academic outcomes may be due to the different cognitive strategies that are involved during learning. Students using mastery goal orientations have been found to be more likely to self-monitor their cognition and to be more aware of their own learning (Meece, Blumenfeld, & Hoyle, 1988; Meece & Holt, 1993; Middleton & Midgley, 1997; Pintrich, 1999; Pintrich & Schrauben, 1992; Pintrich, Roeser, & De Groot, 1994; Wolters et al., 1996). In addition, mastery goal orientations have been associated with greater so-called "deep processing" strategies, including organization (e.g., outlining) and elaboration (e.g., summarizing) (Bandalos et al., 2003; Bouffard, Boisvert, Vezeau, & Larouche, 1995; Graham & Golan, 1991; Kaplan & Midgley, 1997).

Students using mastery goal orientations have also been shown to have better academic behaviors that may be partially responsible for their academic success. Students with mastery goal orientations tend to be better able to self-regulate their effort and use of time (Pintrich &

Garcia, 1993; Pintrich et al., 1993), and are more likely to seek help from useful sources (Karabenick, 2004; Linnenbrink, 2005; Newman, 1994; Newman, 1998a; Newman, 1998b; Ryan & Pintrich, 1997; Ryan & Pintrich, 1998; Ryan, Pintrich, & Midgley, 2001). In comparison, students using performance-avoid goal orientations are more likely to create obstacles to successful performance (Urdan, 2004), and are less likely to exhibit help-seeking behaviors (Schunk et al., 2014). How, though, might the influence of mastery and performance goal orientations be unique for students in college settings?

**Goal orientation in college students.** College students have been found to endorse mastery orientations and performance orientations at nearly similar rates, although they endorse mastery goal orientations at slightly greater rates (Hoyert & O'Dell, 2009). Mesa (2012) conducted a study with community college mathematics students and found that students were slightly more likely to endorse mastery goal orientations in their mathematics courses, at both the remedial and college course levels. Interestingly, the faculty predicted that their students would be significantly more likely to endorse performance-goal orientations than they actually were, suggesting that faculty perceptions of their students' goal orientations may be inaccurate. Similarly, Hoyert and O'Dell (2009) found in a sample of four-year college students that the students were slightly more likely to endorse mastery goals than they were performance goals on a five-point Likert-scale (mastery = 3.57, performance = 3.36). Although college students appeared to be slightly more likely to endorse a mastery performance, they did not endorse these goals at a much higher rate than performance goals, and only slightly endorsed them at all (3.00 = neither agree nor disagree with mastery goal statement). Therefore, since a large portion of college students utilize performance goals in the classroom, it may be beneficial to help college students develop mastery-goal orientations.

**Teaching strategies that promote mastery orientation.** Teaching methods have been found to have an impact on whether students utilize mastery or performance goal orientations in the classroom. Ames (1992) found that three structural changes could be targeted within the classroom using various strategies to promote the use of a mastery orientation: "task" structural changes focused on creating meaningful, interesting tasks within the classroom, "authority" structural changes promoted student autonomy and helped students make good choices, and "evaluation / recognition" structural changes focused on how teachers evaluated and encouraged students within the classroom. This method of classroom intervention has also been promoted by others (Deemer, 2004; Meece et al., 2006; Young, 2005).

Ames (1992) suggested specific research-based instructional strategies for each of the three targeted "structures". For "task" structural strategies, Ames (1992) suggested creating tasks that are novel and interesting (but still challenging) for students. She also suggested helping students to develop and utilize effective learning strategies (and specifically, helping students learn to set short-term goals for themselves). For "authority" structures, Ames (1992) espoused giving students the autonomy to make choices and help make decisions within the classroom, and helping students to develop independence and a sense of personal responsibility. For "evaluation / recognition" structures, Ames (1992) recommended that teachers focus evaluation methods on individual improvement rather than competition and comparison to other students. She suggested that making evaluations private, recognizing students' effort, and encouraging students to view mistakes as part of the learning process would help to accomplish this. These strategies may encourage students to utilize a mastery goal orientation in the classroom, but how do students develop their academic goal orientations in the first place?

**Mindset**

One potential explanation for how goal orientations develop is through their implicit theories of intelligence, also known as "mindset". Carol Dweck and her colleagues have found evidence that much of what causes a student to develop their goal orientations can be attributed to their personal beliefs about their own ability and intelligence (Dweck, 1999). Specifically, Dweck (1999) contended that students develop perceptions over time regarding their abilities and intelligence and that interactions with their environments help to shape their attributions towards their own abilities. Carol Dweck's early research utilized an attribution theory framework and was focused on implementing "attribution retraining" interventions that sought to change the attributions of students from perceiving failure as a lack of control to instead viewing failure as due to a lack of effort (Dweck, 1975; Dweck & Reppucci, 1973).

Attribution retraining interventions have had mixed results. Students in attribution retraining interventions may improve academically in reading (Miranda, Vilaescusa, & Vidal-Abarca, 1997; Toland & Boyle, 2008), mathematics (Dresel & Ziegler, 2006; Okolo, 1992), and psychology courses (Haynes et al., 2011; Perry, Stupinsky, Hall, Chipperfield, & Weiner, 2010) across primary, secondary, and post-secondary levels of education. Haynes and colleagues (2011) and Perry and colleagues (2010) found significantly improved academic outcomes (e.g., in-class tests, final course grades, first-year GPAs) in college students after an attribution retraining intervention. Conversely, other researchers have found that students receiving attribution-retraining interventions may not change their attributions or improve academic success (Berkeley, Mastropieri, & Scruggs, 2011; Homer & Gaither, 2004; Morris, 2013; Perry & Penner, 1990). In a meta-analytic review of 20 attribution retraining studies, Robertson (2000) concluded that, for elementary school-aged children, attribution retraining interventions

were a worthwhile endeavor, but the practicality of intervening in the naturalistic school setting with moderate-to-large groups of children limited the benefits for students. Thus, attribution retraining may be best utilized for small groups of children by highly trained professionals.

Carol Dweck (Bempechat et al., 1991; Dweck, 1999; Dweck, Chiu, & Hong, 1995; Kamins & Dweck, 1999; Hong, Chiu, Dweck, & Lin, 1998) refocused her research on a concept related to attributions and attribution retraining: attributions and beliefs regarding one's own ability. These attributions (also called implicit theories of intelligence) fall into two major categories: the "growth" mindset and the "fixed" mindset. Students with a growth mindset see their intelligence as malleable and able to be improved with effort, whereas students with a fixed mindset see their intelligence as stable from birth and unrelated to effort (Dweck, 1999). Students' beliefs about their intelligence have been found to influence whether they adopt a mastery orientation or a performance orientation with specific tasks (Dweck, 1999; Robins & Pals, 2002). Dweck's (1999) research found that students who tend to see their abilities and intelligence as fixed over time tend to simultaneously develop performance orientations, believing that, since their abilities are fixed, their performance is key to academic success (rather than their persistence or understanding). On the other hand, Dweck contended that students who see their abilities and intelligence as malleable tend also to view their performance as secondary to their persistence and ability to challenge themselves to understand new information and develop new, difficult abilities. Not surprisingly, students who have growth mindsets also tend to have greater academic success (McCutchen et al., 2015).

Despite the seemingly innate nature of these implicit theories of intelligence and abilities, environmental factors have been found to impact whether students develop growth mindsets or fixed mindsets. In a seminal paper in 1998, Claudia Mueller and Carol Dweck found that

teachers who give praise to students for high ability actually undermine their motivation. Teachers who give praise to students for their inherent abilities (e.g. “you’re so smart!”, “You’re good at this!”) actually emphasize a fixed mindset (and simultaneously emphasize adoption of a performance-goal orientation) by rewarding academic performance (as opposed to effort) and presuming that students who “are smart” will continue to show high achievement regardless of effort. Indeed, Mueller and Dweck (1998) found that children who received praise for their intelligence were subsequently more likely to describe their intelligence as a fixed trait and children praised for hard work tended to exhibit a growth mindset. High-achieving students who exhibit a fixed mindset were found not have negative academic consequences as long as they continued to experience high academic achievement, despite their goal-orientations continuing to be performance-based (Mueller & Dweck, 1998).

The issue, as Mueller and Dweck (1998) found, was that students who earned this fixed-mindset-based praise and later *failed* a task showed less task persistence, less task enjoyment, worse future task performance, and more attributions of their failure to low-ability. The implications of these results are that instructors who praise fixed traits also encourage students to value these “traits” and develop performance goal orientations, and, when these students encounter failure, they attribute the failure to low ability and are thus more likely to give up on the subject altogether. Relatedly, instructors who praise hard work and persistence encourage students to see their abilities as malleable and therefore encourage student persistence and effort when encountering difficult tasks. As previously discussed, students with performance goal orientations tend to have less academic success, particularly during difficult tasks, than students with mastery goal orientations.

**Mindset in college students.** These implicit theories of intelligence have also been researched with college student populations. Shively and Ryan (2013) found that, in a sample of college algebra students, students who endorsed a growth mindset in general intelligence (i.e. not specific to math or algebra) showed more help-seeking behaviors and earned higher course grades than those who endorsed a fixed mindset. They also found that, in general, college algebra students endorsed more growth-mindset implicit theories of intelligence when asked about general intelligence than when asked about their abilities in mathematics. Interestingly, they also found that over the course of the semester, students' views grew more fixed in both general intelligence and mathematics ability, but that this decline was greater for their beliefs in their mathematics ability. Clearly, although implicit theories of intelligence are often conceptualized as relatively stable, change is still possible, and there may be specific subjects in which students more highly endorse fixed mindsets.

Another study found that growth and fixed mindsets were actually relatively stable from high school through college (Robins & Pals, 2002). This study found, however, that students with growth mindset tended to increase in self-esteem throughout college, whereas those with fixed mindsets tended to decline in self-esteem. Thus, the effects of implicit intelligence theories seem to go beyond academic outcomes. One study of middle school students found that students with growth mindsets not only earned higher grades and were more likely to take more advanced coursework, but that they also endorsed fewer depressive symptoms and exhibited higher well-being over time (Romero et al., 2014). Thus, having a growth mindset is clearly important for academic success, but it may have benefits in social-emotional development as well.

## Growth Mindset and Goal Orientation Interventions

Exhibiting a growth mindset is important for students of all ages, including college students (McCutchen et al., 2015; Shively & Ryan, 2013). Students who struggle academically may be using fixed mindsets and performance orientations, or may not have academic goals at all (Diseth, 2011; Hoyert & O'Dell, 2009; McCutchen et al., 2015; Mueller & Dweck, 1998), however, implicit theories of intelligence may be influenced by changes at the institutional or classroom level (Bempechat et al., 1991; Blackwell et al., 2007; Mueller & Dweck, 1998). Blackwell et al. (2007) found that middle school students participating in eight 25-minute sessions showed a positive change in classroom motivation and no longer exhibited a downward decline in classroom grades, as compared with a control group. Students' grades post-intervention were nearly 0.3 grade points (on a 4.0 scale) higher for the experimental group than the control group, and this reflected a 0.1 grade point *increase* from their grade prior to the intervention for the experimental group compared with a 0.15 grade point *decrease* for the control group. This intervention only differentiated the intervention between the experimental and control groups for four sessions- thus the unique aspects of the intervention that resulted in this difference only required approximately two hours of classroom time.

Bempechat et al. (1991) found that elementary school children were more likely to choose mastery goals over performance goals when given a prompt indicating that the ability to complete the task was malleable rather than fixed. Students in the malleable task condition were also more consistent in their expectancies for future success (Bempechat et al., 1991). Interestingly, this study did not find evidence that children in the growth mindset condition recovered more quickly from failure than children in the fixed mindset condition, perhaps

suggesting that the intensity of intervention was not strong enough to influence students' response to failure.

One way to bolster the intensity of interventions in this area may be to utilize instructors as agents of change. Mueller and Dweck (1998) found that the type of feedback given to fifth-grade students impacted their goal orientations. They also found that students praised for ability endorsed performance orientations and those praised for effort endorsed mastery orientations. Attributions of failure were also impacted by the type of praise students received, such that those praised for ability attributed failure to a lack of ability and those praised for effort attributed failure to a lack of effort (Mueller & Dweck, 1998). In one of the tasks in this study, Muller and Dweck (1998) also found that students receiving praise for ability showed declines in their ability to complete the task later (which is unexpected since practice effects were predicted to help all students improve), whereas students receiving praise for effort showed the expected improvement in their ability to complete the task.

Paunesku et al. (2015) found support for the use of a mindset intervention to improve academic outcomes. They delivered an online module that was designed to take 45 minutes to complete to high school students who were at risk of academic failure. They found a 6.4 percentage point increase in grade in core courses for at-risk students who participated in their intervention compared to controls. This study lends evidence both for the use of an online intervention to improve level of growth mindset and for the effectiveness of having a brief intervention duration.

Interventions for growth mindset may only be effective for students with relatively low-ability, however, as students with higher abilities have been shown to succeed regardless of their mindsets, likely because these students rarely, if ever, face academic failures that must be

interpreted as being due to ability or effort. Hong et al. (1998) conducted a study that found evidence that students with growth mindsets were more likely to elect to take a tutorial (a desirable academic behavior) in a subject than students with fixed mindsets, but *only for those with low ability*. Students with high ability in the subject were equally likely to elect to participate in the tutorial regardless of their mindset. Indeed, even growth mindset interventions appear to have differential effects for students with low and high ability. Paunesku et al. (2015) found that students who were not at risk for dropping out of high school did not derive any significant benefit between their pre-intervention and post-intervention GPA, but students who were at-risk of dropping out gained a significant increase (of around 0.03 grade points, compared to a loss of 0.06 grade points for controls). Thus, students who have lower ability may have a greater benefit in terms of their academic success than students who have higher ability.

Interventions designed to be "psychologically precise, often brief, and often (with the) aim to alter self-reinforcing processes over time and, thus, to improve people's outcomes in diverse circumstances and long into the future" are referred to as "wise" interventions (Walton, 2014, p. 74). Wise interventions can be beneficial for interventions in the implementation phase, as they require less time and resource investment from the stakeholders that are implementing them. Walton (2014) provided evidence for a multitude of wise interventions and their efficacy, but also cautioned that these interventions are dependent on context and will only be effective if they target a specific mental process in such a way as to change it for individuals. Growth mindset interventions have previously been shown to be effective in improving academic outcomes when delivered in this "wise" format, utilizing relatively short durations while targeting specific cognitions and behaviors (Bempechat et al., 1991; Blackwell et al., 2007; Paunesku et al., 2015)

Though little research has been published regarding the implementation of mindset interventions in college students, one such study found evidence that at-risk college students who are taught to view intelligence as malleable (i.e., to have a growth mindset) showed higher rates of academic effort and better study habits compared to controls (Sriram, 2013), suggesting that mindset interventions may have effectiveness in the college setting. The lack of research in this area, when combined with the academic struggles of many community college students, is the major impetus for the current study.

**Problem Theory**

The issue that the current proposed intervention is designed to address is that of community college student academic success and persistence. Community college students are often not academically successful for a multitude of reasons. Community college staff have attempted to help these students in a number of ways, most notably through the use of developmental (remedial) education and through new student orientation, although these methods have not been sufficient to foster success in a large proportion of these students. A novel method that has empirical evidence for students of all age groups is the use of social and emotional learning interventions. These interventions, which target components of education that are often not taught explicitly to students, seek to improve how students interact with their education through their behaviors and cognitions.

For community college students who do not find academic success, their academic motivation, which is one component of social and emotional learning, may be a major factor. It is likely that, through their interactions with the primary and secondary education system, many community college students have formed implicit theories of intelligence that are fixed. In other words, many students may believe that their failures and/or successes are due to their inherent

ability as students and not due to their level of effort. These "fixed mindsets", when combined with failure of an assignment or exam (which, for new college students, is more likely to occur due to the increased academic rigor of college courses as compared to high school or job requirements), may result in demotivated students. Students with fixed mindsets who face academic challenges have been found to experience less academic success than students who exhibit growth mindsets. As evidenced by prior research, students' implicit theories of intelligence can be influenced in a number of ways to promote the use of a "growth" mindset over a "fixed" mindset, and can be accomplished using brief, "wise" intervention procedures. Thus, the current study seeks to improve community college student academic outcomes through the use of a "wise" intervention that has been created through the combination of evidence-based techniques from prior research. This intervention seeks to improve student academic success indirectly, by first encouraging students to utilize growth mindsets and to utilize mastery orientations in the classroom.

This research is novel because very few studies have attempted to influence growth mindset in college students, and even fewer have attempted to do so with community college students. Secondly, this research involves the implementation of an intervention that, while largely based on prior research, is a new combination of techniques. It involves direct student psychoeducation about mindset as well as an indirect intervention for students through their instructors, who will be taught empirically-supported techniques to increase students' adoption of growth mindset and mastery orientations. Through the implementation of this intervention, knowledge will be gained not only of the effectiveness of the intervention in improving student academic success, but also will allow for analysis of the feasibility and treatment acceptability of an intervention of this type.

## Current Study

The problem that the proposed intervention, called the *Go for Growth!* intervention, is attempting to alleviate is student academic failure due to low academic motivation. The intervention will compare academic success measures (course grade and retention) for students receiving the intervention and controls. It is hypothesized that the intervention will increase students' level of growth mindset and mastery orientation, and that this will result in improvements in academic outcomes.

**Conceptual mediational model.** The *Go for Growth!* intervention will seek to utilize evidence from prior research to improve academic success in community college students. This intervention will attempt to foster growth mindsets in community college students. The conceptual mediational model (Figure 1) shows the predicted relations between the variables of interest for this intervention.

It is probable that the indirect effect of the intervention on academic achievement will have an impact on student implicit theory of intelligence, and thus should also mediate the relationship between student implicit theory of intelligence and academic outcomes. The best outcomes for students should exist when they have a teacher who utilizes the evidence-based methods for interacting with their students and when they receive direct psychoeducation in class regarding growth mindset.

**Logic model and theory of change.** The *Go for Growth!* intervention's logic model and theory of change are depicted in Figures 2 and 3, respectively. These techniques, as specified by Fraser, Richman, Galinsky, and Day (2009), explicate how the *Go for Growth!* intervention is

expected to impact students. The logic model (Figure 2) is a method for visualizing the connections between program objectives and inputs with proximal and distal levels of impact.

The theory of change is another visual method used to ensure that the proposed intervention methods match the expected outcomes and how features of the intervention logically impact mediators and outcomes. The theory of change for the *Go for Growth!* intervention (Figure 3) shows how the initial inputs of: training teachers to implement the teaching component of the intervention and training teachers how to promote growth mindset are mediated by how well the intervention is applied by these agents of change. In addition, the response of the teacher to the intervention will impact how well the two classroom components are implemented. Successful application of these techniques is expected to increase adoption of growth mindsets and mastery orientation in students, both at the course-level and overall implicit theories of intelligence. How well this is achieved will depend on how students respond to the content and change in teachers in the classroom. It is subsequently hypothesized that students with higher endorsement of growth mindset and mastery orientation will achieve better academic outcomes (measured by grade) and thus will be less likely to dropout the next semester. In addition, students who have growth mindsets at the end of the semester are also more likely to persist even if they do not succeed in their courses, as they are more likely to adopt mastery orientations that bolster their academic persistence.

**Purpose of the Study.** The current research seeks to answer questions about the efficacy of a classroom intervention called the *Go for Growth!* intervention that seeks to encourage community college students to develop growth mindsets and use mastery goal orientations. This intervention will take place in students' general psychology courses. More specifically, this investigation aims to determine whether the *Go for Growth!* intervention has effectiveness in

influencing students' level of growth mindset, level of mastery orientation, and academic success (measured by GPA and retention). Research questions and hypotheses for the present study are as follows.

**Research question 1**. Do students who receive the *Go for Growth!* intervention have better academic outcomes?

***Hypothesis 1 for research question 1***. It is predicted that students who receive the intervention will have significantly better grades in the course where they received the intervention than students who do not receive the classroom intervention.

***Hypothesis 2 for research question 1***. It is predicted that students who receive the *Go for Growth!* intervention will be more likely to return the following semester, as compared to controls.

***Hypothesis 3 for research question 1***. It is predicted that students who have lower prior academic ability will show greater gains in academic outcomes than students with higher prior ability.

**Research question 2**. Do students who more highly endorse growth mindset and/or mastery goal orientation have greater academic success?

***Hypothesis 1 for research question 2***. It is predicted that students who more highly endorse growth mindset will have higher grades in their psychology course than students who more highly endorse fixed mindsets.

***Hypothesis 2 for research question 2***. It is predicted that students who more highly endorse mastery orientations will have higher grades in their psychology course than students who more highly endorse performance orientations.

***Hypothesis 3 for research question 2***. It is predicted that students who more highly endorse growth mindset will be more likely to return the following semester than students who more highly endorse fixed mindsets.

***Hypothesis 4 for research question 2***. Students who more highly endorse mastery orientations will be more likely to return the following semester than students who more highly endorse performance orientations.

**Research question 3**. Does the *Go for Growth!* intervention impact student endorsement of goal orientation and/or mindset?

***Hypothesis 1 for research question 3***. It is predicted that students receiving the *Go for Growth!* intervention will show higher endorsement of growth mindset as compared to controls.

***Hypothesis 2 for research question 3***. It is predicted that students receiving the *Go for Growth!* intervention will show higher endorsement of mastery orientation as compared to controls.

**Research question 4**. Is the endorsement of growth/fixed mindset related to the endorsement of mastery/performance orientation?

***Hypothesis for research question 4***. It is predicted that there will be a positive, linear relationship between endorsement of growth mindset and endorsement of mastery goal orientations.

**Research Question 5**. Was the fidelity of implementation maintained in the study?

**Research Question 6.** What level of treatment acceptability & feasibility of implementation was obtained from faculty?

# CHAPTER 2: METHODOLOGY

## Participants

Participants included 190 students and four faculty in General Psychology courses during the fall 2016 semester at Guilford Technical Community College (GTCC) in Jamestown, North Carolina. The participating students were diverse in terms of race (47.2% white, 52.8% non-white minority), gender (43.3% male, 56.7% female), and age (78.4% 18-22, 8.4% 23-27, 4.2% 28-32, 3.2% 33-37, 5.3% older than 37). The student participants also self-reported a range High School Grade Point Averages (0.6% 0.0-0.9, 1.9% 1.0-1.9, 30.8% 2.0-2.9, 61.6% 3.0-3.9, 5.0% 4.0 or greater), level of parent education (7.6% no high school diploma, 25.0% high school diploma, 32.1% some college, 20.7% college degree, 14.7% graduate/professional degree). Most participating students were seeking a degree of some type (82.1%).

In order to recruit participants, the researcher contacted psychology instructors at GTCC via standardized e-mail. Participants were asked to reply to the researcher if interested. Initially, five instructors expressed interest in participating in the study. Although instructors teaching courses in an online format were invited to participate, none expressed interest in participation, thus, only the face-to-face format was utilized. The five participating instructors were randomly assigned to two groups, one receiving the intervention and one asked to teach the course as usual. Three instructors were chosen for the treatment group and two for the control group. One instructor who had been selected into the treatment group withdrew prior to receiving any materials from the researcher. The four participating instructors taught a total of 14 General

psychology courses during the fall 2016 semester. Of those, 5 were included in the treatment condition and 9 were included in the control condition. The instructors signed electronic consent forms (see Appendix 1) indicating their intent to participate. In order to recruit student participants, the researcher entered the classrooms of the participating faculty and explained the study and the consent form to students who were present in class during that day. No compensation was offered to students for participation to limit possible perceived coercion. A total of 190 students agreed to participate in the study, 79 in the treatment condition and 111 in the control group.

**Measures**

**Course grade.** The student's grade (on a 4.0 scale) in the participating general psychology course was collected through GTCC's institutional research department. Grades at the institution included A (4.0), B (3.0), C (2.0), D (1.0), and F (0.0).

**Retention.** Retention at the institution was assessed through data collected through the institutional research department at GTCC. This measure will be a simple yes/no indicator of whether the student registered for any courses in the spring semester (2017) by the deadline for registering for courses at GTCC.

**Demographics.** Demographic questions were included on the survey packet and included: minority status, gender, age group, high school GPA, approximate number of credits previously earned at GTCC, whether the student is currently degree-seeking or not, parent education level, college ID number, and name (see Appendix 2). The college ID number and name was only utilized to connect students' survey data to their institutional data, and was removed immediately after this step was completed.

**Motivational factors.** Factors related to motivation were assessed by self-report survey methods. The Theories of Intelligence Scale – Self Form for Adults (Dweck, 1999) was used to assess whether students possess a growth mindset or fixed mindset (see Appendix 3). This measure provides students statements such as "You have a certain amount of intelligence, and you can't really do much to change it" and asks students to rate how much they agree with each statement on a 1-6 scale, where 1=strongly agree and 6=strongly disagree. Internal reliability for this measure has previously been shown to be very high (0.98; Dweck et al., 1995). This measure was used in full as written by Dweck (1999), but, since this questionnaire assesses *overall* mindset across subdomains (i.e. subject), another survey was used to assess *course specific* beliefs regarding mindset. This survey, which was created by the experimenter, was based strongly on the Theories of Intelligence Scale (Dweck, 1999) and has five items that assess domain-specific mindsets (see Appendix 4). Based on the data collected through this study, the Theories of Intelligence scale was found to have a Cronbach's Alpha of 0.881, and the Subject-Specific Theories of Intelligence Scale had a Cronbach's Alpha of 0.725, both indicating a high degree of internal reliability.

In order to assess whether students exhibited mastery orientations, the mastery-approach and mastery-avoid subscales from the Achievement Goal Questionnaire (AGQ) were used (Elliot & McGregor, 2001; See Appendix 5). The AGQ is a 12-item survey that was developed using items used in prior research on goal orientations (Elliot & Church, 1997). The authors utilized prior factor analysis data and synthesized items from other validated sources to create the Achievement Goal Questionnaire. The Achievement Goal Questionnaire has four subscales that match with the four "types" of goal orientations: performance-approach, performance-avoid, mastery-approach, and mastery-avoid. Each subscale contains three items. The present study

utilized only two of the subscales (mastery-approach and mastery-avoid), totaling 6 items. The Achievement Goal Questionnaire was previously found to have high reliability in a sample of introductory psychology students, with Cronbach's alphas between 0.83 and 0.92 (Elliot & McGregor, 2001). The Cronbach's Alpha based on the current study was found to be 0.746. A confirmatory factor analysis from the present data revealed that the two included subscales were supported, with eigenvalues of 2.68 for the primary factor of achievement goal orientation and a factor with an eigenvalue of 1.84 representing the Approach versus Avoid subscales.

The Patterns of Adaptive Learning Scales (PALS) *perception of classroom goal structures* subscale was also given to students to assess their perceptions of the degree to which their classroom promotes mastery orientation (Midgley et al., 2000) (see Appendix 6). This subscale consists of six items rated on a five-point Likert-type scale indicating how "true" each statement is in the student's opinion (1= "Not at all true", 3 = "Somewhat true", 5 = "Very true"). Reliability has been previously shown to be high (Chronbach's Alpha = 0.76) for students in elementary, middle, and high school (Midgley et al., 2000). It has also been found to be valid for assessing goal orientation in a sample of college students, and was found to be the most valid scale for measuring goal orientation with college students when compared with two other commonly utilized scales (Jagacinski & Duda, 2001). The Cronbach's Alpha based on the data collected from this study was 0.771.

**Fidelity.** An intervention that is not implemented with fidelity cannot be evaluated with confidence since the measured effects may be due to a lack of fidelity by some agents of change. The *Go for Growth!* intervention assessed fidelity of implementation via a survey given to students in their survey packet (See Appendix 7). This survey evaluated whether the psychoeducational piece of the intervention was implemented as intended, by asking students

three “yes” or “no” questions: “did your instructor spend time at the beginning of the semester teaching you about implicit theories of intelligence (growth mindset versus fixed mindset)?”, “did your instructor teach you about growth mindsets *at all* during the semester?”, and “did your instructor remind you about the importance of growth mindset more than once during the semester?” The rest of the items in the scale utilized a Likert-type scale for statements, where 1 = “strongly agree” and 4 = “strongly disagree”. Two of these items were designed to assess whether the instructor implemented the psychoeducational component: “I understand the meaning of ‘growth mindset’ and ‘fixed mindset’,” and “I think my instructor believes that intelligence can be increased through hard work.”

Additional items were used to assess whether instructors utilized the recommended teaching strategies with students during the semester. These include the following items: “My instructor praised or criticized my effort this semester (by saying things like “you worked really hard!”),” “The assignments in my class were interesting,” “My instructor helped me to establish academic goals for myself during the semester,” “My instructor encouraged me to actively participate in the course,” “My instructor provided me with choices in assignments and activities within the course,” and “My instructor seemed annoyed or angry when I made mistakes or asked questions during class.” An overall fidelity score was calculated from the Likert-type items for all students, and had an internal reliability of 0.775. These scores were averaged across students within each course to calculate a mean “course” fidelity score.

**Feasibility.** A brief survey was given to faculty assigned to the treatment group to elicit their beliefs regarding usability and feasibility of the intervention (See Appendix 8). These questions were presented as statements where the faculty member rated, on a 1-4 scale, how much they agree with each statement. These questions were designed to elicit whether the

intervention was perceived as easy to implement and worth faculty time. These statements were as follows: "The *Go for Growth!* intervention was easy for me to implement in my classroom," "The *Go for Growth!* intervention seemed worth the time I invested to implement it," "I believe the *Go for Growth!* intervention should include more materials/activities," and "I believe the *Go for Growth!* intervention should be shorter/include less materials/activities." Two additional questions were included to assess whether instructors had knowledge about growth mindset prior to the start of the intervention. These statements were: "I had heard about growth mindset before the semester began.", and "I knew a great deal about growth mindset before the semester began." The final question was a general comment section where faculty were asked to write any additional comments.

## Procedures

**Feasibility and acceptability of intervention**. Careful consideration was made when designing the intervention procedure to ensure the feasibility and acceptability of the intervention by the institution and the participating faculty. The experimenter spoke with the department chair for social sciences at GTCC, who agreed that the intervention was worth exploring. After he met with his faculty and discussed the opportunity to participate in research with them (although no specific details were shared), he felt that enough support existed with the faculty to warrant continuing with the implementation of the intervention. The faculty expressed a desire to receive professional development credits for participation in the study. As such, an e-mail was sent out to the faculty after implementation of the intervention (and collection of data) was complete to allow any faculty (those who participated or not) to request the training and to elicit requests for professional development credit. No faculty contacted the researcher about this opportunity.

The design of the faculty intervention was such that it only required participating faculty to watch a 22-minute video and only required 20-30 minutes of classroom time (not including data collection). This "wise" design was chosen specifically to ensure acceptability of the intervention by the participating faculty, and consequently, to promote fidelity in implementation. The acceptability and feasibility of the intervention were assessed formally at the end of the intervention with the feasibility survey (See Appendix 8).

**Intervention.** Participating instructors teaching general psychology courses in the fall of 2016 were randomly selected to be part of the experimental group (receiving the intervention) or control group. All participating instructors signed informed consent prior to being selected into the control group or experimental group (see Appendix 1).

Instructors in the experimental group were asked to watch a 22-minute training video that explained the procedures required to implement the intervention. This included having them share two PowerPoint slideshows (with audio included) during class time with their students and also provided strategies based on goal orientation literature to incorporate into their teaching methods and course materials. The video also briefly taught the instructors about growth mindsets and shared the information that was included on the PowerPoint slideshows. The teaching strategies included in the video were based largely on Ames (1992) and revolved around the three classroom "structures" she identified as important for targeting to promote mastery goal orientations, namely "task" structures, "authority" structures, and "evaluation / recognition" structures. In addition, research into how instructors can promote growth mindset was incorporated into the strategies.

The strategies that were suggested for faculty included two strategies for each of the three structural areas identified by Ames (1992). First, for the "task" domain, instructors were asked

to create novel, interesting, and challenging assignments and tasks that were designed to help students use newly learned information in class, avoiding "busy work" assignments. The second "task" domain strategy was for instructors to help students to develop short-term goals for themselves and to learn to self-monitor these goals (and continue to create new ones once the original goals were met).

Next, for the "authority" domain, instructors were asked to encourage all students to participate in the course, and to try to listen more to students, resist giving them solutions, allow time for independent work, and utilize "perspective-taking" statements such as "what do you think this means?" The second "authority" strategy was for instructors to provide (limited) activity choices for their students and to promote student accountability and responsibility for their own actions.

Strategies in the third domain, the "evaluation / recognition" domain, first asked instructors to avoid praising or criticizing students for their ability, and to focus instead on praising and criticizing their effort, and asked instructors to make sure that all evaluations were kept private. This strategy is based largely on work by Kamins and Dweck (1999), who found evidence that children who are praised with person-oriented praise (e.g., "you're good at this", "I'm proud of you") actually become *less* persistent when given difficult tasks. Secondly, instructors were asked to emphasize the learning process within their classrooms, making sure that students understood that mistakes are how we learn, and eliminating (or limiting) competitive performance.

All strategies were presented with specific examples of how to successfully incorporate each strategy into the classroom. These examples (as well as the three domains and six strategies) are presented in Appendix 9. A reminder e-mail was sent to participating instructors

after implementation began but prior to data collection to remind them to continue to incorporate the teaching techniques taught to them through the training video. The text of this e-mail is included in Appendix 10.

In order to increase standardization, the psychoeducational component of the intervention was provided to all students through two PowerPoint slideshows (with recorded voiceovers) created by the experimenter (see Appendix 11). These slideshows presented students with information about growth mindset and its benefits and also discussed the handout (which all instructors were asked to provide to their students beforehand). Instructors were asked to show this video during the first week of implementation.

The experimenter went into classrooms during the final three weeks of the semester to give out surveys. The order that students received the surveys was randomized to reduce survey order bias with the exceptions that the Consent form (see Appendix 12) was always presented prior to any surveys, and the demographic questionnaire (see Appendix 2) was always presented last to reduce the effects of stereotype threat (Brodish & Devine, 2009; Steele & Aronson, 1995; Stone & McWhinnie, 2008).

The intervention was split into two sessions (see Appendix 13). During the first session, instructors were asked to provide students with a paper version of the "handout" (see Appendix 14). Instructors were also asked to show students a pre-recorded PowerPoint presentation which contains the psychoeducational component of the intervention. The handout included some general statements about the biology of the brain and some statements about growth mindset. It also contained statements from two fictional "former Guilford Technical Community College" students that described how they struggled with school, but found success because they realized they had control over their own intelligence and they worked really hard (based on Aronson,

Fried, & Good, 2002). One of the fictional accounts was about a recent high school graduate who finished their associate's degree and transferred to a four-year college where they found success. The other statement was about an older adult who came back to school and finished a technical program and has obtained a successful job. These vignettes were designed to show students that their hard work and persistence can have positive results (if they believe their intelligence is malleable).

In addition, the handout included attempts to dissuade students from using a fixed mindset. For example, again from Dweck (2006), the handout asked students, "Do you think babies are dumb because they can't talk? Would you laugh at them for that?" The handout also included images of neural cells from the brain taken between birth and two years of age. Then, the sheet described the slides as such: "When babies are born, they don't know very much, but they all have loads of potential. As they pay attention, study the world, and learn how to do new things, their brains actually become more complex and, yes, *smarter*!" The handout also explained to students "You're in charge of your mind. You can help it grow by using it in the right way" (Dweck, 2006). Then, it explained what the "right way" is, by saying: "the brain grows best when it is presented with new information that it has never seen before. You experience this as things that are *hard*. The more you try to learn *hard* things, the more your brain will grow! So, if you encounter some material, for example, in a psychology course that you think is hard, that is the stuff you need to work the hardest to learn! The harder you try to learn it, the more your brain will grow and the smarter you will become. But only *you* can make this happen." The handout also included the following: "Try really hard to learn everything in this class, *especially* when it is hard. At the end, you will be smarter and better equipped to learn even harder material!"

The session one PowerPoint slideshow presented students more direct information regarding growth mindset and its benefits. The first slide defined intelligence broadly for students and asked students to begin to think about where their intelligence comes from. The second slide described implicit theories of intelligence and growth/fixed mindsets. The third slide made an argument that adopting a growth mindset can be beneficial by using research findings. The fourth and final slide described for students *how* they can adopt a growth mindset, by emphasizing hard work and belief in one's own ability to improve intelligence.

The second session involved two major parts: the first was to view an embedded video that discusses brain plasticity and how it connects to learning and memory (see Appendix 15). The link was contained within a PowerPoint slide presentation previously provided to participating faculty (see Appendix 11). The second slide of the presentation included questions for discussion. Instructors were asked to lead a brief discussion around the questions (5 minutes per question) with the entire class. The instructor was asked to facilitate the discussion with the students while showing that he or she endorses a growth mindset and also attempting to use the teaching strategies they were taught in the training video.

# CHAPTER 3: RESULTS

## Preliminary Analyses

Means and standard deviations were examined by the experimenter and are presented in Table 1. Little missing data existed, although means were not generated for participants who did not answer at least 80% of the items in a particular scale. No extreme outliers were noted, and the internal reliability was high for each measure, with values ranging from 0.725 (Subject-Specific Growth Mindset) to 0.881 (Theories of Intelligence Scale). Dichotomous variables were recoded such that one value was "0" and the other was "1" in order to aid in interpretation of the results. In addition, each Likert-type survey item was recoded such that the lowest value was "0." Only one demographic variable required dichotomization, the "Age" variable, which was changed so that the "0" value represented participants aged 18-22, and the "1" value represented participants 23 years of age and older.

Means and standard deviations were examined for variables that were included in analyses (See Table 1). Sample sizes ranged from 159 to 190. With the exception of high school GPA, all other variables include sample sizes of 176-190. A total of 92% of students were retained from fall to spring.

Table 1. Means and standard deviations of study variables

| | Possible Values | Range | Mean | Standard Deviation |
|---|---|---|---|---|
| Growth mindset (general) | 0-5 | 0.00-4.25 | 3.688 | 0.907 |
| Growth mindset (course specific) | 0-5 | 0.00-4.50 | 3.741 | 0.768 |
| Mastery orientation | 0-4 | 0.17-4.00 | 2.346 | 0.768 |
| Course-level mastery orientation | 0-4 | 0.83-4.00 | 3.256 | 0.635 |
| General psychology course grade | 0-4 | | 2.440 | 1.281 |

Means and standard deviations of demographic variables were compared between the Control and Experimental groups using independent samples t-tests. No significant differences between the control group and experimental group were noted (see Table 2).

Table 2. Mean comparisons of demographic variables between treatment and control groups

| | Mean (Standard Deviation) | | *p-value* |
|---|---|---|---|
| | Control | Treatment | |
| Gender (% Female) | 54 (0.501) | 60 (0.493) | 0.407 |
| Race (% Minority) | 54 (0.501) | 60 (0.503) | 0.623 |
| Age (% Over 22) | 18 (0.387) | 25 (0.438) | 0.239 |
| Degree Seeking (%) | 83 (0.380) | 83 (0.375) | 0.914 |
| Parent Education (0-4 scale) | 2.05 (1.20) | 2.17 (1.11) | 0.483 |
| High School GPA | 3.09 (0.680) | 3.07 (0.549) | 0.826 |

Note. N = 187 for Gender, N = 180 for race, N = 189 for age, N = 190 for Degree Seeking, N = 184 for Parent Education and N = 159 for High School GPA.

**Fidelity**

In order to assess fidelity, a mean score on the fidelity survey was generated for each participant. A one-way Analysis of Variance (ANOVA) revealed a significant difference between treatment and control groups ($N = 189$, $F = 9.64$, $p = 0.002$) with the treatment group, as predicted, having more "fidelity" than the control group. An analysis of the effect size using

Cohen's d suggests a moderate difference between the two groups (d = 0.463). Using one-way ANOVAs, no significant differences in fidelity were found between the two treatment instructors (N = 79, F = 0.09, p = 0.765) or the two control instructors (N = 110, F = 0.507, p = 0.478). Although there was a significant difference between the treatment and control groups, the mean fidelity of implementation for the control group was 2.06 (where 3.0 is the maximum score). The mean fidelity of implementation for the treatment group, meanwhile, was 2.31. As such, students reported that the control group faculty largely utilized methods that were similar to those used by the treatment group faculty.

Additional information related to fidelity was collected through surveys given to the participating instructors (both treatment and control groups). The final two questions of the feasibility survey (given to treatment faculty only) and an additional survey called the "Control Faculty Survey" (See Appendix 16) were designed to assess to what extent participating faculty knew about growth mindset prior to implementation of the intervention. One of the implementing instructors noted no knowledge of growth mindset prior to implementation of the intervention. The other indicated having heard about growth mindset and knowing some information about it, but not a great deal. Interestingly, a similar pattern was found with the two control faculty. One of the control group instructors indicated having no knowledge of growth mindset prior to the intervention, while the other noted having heard of it and knowing about it "somewhat."

In the treatment group, one instructor "strongly agreed" and another "somewhat disagreed" to having learned about growth mindset during the semester, which matches the pattern found previously with previous exposure to growth mindset. In the control group, a similar pattern was noted, with one instructor rating this question "somewhat agree" and the

other rating it "somewhat disagree." All four faculty reported not having spoken to colleagues about growth mindset during the semester, which was asked of them at the onset of the study.

Both control group instructors reported that they teach growth mindset to their students to some degree (although neither reported strong agreement with teaching it to their general psychology students). All four instructors reported incorporating growth mindset techniques into their teaching, although both of the control instructors and one of the treatment instructors reported "somewhat." The other treatment instructor indicated strong agreement to incorporating growth mindset techniques.

**Grade in Psychology Course**

Hierarchical Linear Models (HLM) were created to model the effects of four dependent variables: grade in psychology course, level of growth mindset, level of goal orientation, and retention. In all cases, the level-1 unit of analysis was student, the level-2 unit of analysis was classroom, and the level-3 unit of analysis was instructor. The first HLM analysis included grade in psychology course as the dependent variable and the full-model included the following variables as fixed effects at level-1: gender, racial minority status, age (dichotomized), number of credits previously earned, high school grade point average (on a 0-4 scale), degree-seeking status, level of growth mindset, subject-specific level of growth mindset, and level of mastery orientation. At level-2, the model included the average classroom level goal orientation and a dummy code for whether the course was given the intervention or served as a control. No variables predicting variance at level-3 were included. The full mixed model was as follows: $Grade_{ijk} = \gamma_{000} + \gamma_{010}$ (Classroom Goal Orientation) + $\gamma_{020}$ (Treatment/Control) + $\gamma_{100}$ (Minority Status) + $\gamma_{200}$ (Gender) + $\gamma_{300}$ (Number of Credits Earned) + $\gamma_{400}$ (Growth Mindset) + $\gamma_{500}$

(Subject-Specific Growth Mindset) + $\gamma_{600}$ (Goal Orientation) + $\gamma_{700}$ (High School GPA) + $\gamma_{800}$ (Age) + $\gamma_{900}$ (Degree Seeking Status) + $r_{0jk}$ + $u_{00k}$ + $e_{ijk}$

The first step was to run a "null" model with grade as the dependent variable to assess the impact of class and instructor. These results are included in Table 3 below. The sample size for this analysis was N = 189 students and N = 14 classrooms. This analysis indicated that the classroom level (level-2) was not a significant predictor of grade above the highly significant level-3 effect of instructor. The reliability estimate for the level-1 intercept was 0.257, suggesting that the classroom mean grades do not significantly vary between courses. At level-2, the reliability estimate was 0.897, suggesting that grades do vary significantly between instructors.

Table 3. Null three-level hierarchical linear model of Grade in Psychology Course

| *Fixed Effect* | | Estimate | *SE* | *t*-ratio | *p*-value |
|---|---|---|---|---|---|
| Level-1 Intercept ($\gamma_{000}$) | | 2.507 | 0.310 | 8.083 | 0.004 |
| *Random Effect* | Variance Component | *SD* | *df* | $X^2$ | *p*-value |
| Level-2 Intercept ($r_0$) | 0.033 | 0.183 | 10 | 13.113 | 0.217 |
| Level-3 Intercept ($u_{00}$) | 0.345 | 0.588 | 3 | 38.933 | <0.001 |
| Level-1 (e) | 1.277 | 1.130 | | | |

Next, a "full" model was created to reflect whether any of the predictors significantly predicted grade in general psychology. The results from this analysis are presented in Table 4. For this analysis, the sample size for students was N = 143, which was a reduction from the null model due to some missing student-level data. The sample size for classrooms remained N = 14. Results from the full model indicated that the treatment/control variable was the only significant

fixed effect at level-2 (at $\alpha = 0.01$) and age (at $\alpha = 0.05$) was the only significant fixed effects at level-1, although high school GPA approached significance ($p = 0.082$). The random effect of class remained nonsignificant and the random effect of instructor remained significant, although it was reduced in the size of the variance explained and was only significant at $\alpha = 0.05$.

The reliability estimates were reduced in the full model, likely as a result of missing data. For this model, the reliability of the level-1 intercept was 0.049 and the reliability of the level-2 intercept was 0.514. This pattern of additional reliability at level-2 as compared to level-1 is consistent with the null model. A model comparison deviance test was also calculated to assess whether the included independent variables created a model with better fit than the "null" model. The null model's deviance of 595.955 was significantly higher than the full model's deviance of 431.111, with $\chi^2 = 164.844$ with 13 degrees of freedom and a *p*-value of <0.001, suggesting that the full model significantly predicts grade better than the null model.

Table 4. Full three-level hierarchical linear model of Grade in Psychology Course

| Fixed Effect | | Estimate | *SE* | *t*-ratio | *p*-value |
|---|---|---|---|---|---|
| Level-1 Intercept ($\gamma_{000}$) | | 0.070 | 1.593 | 0.044 | 0.968 |
| Minority status ($\gamma_{100}$) | | 0.100 | 0.202 | 0.494 | 0.622 |
| Gender ($\gamma_{200}$) | | 0.115 | 0.218 | 0.526 | 0.600 |
| Credits earned ($\gamma_{300}$) | | 0.007 | 0.008 | 0.817 | 0.415 |
| Growth mindset ($\gamma_{400}$) | | 0.089 | 0.112 | 0.791 | 0.431 |
| Subject growth mindset ($\gamma_{500}$) | | 0.070 | 0.139 | 0.501 | 0.617 |
| Goal orientation ($\gamma_{600}$) | | -0.088 | 0.135 | -0.656 | 0.513 |
| High school GPA ($\gamma_{700}$) | | 0.331 | 0.188 | 1.755 | 0.082 |
| Age ($\gamma_{800}$) | | 0.680 | 0.286 | 2.375 | 0.019 |
| Degree-seeking status ($\gamma_{900}$) | | 0.027 | 0.260 | 0.103 | 0.918 |
| Course mastery orientation ($\gamma_{010}$) | | 0.030 | 0.532 | 0.056 | 0.957 |
| Treatment/control ($\gamma_{020}$) | | 1.146 | 0.286 | 4.006 | 0.004 |
| Random Effect | Variance Component | *SD* | *df* | $X^2$ | *p*-value |
| Level-2 Intercept ($r_0$) | 0.006 | 0.078 | 8 | 8.791 | 0.360 |
| Level-3 Intercept ($u_{00}$) | 0.039 | 0.197 | 3 | 8.341 | 0.039 |
| Level-1 Error (e) | 1.202 | 1.096 | | | |

As a result of the full model, a "reduced" model including only significant demographic variables was created by removing minority status, gender, credits earned, and degree-seeking status from the model (although the variables of interest were kept in the model). This analysis is presented in Table 5. At level-2 in this model, at $\alpha = 0.05$, only the treatment versus control variable was significantly predictive of grade. At level-1, age remained significant and High School GPA became significantly predictive, but no additional factors were significant predictors of grade. Reliability estimates from this model revealed relatively weak reliability at level-1 (0.204) as well as level-2 (0.244), although the reliability improved at level-1 as compared to the full model. Two deviance tests were run to assess whether this model predicted grade a) better than the null model, and b) significantly different from the full model. The deviance for this model of 468.332 was significantly lower than the null deviance of 595.955, with $\chi^2 = 127.623$, 9 degrees of freedom, and $p < 0.001$. The full model, however, predicted a significant amount of variance better than the reduced model, with $\chi^2 = 37.221$, 4 degrees of freedom, and $p < 0.001$.

Table 5. Reduced three-level hierarchical linear model of Grade in Psychology Course

| Fixed Effect | Estimate | *SE* | *t*-ratio | *p*-value |
|---|---|---|---|---|
| Level-1 Intercept ($\gamma_{000}$) | -0.327 | 1.575 | -0.208 | 0.849 |
| Growth mindset ($\gamma_{100}$) | 0.110 | 0.106 | 1.034 | 0.303 |
| Subject growth mindset ($\gamma_{200}$) | 0.122 | 0.125 | 0.972 | 0.333 |
| Goal orientation ($\gamma_{300}$) | -0.093 | 0.113 | -0.826 | 0.411 |
| High school GPA ($\gamma_{400}$) | 0.408 | 0.168 | 2.422 | 0.017 |
| Age ($\gamma_{500}$) | 0.622 | 0.238 | 2.619 | 0.010 |
| Course mastery orientation ($\gamma_{010}$) | 0.067 | 0.514 | 0.131 | 0.899 |
| Treatment/control ($\gamma_{020}$) | 1.101 | 0.237 | 4.638 | 0.002 |

| Random Effect | Variance Component | *SD* | *df* | $X^2$ | *p*-value |
|---|---|---|---|---|---|
| Level-2 Intercept ($r_0$) | 0.027 | 0.166 | 8 | 11.518 | 0.173 |
| Level-3 Intercept ($u_{00}$) | 0.013 | 0.112 | 3 | 5.027 | 0.168 |
| Level-1 Error (e) | 1.162 | 1.078 | | | |

**Level of Growth Mindset**

The second HLM analysis, predicting level of growth mindset, included the general growth mindset (Theories of Intelligence Scale) as the dependent variable and the full-model included the following variables as fixed effects at level-1: gender, racial minority status, age (dichotomized), number of credits previously earned, high school grade point average (on a 0-4 scale), degree-seeking status, subject-specific level of growth mindset, and level of mastery orientation. At level-2, the model included the average classroom level goal orientation and a dummy code for whether the course was given the intervention or served as a control. No variables predicting variance at level-3 were included. The full mixed model was as follows: $\text{Growth Mindset}_{ijk} = \gamma_{000} + \gamma_{010}$ (Classroom Goal Orientation) + $\gamma_{020}$ (Treatment/Control) + $\gamma_{100}$ (Minority Status) + $\gamma_{200}$ (Gender) + $\gamma_{300}$ (Number of Credits Earned) + $\gamma_{400}$ (Subject-Specific Growth Mindset) + $\gamma_{500}$ (Goal Orientation) + $\gamma_{600}$ (High School GPA) + $\gamma_{700}$ (Age) + $\gamma_{800}$ (Degree Seeking Status) + $r_{0jk} + u_{00k} + e_{ijk}$

The results from the null model, where only the level-2 factor of classroom and level-3 factor of instructor were included, are presented in Table 6. The sample size at level-1 was N = 188 and at level-2 was N = 14. In the null model predicting growth mindset, neither the level-2 factor of classroom nor the level-3 factor of instructor were significant. Reliabilities from this analysis were very small, with the level-1 reliability at 0.031 and the level-2 reliability at 0.001.

Table 6. Null three-level hierarchical linear model of growth mindset

| Fixed Effect | | Estimate | *SE* | *t*-ratio | *p*-value |
|---|---|---|---|---|---|
| Level-1 Intercept ($\gamma_{000}$) | | 3.683 | 0.073 | 50.429 | <0.001 |
| **Random Effect** | **Variance Component** | ***SD*** | ***df*** | $X^2$ | ***p*-value** |
| Level-2 Intercept ($r_0$) | 0.014 | 0.116 | 10 | 13.277 | 0.208 |
| Level-3 Intercept ($u_{00}$) | 0.000 | 0.008 | 3 | 3.443 | 0.328 |
| Level-1 Error (e) | 0.805 | 0.897 | | | |

The full HLM model with growth mindset as the dependent variable included the course-level goal orientation and treatment versus control variables at level-2, and minority status, gender, number of previous credits earned, subject-specific growth mindset, goal orientation, high school GPA, age (dichotomized) and degree-seeking status at level-1. The results of this analysis are presented in Table 7. For this analysis, the total sample size without missing data was N = 143. In the full model, neither course-level goal orientation nor treatment versus control group variables were significant at level-2 (at $\alpha = 0.05$). The subject specific growth mindset measure was highly predictive of the overall growth mindset measure in the expected direction (higher subject-specific growth mindset predicts higher general growth mindset) with $p < 0.001$. No other level-1 factors were significantly predictive at $\alpha = 0.05$, however the degree-seeking status variable approached significance ($p = 0.089$). For this model, the random effect of the level-2 variable (class) became a significant predictor of growth mindset ($p = 0.028$), although the level-3 unit of instructor remained nonsignificant.

Reliabilities at level-1 and level-2 were similarly low as compared to the null model, with the level-1 reliability at 0.025 and the level-2 reliability at 0.001. The deviance model comparison test revealed a significantly more predictive model as compared to the null model for

growth mindset. The full model's deviance of 347.523 was significantly lower than the null model's deviance of 495.652 ($\chi^2 = 148.129$, $df = 12$, $p < 0.001$).

Table 7. Full three-level hierarchical linear model of level of growth mindset

| Fixed Effect | Estimate | *SE* | *t*-ratio | *p*-value |
|---|---|---|---|---|
| Level-1 Intercept ($\gamma_{000}$) | 1.056 | 1.041 | 1.015 | 0.385 |
| Minority status ($\gamma_{100}$) | 0.163 | 0.146 | 1.113 | 0.268 |
| Gender ($\gamma_{200}$) | -0.060 | 0.161 | -0.371 | 0.711 |
| Credits earned ($\gamma_{300}$) | 0.007 | 0.006 | 1.124 | 0.263 |
| Subject growth mindset ($\gamma_{400}$) | 0.529 | 0.094 | 5.639 | <0.001 |
| Goal orientation ($\gamma_{500}$) | 0.122 | 0.100 | 1.221 | 0.224 |
| High school GPA ($\gamma_{600}$) | -0.185 | 0.139 | -1.323 | 0.188 |
| Age ($\gamma_{700}$) | 0.127 | 0.210 | 0.606 | 0.546 |
| Degree-seeking status ($\gamma_{800}$) | 0.330 | 0.192 | 1.715 | 0.089 |
| Course mastery orientation ($\gamma_{010}$) | -0.130 | 0.353 | -0.368 | 0.722 |
| Treatment/control ($\gamma_{020}$) | -0.175 | 0.147 | -1.188 | 0.269 |

| Random Effect | Variance Component | *SD* | *df* | $X^2$ | *p*-value |
|---|---|---|---|---|---|
| Level-2 Intercept ($r_0$) | 0.002 | 0.041 | 8 | 17.148 | 0.028 |
| Level-3 Intercept ($u_{00}$) | 0.000 | 0.004 | 3 | 1.218 | >0.500 |
| Level-1 Error (e) | 0.677 | 0.823 | | | |

As with the previous dependent variable of grade, a reduced model was created with the removal of non-significant demographic variables. Another variable, subject-specific growth mindset, was also removed as it likely is highly multicollinear with the general growth mindset measure. A modest correlation was found between the two measures of R = 0.472 ($p < 0.001$). The results of this analysis are presented in Table 8. This analysis contained N = 186 students and N = 14 courses. In this model, no fixed effects were statistically significant. In addition, neither the level-2 random effect of classroom nor the level-3 random effect of instructor were significant, although the classroom variable approached significance ($p = 0.078$).

The reliability at level-1 and level-2 remained very low. Level-1 reliability fell to 0.005 and stayed the same at level-2 at 0.001. The deviance tests for the reduced growth mindset model revealed that the reduced model was significantly more predictive than the null ($\chi^2$ = 14.687, *df* = 6, *p* = 0.023) and that the full model was significantly more predictive than the reduced model ($\chi^2$ = 133.442, *df* = 6, *p* < 0.001).

Table 8. Reduced three-level hierarchical linear model of level of growth mindset

| Fixed Effect | Estimate | *SE* | *t*-ratio | *p*-value |
|---|---|---|---|---|
| Level-1 Intercept ($\gamma_{000}$) | 1.715 | 0.997 | 1.720 | 0.184 |
| Goal orientation ($\gamma_{100}$) | 0.136 | 0.087 | 1.576 | 0.117 |
| Degree-seeking status ($\gamma_{200}$) | 0.190 | 0.177 | 1.075 | 0.284 |
| Course mastery orientation ($\gamma_{010}$) | 0.440 | 0.311 | 1.415 | 0.195 |
| Treatment/control ($\gamma_{020}$) | 0.151 | 0.136 | 1.106 | 0.301 |

| Random Effect | Variance Component | *SD* | *df* | $X^2$ | *p*-value |
|---|---|---|---|---|---|
| Level-2 Intercept ($r_0$) | 0.000 | 0.017 | 8 | 14.139 | 0.078 |
| Level-3 Intercept ($u_{00}$) | 0.000 | 0.003 | 3 | 0.119 | >0.500 |
| Level-1 Error (e) | 0.795 | 0.892 | | | |

**Level of Mastery Orientation**

The third HLM analysis included level of mastery orientation as the dependent variable and the full-model included the following variables as fixed effects at level-1: gender, racial minority status, age (dichotomized), number of credits previously earned, high school grade point average (on a 0-4 scale), degree-seeking status, level of growth mindset, and subject-specific level of growth mindset. At level-2, the model included the average classroom level goal orientation and a dummy code for whether the course was given the intervention or served as a control. No variables predicting variance at level-3 were included. The full mixed model

was as follows: Mastery Orientation$_{ijk}$ = $\gamma_{000}$ + $\gamma_{010}$ (Classroom Goal Orientation) + $\gamma_{020}$ (Treatment/Control) + $\gamma_{100}$ (Minority Status) + $\gamma_{200}$ (Gender) + $\gamma_{300}$ (Number of Credits Earned) + $\gamma_{400}$ (Growth Mindset) + $\gamma_{500}$ (Subject-Specific Growth Mindset) + $\gamma_{600}$ (High School GPA) + $\gamma_{700}$ (Age) + $\gamma_{800}$ (Degree Seeking Status) + $r_{0jk}$ + $u_{00k}$ + $e_{ijk}$

The sample size for this analysis was N = 188 at level-1 and N = 14 at level-2. Results from this analysis are presented in Table 9. For mastery orientation, neither classroom ($\chi^2$ = 13.260, *df* = 10, *p* = 0.209) nor instructor ($\chi^2$ = 3.786, *df* = 3, *p* = 0.285), were found to have a significant random effect on the level of mastery orientation. The reliability was low at both level-1 (0.114) and level-2 (0.079).

Table 9. Null three-level hierarchical linear model of mastery orientation

| Fixed Effect | | Estimate | *SE* | *t*-ratio | *p*-value |
|---|---|---|---|---|---|
| Level-1 Intercept ($\gamma_{000}$) | | 2.346 | 0.062 | 37.896 | <0.001 |
| **Random Effect** | **Variance Component** | ***SD*** | ***df*** | $X^2$ | ***p*-value** |
| Level-2 Intercept ($r_0$) | 0.075 | 0.006 | 10 | 13.260 | 0.209 |
| Level-3 Intercept ($u_{00}$) | 0.001 | 0.035 | 3 | 3.786 | 0.285 |
| Level-1 Error (e) | 0.579 | 0.761 | | | |

The full HLM model with mastery orientation as the dependent variable included the course-level goal orientation and treatment versus control variables at level-2, and minority status, gender, number of previous credits earned, general growth mindset, subject-specific growth mindset, high school GPA, age (dichotomized) and degree-seeking status at level-1. The results of this analysis are presented in Table 10. For this analysis, the total sample size without missing data was N = 143. In the full model, age, minority status, and gender were significant

level-1 predictors of the level of mastery orientation at $\alpha = 0.05$. Age was predictive in that older students (23 years or older) endorsed significantly higher levels of mastery orientation controlling for the other factors in the model. Students who self-identified as racial minorities also endorsed significantly higher levels of mastery orientation compared to students identifying as white. Females were also significantly more likely to endorse mastery orientations than males. No other level-1 or level-2 fixed effects were statistically significant. In this model, the random effect of classroom approached significance ($\chi^2 = 13.782$, $df = 8$, $p = 0.087$) and the random effect of instructor was nonsignificant ($\chi^2 = 1.750$, $df = 3$, $p > 0.500$).

The reliabilities at both level-1 and level-2 were low, with the level-1 reliability at 0.033 and the level-2 reliability at 0.001. The deviance model comparison test revealed a significantly more predictive model as compared to the null model for goal orientation. The full model's deviance of 297.879 was significantly lower than the null model's deviance of 433.043 ($\chi^2 = 135.164$, $df = 10$, $p < 0.001$).

Table 10. Full three-level hierarchical linear model of level of mastery orientation

| Fixed Effect | Estimate | *SE* | *t*-ratio | *p*-value |
|---|---|---|---|---|
| Level-1 Intercept ($\gamma_{000}$) | 1.698 | 0.862 | 1.969 | 0.144 |
| Minority status ($\gamma_{100}$) | 0.266 | 0.120 | 2.208 | 0.029 |
| Gender ($\gamma_{200}$) | 0.576 | 0.125 | 4.621 | <0.001 |
| Credits earned ($\gamma_{300}$) | -0.004 | 0.005 | -0.753 | 0.453 |
| Growth mindset ($\gamma_{400}$) | 0.085 | 0.069 | 1.223 | 0.224 |
| Subject growth mindset ($\gamma_{500}$) | -0.004 | 0.086 | -0.041 | 0.967 |
| High school GPA ($\gamma_{600}$) | -0.133 | 0.116 | -1.146 | 0.254 |
| Age ($\gamma_{700}$) | 0.418 | 0.171 | 2.445 | 0.016 |
| Degree-seeking status ($\gamma_{800}$) | -0.092 | 0.161 | -0.571 | 0.569 |
| Course mastery orientation ($\gamma_{010}$) | 0.137 | 0.295 | 0.465 | 0.655 |
| Treatment/control ($\gamma_{020}$) | -0.129 | 0.123 | -1.042 | 0.328 |

| Random Effect | Variance Component | *SD* | *df* | $X^2$ | *p*-value |
|---|---|---|---|---|---|
| Level-2 Intercept ($r_0$) | 0.002 | 0.040 | 8 | 13.782 | 0.087 |
| Level-3 Intercept ($u_{00}$) | 0.000 | 0.004 | 3 | 1.750 | >0.500 |
| Level-1 Error (e) | 0.469 | 0.684 | | | |

As with the previous HLM analyses, a reduced model was created with the removal of non-significant demographic variables. The results of this analysis are presented in Table 11. This analysis contained N = 175 students and N = 14 courses. In this model, race ($p = 0.003$) and gender ($p < 0.001$) remained highly significant, but age only approached significance ($p = 0.092$). No other level-1 or level-2 fixed effects were significant. In addition, neither the level-2 random effect of classroom ($\chi^2 = 12.549$, $df = 8$, $p = 0.128$) nor the level-3 random effect of instructor ($\chi^2 = 0.218$, $df = 3$, $p > 0.500$) were significant at $\alpha = 0.05$.

The reliability at level-1 and level-2 remained very low. Level-1 reliability fell to 0.007 and stayed the same at level-2 at 0.001. The deviance tests for the reduced goal orientation model revealed that the reduced model was significantly more predictive than the null ($\chi^2 = 73.668$, $df = 7$, $p < 0.001$) and that the full model was significantly more predictive than the reduced model ($\chi^2 = 61.496$, $df = 3$, $p < 0.001$).

Table 11. Reduced three-level hierarchical linear model of level of mastery orientation

| Fixed Effect | Estimate | *SE* | *t*-ratio | *p*-value |
|---|---|---|---|---|
| Level-1 Intercept ($\gamma_{000}$) | 1.515 | 0.777 | 1.949 | 0.146 |
| Minority status ($\gamma_{100}$) | 0.315 | 0.104 | 3.037 | 0.003 |
| Gender ($\gamma_{200}$) | 0.514 | 0.110 | 4.692 | <0.001 |
| Age ($\gamma_{300}$) | 0.231 | 0.136 | 1.698 | 0.092 |
| Growth mindset ($\gamma_{400}$) | 0.088 | 0.064 | 1.367 | 0.174 |
| Subject growth mindset ($\gamma_{500}$) | 0.005 | 0.077 | 0.058 | 0.954 |
| Course mastery orientation ($\gamma_{010}$) | 0.014 | 0.248 | 0.058 | 0.955 |
| Treatment/control ($\gamma_{020}$) | -0.094 | 0.106 | -0.884 | 0.403 |

| Random Effect | Variance Component | *SD* | *df* | $X^2$ | *p*-value |
|---|---|---|---|---|---|
| Level-2 Intercept ($r_0$) | 0.000 | 0.016 | 8 | 12.549 | 0.128 |
| Level-3 Intercept ($u_{00}$) | 0.000 | 0.002 | 3 | 0.218 | >0.500 |
| Level-1 Error (e) | 0.456 | 0.675 | | | |

**Retention**

The fourth and final dependent variable for which a hierarchical linear model was computed was for retention, coded as 0 for students who did not register for classes during the Spring 2017 semester and 1 for students who did register during that term. The sample size for this analysis was N = 190 at level-1 and N = 14 at level-2. The null model, modeling only the intercept and the random effects for the two nesting levels, is presented in Table 12. For retention, classroom was found to have a significant random effect on retention ($\chi^2 = 18.398$, $df = 10$, $p = 0.048$), but the effect of instructor was nonsignificant ($\chi^2 = 3.314$, $df = 3$, $p = 0.346$). The reliability was modest at level-1 for this model (0.358), and was very low at level-2 (0.002).

Table 12. Null three-level hierarchical linear model of retention

| Fixed Effect | | Estimate | *SE* | *t*-ratio | *p*-value |
|---|---|---|---|---|---|
| Level-1 Intercept ($\gamma_{000}$) | | 0.919 | 0.024 | 37.807 | <0.001 |
| **Random Effect** | **Variance Component** | ***SD*** | ***df*** | $X^2$ | ***p*-value** |
| Level-2 Intercept ($r_0$) | 0.0.003 | 0.054 | 10 | 18.398 | 0.048 |
| Level-3 Intercept ($u_{00}$) | 0.000 | 0.002 | 3 | 3.314 | 0.346 |
| Level-1 Error (e) | 0.070 | 0.264 | | | |

The full HLM model with retention as the dependent variable included course-level goal orientation and treatment versus control variables at level-2, and minority status, gender, number of previous credits earned, growth mindset, subject-specific growth mindset, goal orientation, high school GPA, age (dichotomized) and degree-seeking status at level-1. The sample size for this analysis was N = 143 at level-1 and N = 14 at level-2. The results of this analysis are presented in Table 13. In the full model, neither course-level goal orientation nor treatment versus control group variables were significant at level-2 (at $\alpha = 0.05$). No level-1 factors were significantly predictive at $\alpha = 0.05$. In this model, the random effect of the level-2 variable (class) approached significance ($p = 0.057$), although the level-3 unit of instructor remained nonsignificant ($p = 0.134$).

Reliabilities at level-1 and level-2 were similarly modest as compared to the null model, with the level-1 reliability at 0.211 and the level-2 reliability at 0.304. The deviance model comparison test revealed that the full model was not significantly more predictive than the null model for retention. The full model's deviance of 29.513 was not significantly lower than the null model's deviance of 39.890 ($\chi^2 = 10.377$, $df = 11$, $p > 0.500$).

Table 13. Full three-level hierarchical linear model of level of retention

| Fixed Effect | Estimate | *SE* | *t*-ratio | *p*-value |
|---|---|---|---|---|
| Level-1 Intercept ($\gamma_{000}$) | 0.850 | 0.404 | 2.103 | 0.126 |
| Minority status ($\gamma_{100}$) | 0.025 | 0.049 | 0.514 | 0.608 |
| Gender ($\gamma_{200}$) | -0.026 | 0.052 | -0.493 | 0.623 |
| Credits earned ($\gamma_{300}$) | -0.002 | 0.002 | -0.807 | 0.422 |
| Growth mindset ($\gamma_{400}$) | -0.009 | 0.027 | -0.316 | 0.753 |
| Subject growth mindset ($\gamma_{500}$) | -0.034 | 0.033 | -1.155 | 0.250 |
| Goal orientation ($\gamma_{600}$) | -0.027 | 0.033 | -0.816 | 0.416 |
| High school GPA ($\gamma_{700}$) | -0.049 | 0.045 | -1.090 | 0.278 |
| Age ($\gamma_{800}$) | 0.107 | 0.068 | 1.570 | 0.119 |
| Degree-seeking status ($\gamma_{900}$) | -0.025 | 0.063 | -0.399 | 0.690 |
| Course mastery orientation ($\gamma_{010}$) | 0.145 | 0.133 | 1.085 | 0.310 |
| Treatment/control ($\gamma_{020}$) | 0.021 | 0.064 | 0.335 | 0.746 |

| Random Effect | Variance Component | *SD* | *df* | $X^2$ | *p*-value |
|---|---|---|---|---|---|
| Level-2 Intercept ($r_0$) | 0.002 | 0.043 | 8 | 15.100 | 0.057 |
| Level-3 Intercept ($u_{00}$) | 0.001 | 0.034 | 3 | 5.550 | 0.134 |
| Level-1 Error (e) | 0.070 | 0.264 | | | |

A reduced model was created with nonsignificant demographic variables removed from the model. The variable of age was kept as it most closely approached significance in the full model ($p = 0.119$). This model had a sample size of N = 186 at level-1 and N = 14 at level-2. Results from this analysis are presented in Table 14. The reliability of this model at level-1 was similarly modest compared to the other two models (0.387), but the level-2 reliability estimate was 0.000. The deviance model comparison test revealed that this model also did not significantly predict above what was predicted in the null model, as the deviance for this model was 39.630 compared to the null model deviance of 39.890 ($\chi^2 = 0.260$, $df = 6$, $p > 0.500$).

Table 14. Reduced three-level hierarchical linear model of retention

| Fixed Effect | Estimate | *SE* | *t*-ratio | *p*-value |
|---|---|---|---|---|
| Level-1 Intercept ($\gamma_{000}$) | 0.798 | 0.392 | 2.037 | 0.134 |
| Growth mindset ($\gamma_{100}$) | 0.000 | 0.025 | 0.003 | 0.998 |
| Subject growth mindset ($\gamma_{200}$) | -0.026 | 0.029 | -0.885 | 0.378 |
| Goal orientation ($\gamma_{300}$) | -0.019 | 0.026 | -0.737 | 0.462 |
| Age ($\gamma_{400}$) | 0.038 | 0.049 | 0.765 | 0.446 |
| Course mastery orientation ($\gamma_{010}$) | 0.074 | 0.121 | 0.612 | 0.558 |
| Treatment/control ($\gamma_{020}$) | 0.029 | 0.052 | 0.551 | 0.597 |

| Random Effect | Variance Component | *SD* | *df* | $X^2$ | *p*-value |
|---|---|---|---|---|---|
| Level-2 Intercept ($r_0$) | 0.003 | 0.059 | 8 | 20.138 | 0.010 |
| Level-3 Intercept ($u_{00}$) | 0.000 | 0.001 | 3 | 3.456 | 0.326 |
| Level-1 Error (e) | 0.070 | 0.264 | | | |

**Mindset and Goal Orientation**

In order to assess a more direct relationship between mindset and goal orientation, additional analyses were conducted using a simple linear regression of mastery orientation on growth mindset. This analysis is presented in Table 15. This analysis did not find a statistically significant relationship between level of growth mindset and level of mastery orientation, without other controlling variables.

Table 15. Simple linear regression of mastery orientation on growth mindset

| Independent Variable | β | *SE* | *t*-ratio | *p*-value |
|---|---|---|---|---|
| Constant | 1.985 | 0.234 | 8.500 | 0.000 |
| Growth Mindset | 0.100 | 0.061 | 1.623 | 0.106 |

Similarly, using the subject-specific growth mindset measure to predict mastery orientation also did not yield a significant relationship. These results are presented in Table 16.

Table 16. Simple linear regression of mastery orientation on subject-specific growth mindset

| Independent Variable | β | *SE* | *t*-ratio | *p*-value |
|---|---|---|---|---|
| Constant | 2.102 | 0.277 | 7.590 | 0.000 |
| Subject Specific Growth Mindset | 0.067 | 0.072 | 0.926 | 0.356 |

**Implementation Feasibility and Acceptability of Intervention**

Although only two instructors participated in implementing the intervention in their classrooms, feedback from these instructors on the feasibility and acceptability survey can be utilized to determine whether they found the intervention easy to implement and valuable. The first question asked participating faculty to what extent they agreed that the intervention was easy for them to implement in their classrooms. Both participants "strongly agreed" with this statement. Both participating faculty also strongly agreed that the intervention seemed worth the time they invested to implement it. The third item asked the faculty whether they felt that the intervention should include more activities or materials. One instructor "somewhat disagreed" and the other "strongly disagreed" with this statement, suggesting that some faculty might desire additional materials. The fourth survey item was designed to elicit the opposite information: whether faculty felt that fewer materials or activities should be included in the intervention. One instructor "strongly disagreed" with this, but the other instructor "somewhat agreed." As such, some faculty might also desire fewer materials in the intervention.

An open-ended question was also included in the feasibility survey to allow participating instructors to indicate any other information about the intervention. One instructor stated, "I think that the Go for Growth intervention is extremely useful and I plan to use the power-points in future semesters at the beginning of the course to set the tone." The other noted, "I will be interested to read published results!"

# CHAPTER 4: DISCUSSION

## Findings Related to Implementation

One aim of the present study was to determine if the *Go for Growth!* intervention was feasible and could be implemented with fidelity in a classroom setting. Based on surveys completed by students, classrooms selected for implementation of the *Go for Growth!* intervention contained more of the intervention components than did control classrooms. Although the "treatment" classrooms contained more intervention components than the "control" classrooms, many of the classrooms selected as controls also included many of the main components of the intervention (e.g., teaching about growth mindset, giving students choices on assignments, etc.). The feasibility survey indicated that some instructors (in both treatment and control groups) had prior knowledge about growth mindset and regularly included this content in their courses even prior to receiving the *Go for Growth!* intervention. This will be discussed further in the limitations section. None of the participating instructors reported speaking to colleagues about growth mindset during the semester, which suggests that no diffusion of intervention components occurred through instructor interactions.

Faculty who implemented the *Go for Growth!* intervention reported that the intervention was both easy to implement and also agreed that the intervention was worth the time investment required for implementation. There was some disagreement between faculty regarding whether additional or fewer materials should be included in the intervention, although neither instructor

reported strong feelings about needing more or fewer materials. The open-ended feedback was also positive about the intervention, noting interest in the results of the study as well as an indication that the intervention materials would be used in their future courses. One of the main aims of the study was to create an intervention that would be easily implemented but have high impact, also known as a "wise" intervention (Walton, 2014) that would be likely to be implemented with fidelity. According to the fidelity and feasibility data, the intervention was perceived as easy to implement and instructors believed it was worthwhile for their students. In order to determine if the intervention impacted student success, additional analyses were completed.

## Findings Related to Student Success

**Grades.** Analyses related to the effects of the intervention on student success found that, over and above the effects of demographics, prior success (measured using high school GPA), level of growth mindset, level of subject-specific growth mindset, goal orientation, and instructor, students in classrooms receiving the *Go for Growth!* intervention had significantly higher overall grades in their general psychology course. Interestingly, however, analyses revealed that the effect of instructor was also significant, suggesting that instructors may be more or less likely to give better grades independently of whether they participated in the intervention or served as controls. Additionally, since instructors were aware whether they received the intervention or not and were solely responsible for assigning student grades, it may be possible that participation in the treatment and/or control group affected the grades instructors chose to give to students. Another possible explanation is that the intervention methods influenced instructors through an unmeasured factor that resulted in differences in grades assigned by the instructor. Despite these possible sources of bias, hypothesis 1 for research question 1 is largely

confirmed, as students who received the intervention had better course grades in their General Psychology course even when controlling for demographic variables and prior academic ability.

Hypothesis 3 for research question 1, which predicted that students with higher prior academic ability (high school GPA) would obtain better grades in the course was not confirmed in the full HLM analysis including all demographic variables, but was confirmed in the reduced HLM analysis which removed insignificant demographic variables. This suggests that, as previous findings have shown, prior academic ability has an impact on classroom grades, above the effects of growth mindset, goal orientation, age, classroom-level growth mindset, and participation in the intervention.

Students' self-rated levels of growth mindset (both general and course-specific) were not found to be significantly related to their grades in general psychology above the effects of demographics, prior ability, and goal orientation (both student-level and course-level). Thus, hypothesis 1 for research question 2, that students endorsing higher levels of growth mindset would be more likely to receive higher grades, was not supported by this research. Similarly, goal orientations (both student-level and course-level) were not found to be significant predictors of grade in general psychology. As such, hypothesis 2 for research question 2, which predicted that students with higher endorsement of mastery orientations would be more likely to earn higher grades, was also not supported.

The *Go for Growth!* intervention was related to students' grades in the expected direction, such that students participating in classes receiving the intervention received better grades than students in the control condition. Despite this, the expected mediating factor of mindset and goal orientation was not supported by this research, suggesting that the intervention may have had an effect on an unmeasured mediating factor. It may be that the intervention,

which was designed to affect instructors through influencing their delivery of instruction (and, as such, was designed to only indirectly affect students), affected *instructors'* implicit theories of intelligence, although this was not directly measured in the present study. As has been shown previously by Rattan, Good, and Dweck (2012), instructor's mindsets can have a significant influence on student motivation and perceptions of the expectations of their own performance and ability.

**Retention.** Hypothesis 2 for research question 1, which predicted that students who participated in the *Go for Growth!* intervention would be more likely to return for classes in the spring semester than students not participating in the intervention, was not supported by the present research. This result is not altogether surprising, however, as many factors likely influence whether or not students are retained, and participation in the intervention appeared not to outweigh other factors in predicting retention. Similarly, hypothesis 3 for research question 2, which predicted that students with higher growth mindsets would be more likely to be retained, was also not supported by the present research. This is likely a result of other, unmeasured, factors being of greater importance to whether students are retained or not. Level of mastery orientation was also not found to be related to retention, as hypothesis 4 for research question 2 was also not supported. It is likely that for all three of these variables, the lack of significance was due to the importance of other (unmeasured) factors in predicting retention, such as life stressors.

**Interpretation.** One major difficulty when conducting research on academic success in students is in choosing appropriate measurement tools. Two factors were chosen for this research due to their relevance to the underlying theory that the *Go for Growth!* intervention, which targeted students' implicit theories of intelligence and goal orientations, would improve

student outcomes (most commonly measured by grades) and would increase the likelihood that students would return to school the following semester. This was predicted because previous research has shown that interventions for mindset and goal orientation can influence students' implicit theories of intelligence and goal orientations (Bempechat et al., 1991; Blackwell et al., 2007; Mueller & Dweck, 1998), and that implicit theories of intelligence and goal orientations are related to academic success (Diseth, 2011; Hoyert & O'Dell, 2009; McCutchen et al., 2015). Although previous research supports the relationship between these factors, no prior research has shown if, in the community college setting, attempting to influence implicit theories of intelligence in students can be accomplished, and, whether these efforts can impact student success. The present research provides some evidence that interventions targeting mindset and goal orientations can have an impact on more "proximal" goals such as grade in the course, but that they may not influence more "distal" goals such as retention. In addition, although students participating in the intervention obtained significantly higher grades than students in the control condition, this effect appeared not to be the result of higher student growth mindset or mastery goal orientation.

It was also found that instructors may have a large impact on students' grades, over and above the effects of student mindset and goal orientation. This finding suggests that there is a subjective component to assigning course grades that may be influenced by participation in interventions such as the *Go for Growth!* intervention. Due to the complex nature of implementing an intervention within diverse classroom settings, however, grading methods were not standardized as part of the present study. As such, future research in this area may attempt to standardize teachers' grading methods and procedures or measure them in some way to allow for analytical control. The significant effect of teacher in predicting course grades may also be due

to other factors regarding the instructor that may or may not have been affected by the intervention, such as empathy toward students, beliefs regarding equity, instructor's implicit theories of intelligence, experience with teaching, methods of grading, etc.

Another potentially important aspect of the present study which may have influenced these results was the use of general psychology classrooms as intervention sites. Prior research has shown efficacy for mindset interventions in different settings such as reading classes (Andersen & Nielsen, 2016; Rhew, 2018), outdoor personal development courses (O'Brien & Lomas, 2017), and math courses (Shively & Ryan, 2013). Further exploration into mindset and goal orientation interventions in other types of classes, particularly those where the content would be different from much of the rest of the course content (e.g., history, arts, or vocational courses) is warranted.

Other current research has shown that interventions focusing on growth mindset have not been shown to influence academic outcomes (Bahnik & Vranka, 2017; Broughham, 2018; Burnette, Russell, Hoyt, Orvidas, & Widman, 2017; Li & Bates, 2017), and may even negatively impact it for students with a lower sense of autonomy (Chao, Visaria, Mukhopadhyay, & Dehejia, 2017). These findings, which are from interventions that were provided in naturalistic educational settings (similarly to the present research), suggest that influencing mindset might be a short-term effect, and may require far greater resources than have been theorized to be necessary. In addition, much published research regarding interventions with mindset have not controlled for previous academic ability (e.g., Bempechat et al., 1991; Blackwell et al., 2007; Mueller & Dweck, 1998), and some research has shown that, when prior academic ability is controlled for, interventions for mindset are not significantly effective at improving academic success (Sriram, 2010). As such, there may be a more complex relationship involving academic

success and mindset than is currently postulated in the research, possibly such that mindset may be a moderating factor between prior and future academic success.

**Findings Related to Motivation**

The *Go for Growth!* intervention was designed to influence student academic success through increasing students' levels of growth mindset and mastery orientations. The second major aim of the study was to determine if receiving the *Go for Growth!* intervention led to greater endorsement of growth mindset and mastery orientations. Interestingly, the present research was not supportive of hypothesis 1 for research question 3, which predicted that students receiving the *Go for Growth!* intervention would be more likely to endorse growth mindsets. This suggests that the significant effects of the intervention on students' grades may not be due to the mediating factor of mindset and may have been the result of another factor. Similarly, the data did not support an impact for the *Go for Growth!* intervention on students' endorsements of mastery goal orientations. It should also be noted that, for both the mindset and goal orientation variables, the variance was relatively low and most students endorsed relatively high levels of both growth mindset and mastery orientation, possibly due to a social desirability bias (Nederhof, 1985). As such, it is possible that interventions targeting community college students' mindsets and goal orientations may be ineffective for most students as these students already have high levels of these constructs. This finding may also indicate that the surveys and methods utilized in the present study to elicit data on mindset and goal orientation may not have reduced bias sufficiently to capture the true variability in students' mindsets and goal orientations.

A third major aim for this study was to further explore the relationship between implicit theories of intelligence (i.e., mindset) and goal orientation. Previous research supports the

relationship between greater endorsement of growth mindset and mastery orientation, and conversely, fixed mindsets and performance orientations (Bempechat et al., 1991). The present research was unable to replicate these findings, as neither the general growth mindset nor the subject-specific growth mindset measure was significantly predictive of level of mastery orientation, even without other controlling variables in the analyses. As such, hypothesis 4, that mastery orientation will be significantly related to growth mindset, was not supported.

**Unexpected Findings**

A number of findings were unexpected in the present study. Firstly, it was found that age was a significant predictor of grade in general psychology (controlling for demographics, growth mindset, subject-specific growth mindset, high school GPA, course, and teacher), such that older students (older than age 22) obtained significantly higher grades than younger students. This may be due to a number of factors, such as more stable lifestyles, more financial or emotional support, or different attitudes towards school in general.

Another interesting finding was that the correlation between general growth mindset and subject-specific growth mindset (in the psychology course) was only a modest one. It was predicted that there would be a high correlation between these two factors, but this finding suggests that it may be important to differentially analyze growth mindset in specific settings and not to assume that mindset is a stable trait within individuals that is similar in all situations. The implications of this finding suggest that much of the present research on mindset, which measures implicit theories of intelligence as a perceived stable trait related to the concept of G (Spearman, 1904), may underestimate the differential impact of people's perceived strengths and weaknesses. In other words, the mindset literature might need to evolve in ways that are analogous to how research on intelligence has evolved over time, including more specific

indicators of perceived ability and effort *in specific areas* (Brody, 2000). Most prior research on mindset has either focused on very specific ability beliefs (e.g., "I can get better *on this particular task*") or on more broad intelligence (e.g., "I can improve my intelligence"). The subject-specific measure used in the present study asked participants about beliefs somewhere in-between these two ideas, identifying their implicit beliefs regarding ability as a student within a particular academic classroom. Student perceptions about other context-dependent factors, such as class difficulty, relationships with the teacher, time and support resources, etc., may explain this finding.

The current research also found that gender, age, and minority status all significantly predicted students' level of mastery orientation above the effects of other demographic variables, growth mindset, and participation in the intervention. More specifically, it was found that older students (23 year of age or older), students identifying as racial/ethnic minorities, and self-identified female students were all more likely to endorse mastery orientations than younger, non-minority, or male students. It may be that older community college students, many of whom have chosen to return to school in order to improve themselves, may have a higher proportion of students with a growth mindset compared to their "traditional" student peers, who may be attending college due to parental and societal expectations. For racial and ethnic minority students, exhibiting growth mindsets might be a learned response coinciding with the development of resilience in the face of adversity. In this case, resilience describes one's ability to adapt successfully to challenges to the stability of one's life (Masten, 2014; Southwick, Bonanno, Masten, Panter-Brick, & Yehuda, 2014). Similarly, for female students, it is possible that the development of growth mindset is a response to the experience of discrimination and different societal expectations, which are factors that may disproportionally cause students to

face challenges to the stability of their lives. In each of these cases, however, additional data would need to be collected to formulate hypotheses as to why these groups exhibited higher levels of growth mindset than their peers. Prior research has shown that there are gender differences in mindset such that females are more likely to have growth mindsets than males (Diseth, Meland, & Breidablik, 2014). Similarly, female students have been found to have higher endorsement of mastery goal orientations (D'Lima, Winsler, & Kitsantas, 2014). The effect of race and ethnicity on goal orientations and mindsets have not been thoroughly explored in the existing literature.

**Research Limitations**

Limitations with the present research were largely due to challenges with implementing interventions in a real-world community college setting. The first challenge was simply in the recruitment of faculty to participate in the research. Despite an initial widespread showing of support by faculty, support appeared to wain as a result of implementation beginning a couple of weeks into the semester and perceptions of time commitments. As a result of this, only four faculty members agreed to participate, which limited the variability of courses and teaching methods. Another major limitation was in the way that courses were assigned to treatment or control conditions. As a way to increase the fidelity of implementation and perceived feasibility from instructors, the instructors were randomized to treatment versus control conditions rather than the courses themselves (which would have resulted in each instructor teaching some sections *with* the intervention and others *without*). Although this helped to limit treatment diffusion into control conditions, it also limited the variability and randomization between courses, and created unequal sample sizes where more students were included in the control condition than the treatment condition.

Another limitation with the present research was that instructors were invited to participate whether they had prior knowledge of mindset theory or not. This was a particularly relevant problem since all courses were taught by psychology faculty, who are more likely to be aware of psychological theory than instructors of other subjects. In fact, one of the two "control" faculty indicated significant prior knowledge regarding growth mindset and also reported regularly teaching mindset and using related techniques while teaching. As such, the control condition may not have represented a true "lack" of the intervention and may have affected the ability to find significant results when comparing treatment and control conditions.

The sample of instructors was chosen largely as a convenience sample, as the researcher had prior relationships with employees in the department chosen for implementation. Using only one type of course and at one institution limited the external validity of research findings. The research data was collected at only one time point, near the end of the semester, to aid in treatment acceptability and feasibility. A better methodology to answer many of the proposed questions may have utilized a "pre-post" design to elicit whether students' levels of growth mindset and/or mastery orientation changed as a result of the implemented intervention. In addition, contrary to expectations, the sample of community college students reported high levels of growth mindset and mastery orientation even in the control condition. As such, the present study may have been more effective with the (relatively few) students who began the semester with more fixed mindsets, but these benefits were "lost" in the analysis due to a ceiling effect.

Another possible limitation to the present study was the selection of survey materials; most notably the Theories of Intelligence Scale that was used to measure mindset. Some current research has shown that revisions to the scale, which uses broad terminology referring to "people" and not necessarily one's self, uses terms like "intelligence" rather than ability, and

includes only 8 items, may better reflect students' true levels of mindset (DeCastella & Byrne, 2015). In particular, new measurement instruments may need to be developed to reflect how students perceive the malleability of their ability in different areas and how this might impact their "overall" perception of their intelligence.

Since the *Go for Growth!* intervention included two main components, namely the psychoeducational PowerPoint slideshow and the suggested instructional techniques, it is difficult to differentially analyze which components of the intervention may have affected variables of interest and which may not have. In addition, the intervention asked instructors to attempt to incorporate as many of the instructional techniques as was feasible, but did not specify which techniques should be used or specify a "minimum" number, so instructors may have implemented different (or more/fewer) techniques from one another.

The present study also utilized a training method for participating instructors designed to be minimally time-intensive and standardized through the use of a training video. It is likely that the skill transfer required to fully implement the necessary changes in the classroom was not fully achieved through this method, and a more time-intensive coaching-based method may have yielded stronger results (Joyce & Showers, 1980). In particular, the fluency with which instructors implemented the classroom alterations was likely minimal as there was no coaching or training beyond the initial explanation of the techniques and providing of examples. For example, it is possible that instructors understood the difference between praise for ability versus effort, but may not have realized that they regularly provide ability feedback. Thus, although participating faculty may have wanted to implement the intervention with fidelity, they were not provided sufficient support to develop fluency with components of the intervention.

The present research also did not collect specific data on instructor characteristics that may have impacted the effectiveness of the intervention beyond their familiarity with the topic of growth mindset. Other factors, such as level of teaching experience, fluency with teaching methods and techniques, as well as class sizes, might have predicted whether the intervention was effective in its goals. Also, the present study collected student data at only one time point, and, although experimental in nature since a control group was also analyzed, the impact of the intervention might have been better measured with a pre-post design to assess changes in mindset and goal orientation during the semester.

**Future Directions**

Based on the results of the present study, future research could explore some of the unexpected findings, such as how student age affects success at community colleges. In particular, it would be interesting to see what factors contribute to the relatively greater success of older students, and whether this finding is also present for other subjects, courses, or colleges. Findings from prior research suggest that nontraditional (older) college students' self-efficacy and beliefs regarding peers' attributions about learning were significant predictors of academic success, while attributions of ability and cost value were significant predictors for traditional students (Johnson, Taasoobshirazi, Clark, Howell, & Breen, 2016). This suggests that older students may be differentially influenced by classroom characteristics as well as efficacy beliefs and this may at least partially explain the difference in academic success in the college setting.

Another finding that may warrant further exploration is how age, race, and gender interact to predict student goal orientation. Specifically, it may be of interest to examine whether interpretation of goals differ with respect to age, gender, or race with respect to levels of

maturity, stability, resilience, stress, or perceived value of education, among other possible factors.

The relatively modest correlation between general growth mindset and subject-specific growth mindset is another finding that may warrant further study, although it aligns with prior research which has shown that differences in mindset in specific settings as compared to broadly are likely (Shively & Ryan, 2013). Future research could explore whether individuals have different implicit theories of intelligence in different academic subjects or with different skills (e.g., ability to play music). In addition, as mentioned previously, the research on implicit theories of intelligence may wish to focus on including multiple components of perceived intelligence as individuals may have differentially fixed/growth mindsets in each area (e.g., "I can get better at math, but I am terrible at art and visual puzzles").

The present study found that community college students reported a relatively high level of growth mindset whether they were exposed to the intervention or not, which suggests further interventions targeting growth mindset might have better efficacy by focusing on those students who have more fixed mindsets to start (thus allowing for greater changes in mindset). Future research may wish to identify academically at-risk students who also exhibit more fixed mindsets and target these students' implicit theories of intelligence directly through peer mentorships or direct intervention with researchers.

Other future directions include studying the relationship between instructors and interventions like the *Go for Growth!* intervention. For instance, it might be of value to explore the impact of interventions such as this one on the instructors' skills, attitudes, and beliefs, and how the benefits of implementing the intervention for instructors interact with students' mindsets and goal orientations. Moreover, it may be beneficial to conduct further analysis into which

specific strategies that were recommended in the *Go for Growth!* intervention may benefit students and/or instructors and more specifically discern which pedagogical/andragogical techniques should be recommended in future interventions. In the present research, these techniques, adopted from Ames (1992), were given as a "package" of techniques, and instructors were asked to attempt to implement as many as were feasible. Future research could explore how each of these techniques individually impact student goal orientations and academic success, and the mechanisms for how they do so. This might be done by standardizing grading methods, or using standardized quizzes provided to all participants to calculate a separate "grade" from the one they receive in the class.

In addition, future research could analyze whether different "dosages" of the intervention affect outcomes, possibly by asking some instructors to use minimal alterations and using an intensive coaching model for other instructors. Moreover, the results of the present study suggest that interventions that use instructors as agents of change may show greater effects if the instructors themselves are also the study participants. In other words, future research could assess whether mindset and goal orientation interventions for instructors affect the instructors themselves and cause them to align their courses with more effective teaching methods.

One final area for further exploration includes studying the impact of the intensity of interventions such as the *Go for Growth!* intervention, and, specifically, whether increasing the number of materials / expectations / time commitments for instructors may impact student outcomes and treatment acceptability. Alternately, it would be interesting to note whether reducing the number of techniques presented or the length of the psychoeducational component would result in similar outcomes. In addition, the method of professional development delivery might be explored further to see if, as has been found by Joyce and Showers (1980), the addition

of coaching might result in stronger results, and whether this addition would impact the treatment acceptability in significant ways.

**Implications of Research**

The present research indicates that the *Go for Growth!* intervention at the community college level targeting growth mindset and mastery orientations may have an impact on student success as measured by classroom grades, but not through the expected mechanism of increasing growth mindset and mastery orientation. Although not measured in the present study, it is possible that improvements in student grades were mediated by *instructor*-level variables, possibly the instructors' perceptions of either their own mindsets or the mindsets of their students. In other words, it may have been that instructors who received the intervention more strongly attributed their students' motivation to mindset rather than to a lack of ability, thus leading instructors to assign higher grades to students who gave strong effort when grading them.

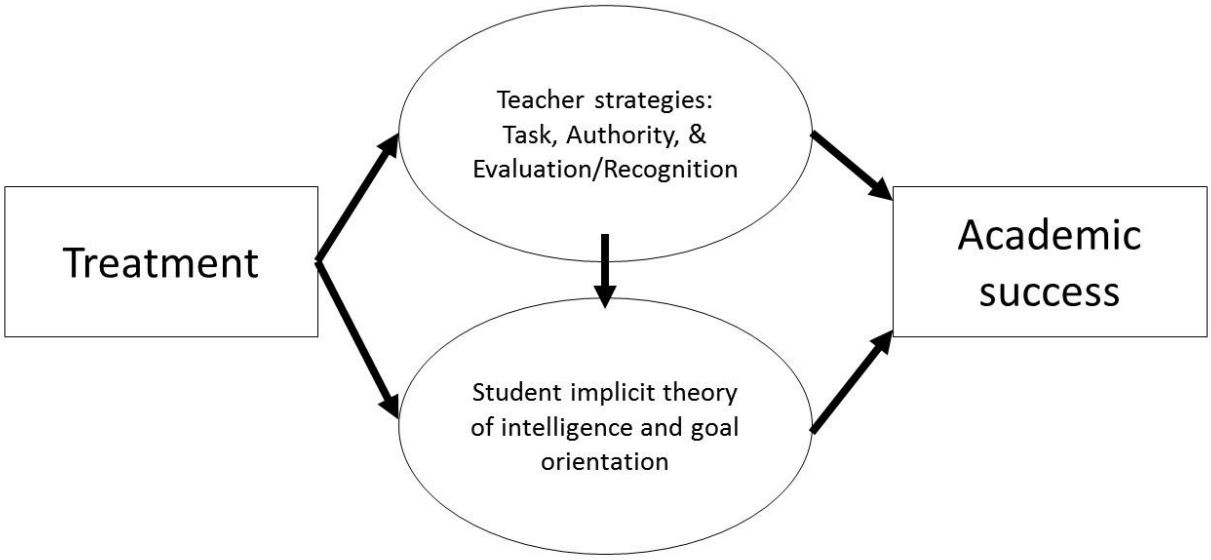
The present research suggests that the *Go for Growth!* intervention may influence the classroom in such a way that students receive higher grades. Although influences to instructors were not specifically measured as part of the present study, it may be that participating instructors thought more critically about individual students' needs and matching their instruction to meet those needs. It may also be that the influence on grades did not represent a greater mastery of the material by participating students, but, rather, a difference in how instructors viewed their students. Further research is needed to explore these hypotheses. However, although the mechanism is unclear, students participating in the intervention earned higher course grades, suggesting that further implementation of similar interventions may be beneficial. The *Go for Growth!* intervention was not found to significantly impact students' levels of growth mindset or mastery goal orientation, and future research may want to consider

different research methodologies or treatment components to better determine whether these factors are possible to affect in the community college setting.

The current study also found that student-rated levels of growth mindset were not significantly related to levels of mastery orientation, contradicting previous research, which has found significant correlation between these factors. It is possible that separate mechanisms drive students' implicit theories of intelligence and goal orientations, particularly when taking academic ability into account. In other words, it may be that, for students with high academic ability, who are unlikely to struggle academically, having performance goal orientations does not preclude them from utilizing growth mindsets. It was also discovered that community college students exhibit high levels of growth mindset without intervention, suggesting that targeted interventions for students with more fixed mindsets may be more effective than interventions for all students. It was also found that the subject-specific (i.e. in the psychology course they were taking) growth mindset was only modestly correlated with general growth mindset, providing evidence that mindset may be dependent on the setting and not an inherent quality within an individual that impacts all settings equally.

Fidelity and treatment acceptability data gathered from participating instructors indicated that the *Go for Growth!* intervention was perceived as easy to implement and worth the time investment for faculty, suggesting that the feasibility of implementing similar interventions at the community college setting is high. As such, further development of similar interventions is likely a worthwhile endeavor, and may find additional ways for community colleges to improve student academic success.

**FIGURE 1: Conceptual Mediational Model**



## FIGURE 2: The Go for Growth! Intervention Logic Model

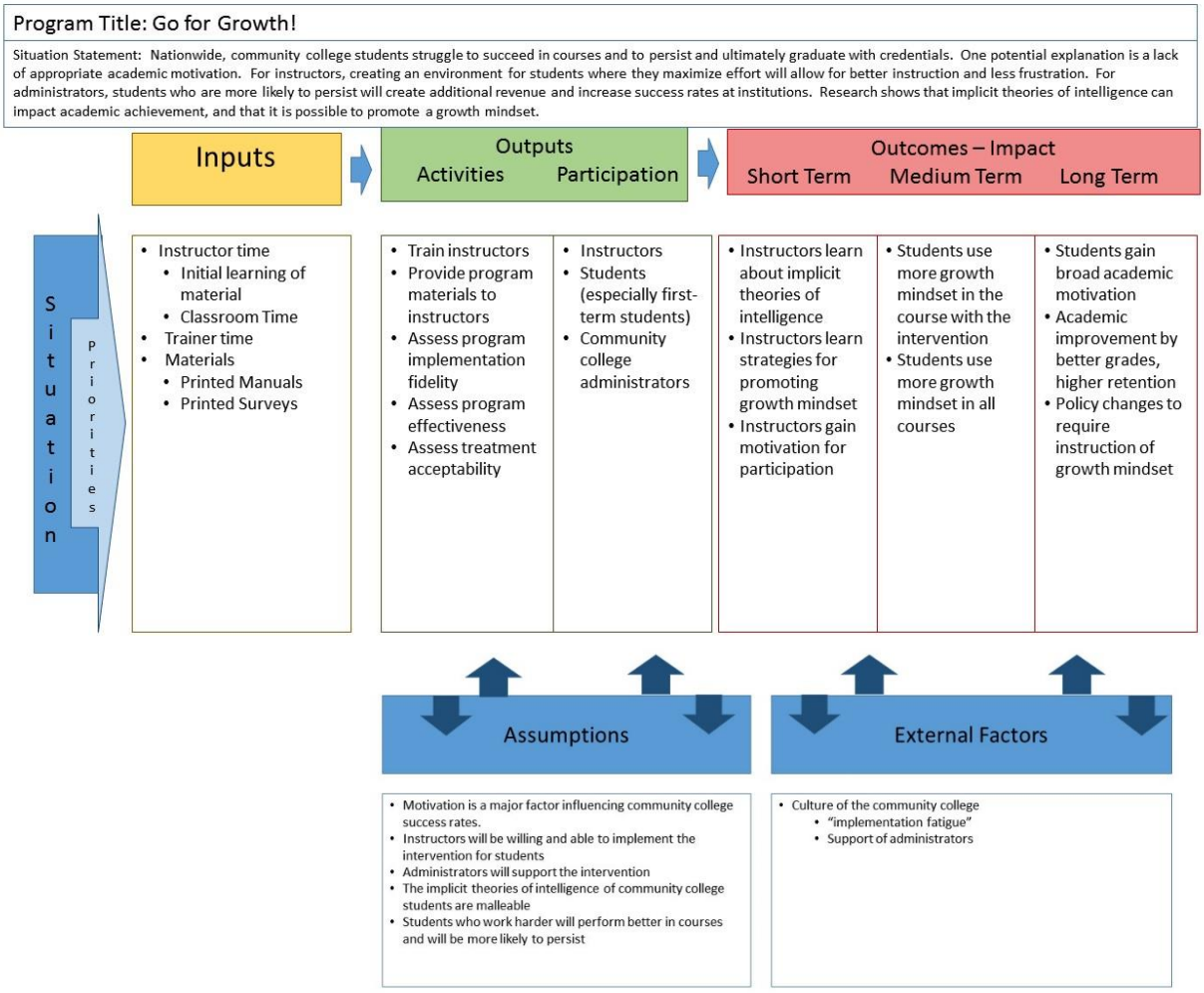
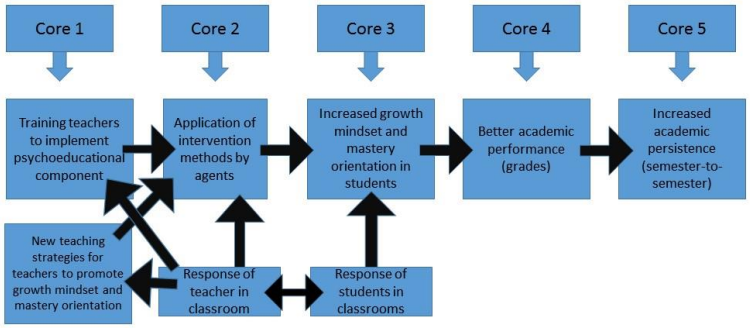


**FIGURE 3: The Go for Growth! Intervention Theory of Change**



## APPENDIX 1: INFORMED CONSENT FORM FOR FACULTY

### The Go for Growth! Intervention

You are being asked to take part in a research study on the effects of a short intervention given in your classroom. This intervention will involve two short lessons on Growth Mindset (two videos and a brief discussion) as well as having your students fill out surveys at the end of the semester. The principle investigator on this project, Jonathan Clark Wright, is a doctoral student in school psychology at the University of North Carolina at Chapel Hill, being supervised by Dr. Steve Knotek and Dr. Judith Meece.

In this study, your students will be asked to complete surveys at the end of the semester that ask them about how they feel about college in general and about this specific course (whether you are selected for participation or not). If selected, you will be asked to show two videos in class (totaling about 20 minutes) and hold a brief (10 minute) discussion with your students. The surveys given to students will be brief, taking no more than 15 minutes to complete. An additional survey (that is very brief – taking no more than 5 minutes to complete) will be given to you as an instructor, whether you are selected for participation or not. If you are not selected for participation, you will not be asked to change anything from how you normally teach your class, except filling out the same 5-minute survey and asking your students to fill out the same surveys. You will receive the materials given to the participating faculty at the end of the semester to use as you'd like.

You may decide to stop being a part of this study at any time without explanation. You have the right to request that any data you have supplied up until that point be destroyed/withdrawn. The only consequence for choosing not to participate is not receiving your professional development credit. You have the right to have your questions about the procedures involved in the study answered (unless answering these questions would interfere with the study's outcome). If you have questions as a result of reading this information sheet, you should ask the researcher before you begin your participation.

Your data will be aggregated with other participating faculty. Although the data will be kept anonymous, since the number of faculty participating is small, there is a risk that your data may be identifiable.

The purpose of this study is *not* to assess your teaching, except in the verification that you've followed the experimental procedures. Your answers (as well as your students') will ***not*** be shared with other faculty, administrators, or anyone at the institution, except in aggregate form (and even then, only in the context of the research).

Your participation in this study is voluntary. Your compensation for participation will be professional development credits (this will be handled by GTCC). This research will be used to improve how college faculty teach students and will explore how to best support students in the classroom.

To the maximum extent possible, your data will be kept anonymous. Only the principle investigator will have access to your data, and your individual responses will not be shared. The aggregate data may be utilized in publication, presentation at conferences, or other public places.

For further information on this study, please contact Jonathan Clark Wright at (803)767-8561. If you wish to find out about the final results of the study, you should contact Mr. Wright at the above e-mail address and it will be provided to you when it is available. If you feel that your rights have been violated, please contact the GTCC IRB office at 336-334-4822 ext. 50276. Thank you for your participation!

By signing below, I agree that a) I am at least 18 years of age, and b) that I have read, and agree to, the information presented above.

---

Typed/printed name

_____ _____

Signature Date

## APPENDIX 2: DEMOGRAPHIC QUESTIONNAIRE

Please write (or *clearly* mark) your answer to the questions below:

1. Please write your full name (as known by GTCC):_____

2. Please write you college ID (if known): _____

3. Racial identity (please select one):
   - White ○
   - Non-white minority ○

4. Gender (please select one):
   - Male ○
   - Female ○

5. Age group (please select one:
   - Under 18 ○
   - 18-22 ○
   - 23-27 ○
   - 28-32 ○
   - 33-37 ○
   - 38 or older ○

6. Are you currently seeking a degree from GTCC (i.e., an associate's degree, certificate, or diploma)?
   - Yes ○
   - No ○

7. What was your high school GPA (between 0.0 and 4.0)? _____

8. How many credits have you earned at GTCC? _____

9. What is the highest level of education completed by either of your parents?
   - Did not complete high school ○
   - High school diploma ○
   - Some college ○
   - College degree ○
   - Graduate or professional degree ○

## APPENDIX 3: THE THEORIES OF INTELLIGENCE SCALE – SELF-FORM FOR ADULTS

This questionnaire has been designed to investigate ideas about intelligence. There are no right or wrong answers. We are interested in your ideas.

Using the scale below, please indicate the extent to which you agree or disagree with each of the following statements by writing the number that corresponds to your opinion in the space next to each statement.

| 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|
| Strongly Agree | Agree | Somewhat Agree | Somewhat Disagree | Disagree | Strongly Disagree |

____ 1. You have a certain amount of intelligence, and you can't really do much to change it.

____ 2. Your intelligence is something about you that can't change very much.

____ 3. No matter who you are, you can significantly change your intelligence level.

____ 4. To be honest, you can't really change how intelligent you are.

____ 5. You can always substantially change how intelligent you are.

____ 6. You can learn new things, but you can't really change your basic intelligence.

____ 7. No matter how much intelligence you have, you can always change it quite a bit.

____ 8. You can change even your basic intelligence level considerably.

## APPENDIX 4: THE SUBJECT-SPECIFIC GROWTH MINDSET SCALE

This questionnaire has been designed to investigate how you feel about this class. There are no right or wrong answers. We are interested in your ideas. Your individual responses will *NOT* be shared with your instructor.

Using the scale below, please indicate the extent to which you agree or disagree with each of the following statements by writing the number that corresponds to your opinion in the space next to each statement.

| 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|
| Strongly Agree | Agree | Somewhat Agree | Somewhat Disagree | Disagree | Strongly Disagree |

____ 1. No matter how hard I try in this class, I won't be able to improve my intelligence.

____ 2. If I do all of my work for this class, my intelligence will improve.

____ 3. If the material in this class is too hard for me, I won't be smart enough to complete it, even if I work hard.

____ 4. When I try hard in classes like this one, it makes me smarter in general.

____ 5. When I try hard in classes like this one, it makes me smarter at this subject.

## APPENDIX 5: ACHIEVEMENT GOAL QUESTIONNAIRE

Using the scale below, please indicate the extent to which each of the following statements describes you by writing the number that corresponds in the space next to each statement.

| 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|
| Not at all true of me | A little true of me | Somewhat true of me | Mostly true of me | Very true of me |

_____ 1. I desire to completely master the material presented in this class.

_____ 2. Sometimes I'm afraid that I may not understand the content of this class as thoroughly as I'd like.

_____ 3. I want to learn as much as possible from this class.

_____ 4. It is important for me to understand the content of this course as thoroughly as possible.

_____ 5. I worry that I may not learn all that I possibly could in this class.

_____ 6. I am often concerned that I may not learn all there is to learn in this class.

## APPENDIX 6: THE PALS PERCEPTION OF CLASSROOM GOAL STRUCTURES SUBSCALE

HERE ARE SOME QUESTIONS ABOUT YOURSELF AS A STUDENT IN THIS CLASS. PLEASE WRITE IN THE NUMBER THAT BEST DESCRIBES WHAT YOU THINK.

| 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|
| Not at all true | | Somewhat true | | Very true |

_____1. In our class, trying hard is very important.

_____2. In our class, how much you improve is really important.

_____3. In our class, really understanding the material is the main goal.

_____4. In our class, it's important to understand the work, not just memorize it.

_____5. In our class, learning new ideas and concepts is very important.

_____6. In our class, it's OK to make mistakes as long as you are learning.

## APPENDIX 7: FIDELITY SURVEY

For the following items, please choose "yes" or "no" for each item.

| | |
|---|---|
| Q1. Did your instructor spend time at the beginning of the semester teaching you about implicit theories of intelligence (growth mindset versus fixed mindset)? | ☐ Yes ☐ No |
| Q2. Did your instructor teach you about growth mindsets *at all* during the semester? | ☐ Yes ☐ No |
| Q3. Did your instructor remind you about the importance of growth mindset more than once during the semester?" | ☐ Yes ☐ No |

For the following questions, please rate on a scale from 1 to 4 how much you agree with each statement:

| 1 | 2 | 3 | 4 |
|---|---|---|---|
| Strongly Agree | Somewhat Agree | Somewhat Disagree | Strongly Disagree |

_____Q4. My instructor praised or criticized my effort this semester (by saying things like "you worked really hard!")
_____Q5. I think my instructor believes that intelligence can be increased through hard work.
_____Q6. I understand the meaning of "growth mindset" and "fixed mindset"
_____Q7. The assignments in my class were interesting.
_____Q8. My instructor helped me to establish academic goals for myself during the semester.
_____Q9. My instructor encouraged me to actively participate in the course.
_____Q10. My instructor provided me with choices in assignments and activities within the course.
_____Q11. My instructor seemed annoyed or angry when I made mistakes or asked questions during class.

## APPENDIX 8: FEASIBILITY SURVEY

For the following questions, please rate on a scale from 1 to 4 how much you agree with each statement:

---

| 1 | 2 | 3 | 4 |
|---|---|---|---|
| Strongly Agree | Somewhat Agree | Somewhat Disagree | Strongly Disagree |

Q1. _____ The *Go for Growth!* intervention was easy for me to implement in my classroom.

Q2. _____ The *Go for Growth!* intervention seemed worth the time I invested to implement it.

Q3. _____ I believe the *Go for Growth!* intervention should include more materials/activities.

Q4. _____ I believe the *Go for Growth!* intervention should be shorter/include less materials/activities.

Q5. _____ I had heard about *growth mindset* before the semester began.

Q6. _____ I knew a great deal about *growth mindset* before the semester began.

Q7. Please include any comments you with to share regarding the *Go for Growth!* intervention:

_____
_____
_____
_____
_____

## APPENDIX 9: TEACHING STRATEGIES FOR PROMOTING GROWTH MINDSET AND MASTERY ORIENTATION

| Domain | Strategy | Example(s) |
|---|---|---|
| Task | Create novel, interesting, and challenging assignments and tasks that are designed to help students use newly learned information in class, avoiding "busy work" assignments | -Group students together and ask them to select a topic (from a list that you create) from the chapter you're covering and present a short "skit" to the class about it |
| | Help students to develop short-term goals for themselves and learn to self-monitor these goals | -This may be done with the class as a whole, with guidance. Suggest goals that can be accomplished within a week and involve good learning strategies (read the chapter, talk to a friend about the content, study 1 hour per week, etc.) and *follow-up* with students to see how they are meeting goals |
| Authority | Encourage all students to participate in the course. Try to listen more to students, resist giving them the solutions to questions/problems, allow time for independent work, and use "perspective-taking" statements | -Give students a grade for participation—this grade should reflect *effort* and not *ability* (i.e. not *what* they ask or say in class, but that they are clearly *trying* to participate).<br>-Ask students questions like "what do you think this means?" |
| | Provide (limited) activity choices for students, and promote student accountability and responsibility for their own actions | -Allow students to write papers from a provided list of topics.<br>-Let students choose a famous psychologist and present an interesting theory or finding they had. |
| Evaluation / recognition | Avoid praising or criticizing students for ability, instead praising or criticizing students for effort (keeping these evaluations private) | -Avoid comments like "you're smarter than that!" or "you're so smart!" and instead use statements like "you worked so hard on this!" or "I don't think you studied as much as you could have for the test- but could you set aside 30 minutes each day to study for the next test?"<br>-Do not put grades on students' assignments- post them online where the student can only see his/her grade. |
| | Emphasize the learning process within the classroom, making sure that students understand that mistakes are how we learn, and should not be avoided. Eliminate or | -Let students know that you expect each of them to make a mistake or answer a question wrong- and let them know that this is how *all* of us learn, and people who make more mistakes, learn more. |

| | | |
|---|---|---|
| | strongly limit competitive performance. | -Give students points for improvement in grade. Lay out very clearly for them how to earn these extra points, and make sure *not to punish students who do not improve.* |

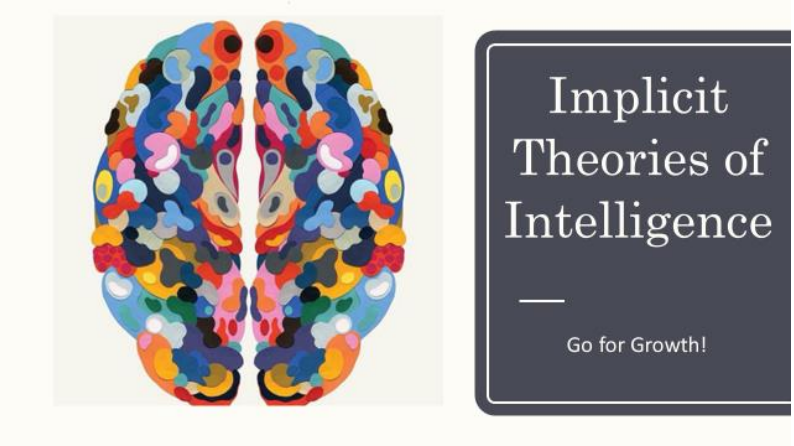
## APPENDIX 10: REMINDER E-MAIL TO FACULTY

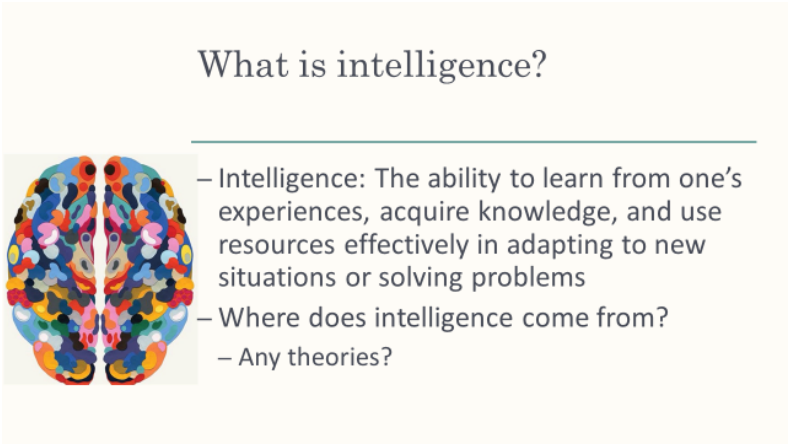
Hi participating faculty!

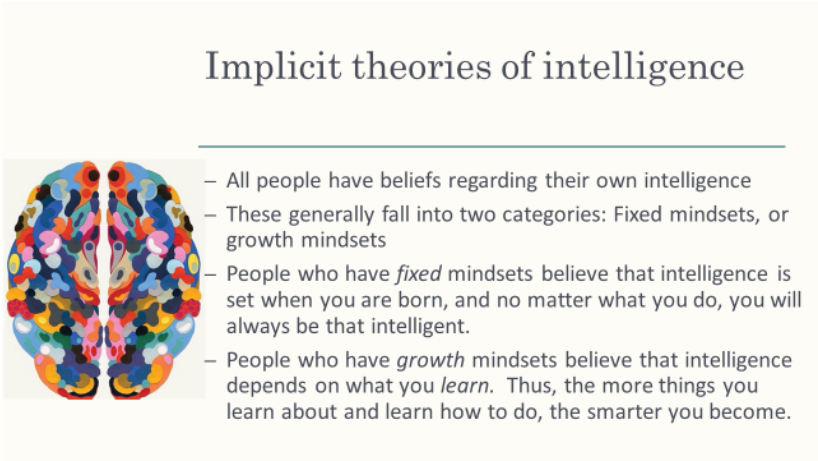
I hope implementation has gone well so far and that you've found it helpful. This week, I ask that you think about how you provide feedback to your students. Do you regularly provide feedback on their abilities? I urge you to try to change your feedback from ability-based statements like "you're smart!" to effort-based statements like "I can tell you worked really hard!" In addition, try to provide positive feedback to any of your students who you have seen grow during the semester- are they doing their best? Are they earning better grades than before? Praise them for it! Thank you so much again for participating (and working hard!). You will receive a separate e-mail with details about scheduling a time for me to come in and administer surveys in your general psychology courses. As always, please let me know if you have any questions about the project.

## APPENDIX 11: POWERPOINT SLIDES

Session 1



## So why should I care?

- It's simple: People who have *growth* mindsets tend to work harder and perform better in school and at work.
- They also tend to have higher self-esteem, feel less depressed, and had higher well-being over time. (Romero, Master, Paunesku, Dweck, & Gross, 2014)
- The more you believe in your own power to improve your intelligence, the more you will actually be able to change it!
- There is evidence that you **CAN** change your brain and get smarter! (Mueller and Dweck, 1998; Blackwell, Trzesniewski, & Dweck, 2007)

## So how can I have a growth mindset?

- First- believe the research! The first step is to accept that *you have control over your own abilities!*
- Second- WORK HARD! The more work you put in to learn difficult material, the smarter you will become!
  - The more your brain has to work to learn something, the more connections it will make!

Session 2

## Implicit Theories of Intelligence

Go for Growth!

## Video About the Brain

Video about the brain

## Class Discussion

- How does the information in the video relate to what we learned last week about growth mindset?
- Do you think you can form new long-term memories and build strong, new neuron connections if you don't try really hard to learn something?

## Class Discussion

- Before this class, do you think you had a *growth* mindset or a *fixed* mindset?
  - Why do you think you had this mindset?
- What would you tell another student if they said to you "I'm too dumb for college- I think I'm going to drop out?"

## APPENDIX 12: INFORMED CONSENT FORM FOR STUDENTS

You are being asked to take part in a research study on the effects of a short intervention that may be given to you by your instructor. If selected for participation, this intervention will involve two short lessons as well as having you fill out (brief) surveys at the end of the semester. If not selected for participation, you will still be asked to fill out (brief) surveys at the end of the semester. The principle investigator on this project, Jonathan Clark Wright, is a doctoral student in school psychology at the University of North Carolina at Chapel Hill, being supervised by Dr. Stephen Knotek.

In this study, you will be asked to complete surveys at the end of the semester that ask you about how you feel about college in general and about this specific course. You may also be presented two short lessons by your instructor. The surveys will be brief, taking no more than 15 minutes to complete each time. The lessons will also be brief, and should take a combined 30-40 minutes.

You may decide to stop being a part of this study at any time without explanation. You have the right to request that any data you have supplied up until that point be destroyed/withdrawn. There will be no consequences for choosing not to participate. You have the right to have your questions about the procedures involved in the study answered (unless answering these questions would interfere with the study's outcome). If you have questions as a result of reading this information sheet, you should ask your instructor or the researcher before you begin your participation.

Your responses to the surveys will be connected to your institutional data using personally identifying information. The data that will be collected from your institution include: grade in your general psychology course and course registration information. Once your survey data has been connected to your institutional data, all identifying information (e.g., colleague ID, name, birthday, etc.) will be removed from the data. The only risks involved with this research involve stirring up emotions you may have about your abilities in school while taking the survey(s), although these risks are very minimal.

Your participation in this study is voluntary. You will not receive any compensation for the completion of this research. This research will be used to improve how college faculty teach students and will explore how to best support students in the classroom.

To the maximum extent possible, your data will be kept anonymous. As described previously, personally identifying information will be used initially to connect your survey responses to institutional data, but will be removed after this connection is made. Only the principle investigator will have access to this identifying information. The data you provide will be combined with data from other students participating in this research and your individual responses will not be shared. The aggregate data may be utilized in publication, presentation at conferences, or other public places.

For further information on this study, please contact Jonathan Clark Wright at jclarkw@live.unc.edu (803)767-8561. If you wish to find out about the final results of the study,

you should contact Mr. Wright at the above e-mail address and it will be provided to you when it is available. If you feel that your rights have been violated, please contact the GTCC IRB office at 336-334-4822 ext. 50276. Thank you for your participation!

By signing below, I agree that a) I am at least 18 years of age, b) that I agree to allow the aforementioned investigators to collect institutional information limited to: my course grade in my general psychology course, and my registration and graduation information for Spring 2017 at GTCC c) I agree to allow my responses on the surveys to be connected to my institutional data, and d) that I have read, and agree to, the information presented above.

---

Typed/printed name

_____ _____

Signature Date

## APPENDIX 13: SESSION PROTOCOLS

**Sessions (face-to-face instructor).**

***Session 1.*** The goal of the first session is to have instructors introduce and teach students about implicit theories of intelligence (growth mindset). Objectives during the first session include:

- Instructor: Teach students about implicit theories of intelligence and share the benefits of adopting a growth mindset. Make sure to remember (for the whole semester!) to utilize the best practice techniques to promote growth mindsets in your students.
- Students: Students will be taught about growth mindset and will be persuaded to adopt this view. They will be provided a handout to reinforce the information.

*Session 1 content.* Please follow this protocol in the correct order.

1. Hand out the "Growth Mindset Handout"
2. Open the "Growth Mindset 1" PowerPoint slides, as provided to you.
    - Show the video as provided in slide 2.
3. Remind students that their handouts also contain information about growth mindset, and reaffirm your own belief in growth mindset.

Session materials:

- The Growth Mindset Handout (1 per student)
- Session 1 PowerPoint Slides

***Session 2.*** The goal for the second session is to reinforce the learning that took place in the first session using two different strategies: a video on brain plasticity and a brief class discussion. Instructors will be asked to open the "Growth Mindset 2" PowerPoint slides, which will contain a link to the second video. After the video, two broad discussion questions will be on the slides,

which the instructor will pose to the class and facilitate a brief discussion (5 minutes per question). Objectives during the second session include:

- Instructors: Instructors will continue to promote the use of growth mindset in their students and will continue to implement strategies that promote growth mindset.
- Students: Students will receive additional information in order to reinforce the learning that took place in the first session regarding growth mindsets. Students will also be asked to participate, using their new knowledge to answer broad questions.

*Session 2 content.* Please follow this protocol in the correct order.

1. Open the "Growth Mindset 2" PowerPoint slides.
2. Open the video link using the URL on slide 2 (make sure the sound is working), and allow the students to watch the video. You may stop showing the video at the 3:42 mark, when the host begins discussing sponsors.
3. Immediately after the video finishes, turn to slide #3 and discuss the questions with the whole class. Be sure to praise effort and not correctness here, as well as to encourage all students to participate, whether they think they know the answer for sure or not.

Session Materials:

- Session 2 PowerPoint Slides
- Hyperlink to Video (also contained within PowerPoint slides)

## APPENDIX 14: THE GROWTH MINDSET HANDOUT

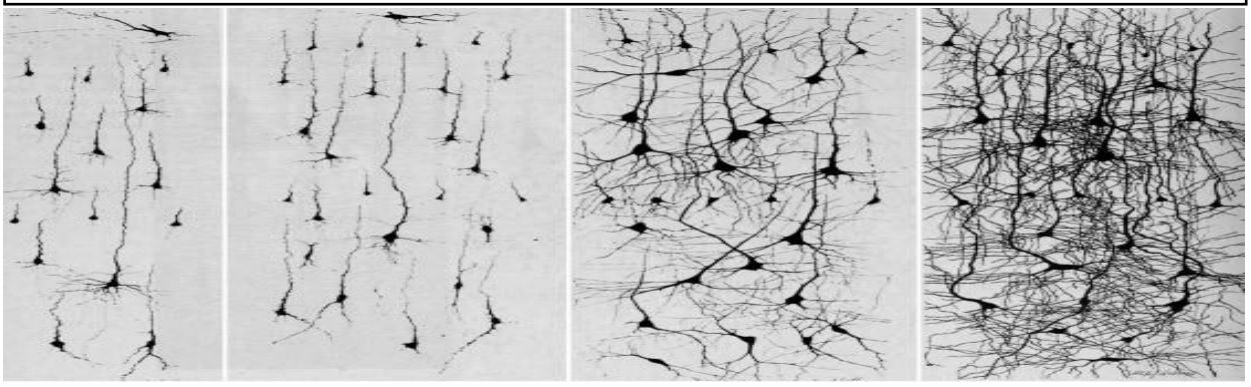
- ❖ Many people think of the brain as a mystery. They don't know much about intelligence and how it works. When they do think about what intelligence is, many people believe that a person is born either smart, average, or dumb—and stays that way for life. But new research shows that the brain is more like a muscle—it changes and gets stronger when you use it. And scientists have been able to show just how the brain grows and gets stronger when you learn.
- ❖ When you learn new things, these tiny connections in the brain actually multiply and get stronger. The more that you challenge your mind to learn, the more your brain cells grow. Then, things that you once found very hard or even impossible—like doing psychology—seem to become easy. The result is a stronger, smarter brain.

The following two quotes are from GTCC students, just like you:

- "When I was in high school, I always thought that I just wasn't one of the smart kids. It seemed like no one really expected me to do well in school. When I went to GTCC, I decided that no one would tell me I couldn't succeed there. I decided to work really hard and try my best to learn everything. I went from being a C student in high school to getting a 3.2 at GTCC. Now, I have a 3.0 at UNC and I am studying to become a registered nurse!"
- "When I decided to go back to school, I remember how my family reacted. They said "are you crazy?" because I hadn't been that good in school when I was there years ago. I actually failed my developmental math class my first semester at GTCC, but I had a teacher tell me that they knew I could succeed if I really tried my hardest and that I wasn't stupid. I came back the next semester and passed, and just last year I got my AA in accounting and I am now working as an accounting assistant at a large firm in Greensboro."

- ❖ Do you think babies are dumb because they can't talk? Would you laugh at them for that?

Brain cells as we age



Newborn 1 month 6 months 2 years

When babies are born, they don't know very much, but they all have loads of potential. As they pay attention, study the world, and learn how to do new things, their brains actually become more complex and, yes, *smarter*!

- You're in charge of your mind. You can help it grow by using it in the right way.

- The brain grows best when it is presented with new information that it has never seen before. You experience this as things that are *hard*. The more you try to learn *hard* things, the more your brain will grow! So, if you encounter some material, for example, in a psychology course, that you think is hard, that is the stuff you need to work the hardest to learn! The harder you try to learn it, the more your brain will grow and the smarter you will become. But only *you* can make this happen.

**Try really hard to learn everything in this class, *especially* when it is hard. At the end, you will be smarter and better equipped to learn even harder material!"**

- When was one time that you gave up on learning something because you weren't smart enough?

- What are some strategies you can use when you're trying to learn something that seems very hard to you?

## APPENDIX 15: VIDEO LINK AND TRANSCRIPT

Video link: http://viewpure.com/5KLPxDtMqe8

Transcript for video:

"You would not be here if you weren't interested in learning, and neither would I. But here's something we haven't learned about together: Learning! The ways in which we acquire and retain knowledge, which is the very definition of learning is really a science in itself. And like any other discipline that involves the study of the human brain, it is practically still in its infancy. Just 20 years ago, most scientists believed that once we reached adulthood, our brains were pretty much fixed. Not that we were incapable of learning anything new exactly, but the assumption was that our brain's development phase was over. And now it's pretty much there to remind our hearts to keep beating and occasionally let us remember where we left our phone. But thanks to huge advances in things like functional brain imaging, we have a clearer picture than ever of how our brain's work. And we're beginning to observe some wonderful things. For one, we now know that the process of learning actually alters the structure of our brains at the cellular level, and what's more, it turns out that our brains never stop changing to make room for new information. People often compare the human brain to a computer, but imagine a computer that could actually grow new circuits as it acquires new facts and associations and you have a much more awesome comparison. This is the gift known as neuroplasticity. You might think of plastic as being stiff and cheap, but in biology plasticity refers to the capacity of living things to mold themselves to new conditions, and our brains are great at it. For one thing, your brain cells, or neurons, are always changing their connections to one another to meet changing demands. Each of your neurons consists of a central body with spindly dendrites and a long axon stemming from it. The neuron transmits electrochemical signals to other brain cells through its axon and receives signals through its dendrites via connections where the cells meet, called synapses.

When you're born, each neuron in your brain has about 2,500 synapses connecting it to other cells. But by the time you're three, and you've become just a sponge of fascinating new information like what sound a piggy makes and where your mom's face goes when she hides it behind her hands, you have six times as many. Up to 15,000 synapses for each neuron in your brain. And in this regard, it's kind of true that your brain hits its peak when you're young, because by the time when you're an adult, your brain cells have about half as many synapses as when you were three. But it turns out that's okay, because we now know that synapses just shrink up when they're no longer needed. Like, you know now that pigs go "oink" and that people still exist when you can't see their faces, so you don't need to keep those connections to remind you. This process of winnowing down unused connections is known as synaptic pruning. Meanwhile, your neurons experience all kinds of new growth as you continue to soak up new information like how to drive, how to solve for "x" and how to get through that one really hard level in your favorite castle-smashing game. Here, the key to learning is memory, because you need to retain that information in order to apply it in the future. So your brain cells can change in different ways depending on how long you remember what you've learned. As you stockpile data in your short-term memory, for example, the structure of your existing synapses has been found to change with more and stronger dendrites growing to reinforce them. So for info that you retain for just a short time like how to destroy digital castles using rocks and fire, you don't need to sprout whole new connections. Just beefing up the existing ones you've used so far will help you master the game just fine. But when it comes to important stuff like the learning we do at school or hopefully the stuff you learn here on SciShow, your neurons actually forge entirely new synapses over time as you relearn, re-remember and reuse the information. This is how your brain builds the long-term memory you need to retain the learning you're doing right now,

at work, at school, and turn it into a lifetime of applied knowledge.  So I said it before and I'll say it again, take care of your brain and it will take care of you!"

## APPENDIX 16: CONTROL FACULTY SURVEY

For the following questions, please rate on a scale from 1 to 4 how much you agree with each statement:

| 1 | 2 | 3 | 4 |
|---|---|---|---|
| Strongly Agree | Somewhat Agree | Somewhat Disagree | Strongly Disagree |

_____Q1. I had heard about *growth mindset* prior to the start of the fall 2016 semester.

_____Q2. I knew a great deal about *growth mindset* prior to the start of the fall 2016 semester.

_____Q3. I learned about *growth mindset* during the fall 2016 semester.

_____Q4. I spoke with colleagues about *growth mindset* during the fall 2016 semester.

_____Q5. I incorporated *growth mindset* techniques into my teaching during the fall 2016 semester.

_____Q6. I teach students in my general psychology courses about *growth mindset.*

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