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Growth Mindset Intervention at the Community College Level: A Multiple Methods
Examination of the Effects on Faculty and Students

A dissertation submitted in partial satisfaction of the requirements
for the degree of Doctor of Education

by

Miguel Daavid Powers

2015

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ABSTRACT OF THE DISSERTATION

Growth Mindset Intervention at the Community College Level: A Multiple Methods Examination of the Effects on Faculty and Students

by

Miguel Daavid Powers

Doctor of Education

University of California, Los Angeles, 2015

Professor Christina A. Christie, Chair

The problem of college student success rates, especially for basic skills students, is well documented. The current study builds on established growth mindset research as an effective non-cognitive approach. Although research has documented the effects of a growth mindset in other populations, scant research examines the concept at the community college level.

This study used a multiple methods experimental design to examine the short-term effects of a brief growth mindset intervention on basic skills English faculty and students at two California community colleges. Using random assignment, intervention faculty were trained to present six sessions encouraging students to adopt a growth mindset—the belief that one’s intelligence can grow through intelligent practice.

Intervention faculty ($n = 9$) completed pre-test and post-test surveys and a series of reflections, as well as an interview and focus groups. Intervention students ($n = 208$) completed intervention response sheets and closed-ended pre- and post-intervention surveys. Comparison

faculty ($n = 9$) and students ($n = 223$) completed closed-ended pre- and post-intervention surveys. Furthermore, outcome data regarding student course completion and success were collected.

Results demonstrate that all intervention faculty changed their mindsets, and their view of students. Consequently, faculty changed their assignments, class discussions and grading practices to foster a growth mindset. All faculty will embed growth mindset as a fundamental element of their teaching.

For students, the qualitative data suggest changes in student mindset and behavior, but results from statistical analyses were mixed. Most students changed their mindset ($p < .05$) and reported new attitudes and behaviors, confirming research with students in other contexts. Importantly, most students reported transferring growth mindset attitudes and behaviors beyond the intervention class, especially to math. Further, many students reported adopting a new response to challenge. While students reported changes, and achieved high success rates, there were few statistically significant results.

The results suggest that given classroom strategies and a chance for reflective collaboration, community college faculty will practice growth mindset and create new approaches to encourage students to learn from criticism, embrace challenge, and rethink failure. The results also suggest their students will respond and transfer their new approaches.

The dissertation of Miguel Daavid Powers is approved.

Mark K. Eagan

Linda P. Rose

James W. Stigler

Christina A. Christie, Committee Chair

University of California, Los Angeles

2015

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VITA

EDUCATION

- 1996 M.A., English Literature
Indiana University, Bloomington, IN
- 1994 B.A., English, *Summa Cum Laude*
University of San Diego, San Diego, CA

PROFESSIONAL EXPERIENCE

- 2000-2015 Professor, Fullerton College
- 2015-2015 Faculty Fellow, Association of American Colleges & Universities
- 2014-2015 Co-Creator, Co-Leader California Community of Practice on Growth Mindset
- 2002-2015 Facilitator Coordinator, Fullerton College Transfer Achievement Program
- 1999-2000 Adjunct Faculty, University of San Diego and Palomar College
- 1996-1999 Associate Instructor, Indiana University
- 1997-1999 Teaching Consultant, Indiana University
- 1998-1999 Volunteer Service Coordinator, Indiana University

SELECTED PRESENTATIONS

- 2014 Cultivating a Growth Mindset. Presented at Strengthening Student Success Conference, Costa Mesa, CA
- 2014 Innovative Methodological Strategies: Action Research Intervention. Presented at UCLA Graduate School of Education and Information Studies Research and Inquiry Conference, Los Angeles, CA
- 2014 Growth Mindset. Presented at Student Success Conference: Pierce College, Woodland Hills, CA
- 2013 Growing Habits of Mind. Keynote Presenter at 3CSN Regional Event, Los Angeles, CA
- 2013 Growth Mindset: A Growing Solution to Fixing Education? Presented at Strengthening Student Success Conference, Oakland, CA
- 2008 Using Turnitin.com as a Teaching Tool. Presented at Conference on College Composition and Communication, New Orleans, LA

SELECTED HONORS AND AWARDS

2015	Educational Leadership Program Dissertation Scholarship, UCLA
2013	Educational Leadership Program Alumni Scholarship, UCLA
2012	Christopher L. Smith Fellowship, UCLA
2011	Fullerton College Teacher of the Year, Top Four Finalist
2010	Fullerton College Educational Opportunity Program Teacher of the Year
2005	Fullerton College Teacher of the Year
1999	Guy Lemon Public Writing Award – Service Learning
1995	Trustee Fellowship, Indiana University
1994	English Student of the Year, University of San Diego
1990	Four Year Trustee Fellowship, University of San Diego

CHAPTER 1: INTRODUCTION

Statement of the Problem

Many community colleges have low student retention and success rates. For decades, researchers have explored ways to improve these rates, especially given that community colleges serve a disproportionately high number of economically disadvantaged and academically underprepared students (Bettinger & Long, 2005). At the same time, the demand for basic skills classes is increasing nationwide. Nationally, over 60% of community college students take at least one basic skills course, and 25% take more than one (McIntosh & Rouse, 2009). Unfortunately, students in basic skills classes earn credit at significantly lower rates than students in transfer level courses, with high costs to students and institutions. For example, in fall 2009 at one California community college, only 60% of basic skills English students successfully completed their basic skills courses, which means 844 students failed.

This high failure rate has personal costs, both emotional and financial. Students face the emotional cost of not succeeding as well as the repeated tuition that they pay in hopes of earning credit and becoming eligible to earn transferable college credit, now at least another semester away. In addition to the personal costs, there are also significant institutional costs. Specifically, according to the college's accreditation self-study, 844 students represents 34 basic skills composition sections. Thus, the low basic skills student success rate has personal and institutional costs and means that individual community college campuses and the larger community need to explore ways to improve students' success strategies in these courses. Likewise, legislative and educational leaders seek to increase student success and graduation rates as a matter of economic concern (Field, 2014). Unfortunately, after decades of research on

course content strategies, successful implementation remains elusive (Boylan & Bonham, 2007; Kozeracki, 2002).

To address low retention and student success rates, California community colleges have implemented the Basic Skills Initiative, a statewide effort to create campus-based action plans to improve student success (Academic Senate for Community Colleges, 2007; Illowsky, 2008; Levin, Cox, Cervin, & Haberler, 2010). More recently, the California Community Colleges Student Success Task Force recommended specific steps to improve degree/certificate achievement rates, especially for the approximately 70% of community college students who require basic skills instruction (California Community Colleges, 2012).

Mounting research suggests a need not only for content-based support, but also non-content interventions, such as sociological and psychological models (Gerlaugh, Thompson, Boylan, & Davis, 2007; Jez & Venezia, 2009; Kozeracki, 2002; Liff, 2003; Yeager & Walton, 2011). Non-content interventions seek to change student behaviors and improve student study skills and success strategies, rather than simply supporting specific content based learning. A recent meta-analysis of college sociological and psychological intervention models identified Carol Dweck's growth mindset model as among the most effective (Heikkila, Niemivirta, Nieminen, & Lonka, 2010; Yeager & Walton, 2011). Dweck's model encourages students to view intelligence as capable of growth, in part by describing how learning changes the brain.

Dweck's growth mindset model has been implemented at the local level—for example, in Los Angeles at Chaffey College (Guerrero, Fillpot, Bailey, & Hope, 2011)—and has also received national attention (Dweck, 2006; Glenn 2010). In fact, the American Psychological Association awarded Dweck the 2011 Award for Distinguished Scientific Contributions for her mindset research and its practical applications (American Psychological Association, 2011).

Although the growth mindset has been widely studied and has been increasingly implemented in education, it has not been widely studied or implemented in community colleges (Paunesku, Yeager, Romero, & Walton, 2012; Yeager & Dweck, 2012).

Improving student success in community college basic skills courses will help improve the success rates of racial and ethnic minority students, since a disproportionate number of basic skills students come from these historically underrepresented groups. At least one study has documented that a growth mindset intervention at four-year colleges can help minority students overcome stereotype threat and the achievement gap (Aronson, Fried, & Good, 2002). As noted, however, there is little evidence about implementing growth mindset interventions with community college students.

In sum, California community colleges face substantial challenges addressing basic skills student success rates (Illowsky, 2008). Previous content-based interventions have not achieved desired results (Boylan & Bonham, 2007; Kozeracki, 2002) and researchers have suggested non-content-based, psychological approaches (Gerlaugh et al., 2007; Jez & Venezia, 2009; Liff, 2003). Mindset interventions drawing from the work of Carol Dweck have been shown to be brief and cost effective (Pretlow & Wathington, 2011; Yeager & Walton, 2011), and their success with college students has been documented (Heikkila et al., 2010; Yeager & Walton, 2011). Moreover, because they are not content-based, mindset interventions can be implemented in various disciplines or through workshops. Successful implementation of growth mindset interventions in basic skill courses may help address the achievement gap, which the state's Student Success Task Force considers one of the keys to improving community colleges and the future of the state economy (California Community Colleges, 2012).

There is growing research and practice that attempts to move beyond content-level interventions to improve student success, especially for community college basic skills students. The current study builds on well-established research on the growth mindset as an effective non-cognitive approach. Although research has documented the effects of a growth mindset on university students and younger students, scant research examines how it works at the community college level. Therefore, this dissertation explores the effects of participating in a growth mindset intervention at two southern California community colleges in order to: 1) address the gap in research on this method in community colleges; 2) examine the effects on faculty participants; and 3) improve student study strategies and success outcomes.

Pilot Study

The current study builds on a previous action research pilot project. In spring of 2013, as part of the UCLA Educational Leadership Program, Mary-Jo Apigo and I conducted an action research project at Western College and Foundation College, two community colleges in California.¹ This project examined the effects of six brief growth mindset interventions for basic skills students and faculty. At Foundation, six faculty members received training and then presented the growth mindset interventions in five sections of “English 60: Preparation for College Writing” (a basic skills class) and one section of “English 59: Developmental Writing” (an accelerated class). At Western, an outside presenter conducted the interventions in one basic skills section each of English, ESL, and math.

The data suggested that the interventions had a positive impact on both students and faculty. The intervention increased the number of students with a growth mindset, changed student mindsets and learning strategies, helped students identify and practice new learning strategies, and increased student resource use. It also helped improve student course completion

¹ These and other names of institutions used in this dissertation are pseudonyms.

and success, especially at Western. Additionally, we found that students transferred growth mindset practices beyond the intervention course. Moreover, all faculty participants said they integrated a growth mindset into their instructional practices, and most applied it beyond the intervention course. A strong majority (7 of 9) of faculty altered their view of student success. Four of the six Foundation faculty participants formed a Growth Mindset Faculty Inquiry Group, developing a growth mindset toolkit and faculty professional learning workshops.

The findings from the spring 2013 pilot study indicated that participation in the growth mindset intervention changed faculty instructional practices and student success measures (Apigo & Powers, 2013). The current project built on these findings to further explore these issues. I developed specific training activities to help faculty implement a growth mindset in their community college courses. For the dissertation research, I used a larger sample and a more extensive research design to explore the effects on faculty and students. In particular, while the pilot study illustrated that faculty changed their instructional practices after participating in the growth mindset intervention, especially at Foundation College, and that most students changed their mindset, it did not reveal *how* participation in a growth mindset intervention changes faculty instructional practice or *how* students change their practices. Thus, I have taken up these issues in the current research.

Study Purpose & Research Questions

The purpose of this research was to study the short-term effects of a brief growth mindset intervention on basic skills English faculty and students at two California community colleges. For faculty, the study examined how growth mindset interventions change instructional practices. For students, the study examined how they change their mindsets, study strategies, and success (measured by earning course credit in the credit/no credit basic skills English course). I compared student success measures with data from comparison group faculty who did

not participate in the growth mindset intervention. I also examined how students transferred growth mindset practices beyond the intervention course. In a later chapter, I discuss how to improve future interventions based on the results. The research was guided by the following questions:

1. According to student perceptions and student success data, what are the effects of six brief growth mindset interventions on students' mindsets?
2. In what ways, if any, do students report a transfer of growth mindset practices beyond the intervention course?
3. How does a series of growth mindset interventions change faculty perceptions about instructional practices?
4. Based on student and faculty feedback, how can we improve the series of growth mindset interventions?

Site Description

The dissertation was conducted at two community colleges that are part of a multi-college district in Southern California—schools I will call Colonial College (CC) and Foundation College (FC). These two colleges have diverse student populations and high numbers of students in basic skills programs, making them representative of large Southern California urban community colleges. Moreover, they have established programs to improve student success; these programs allowed for effective comparison between the growth mindset intervention and existing basic skills programs.

Overview of the Research Design

As described in more detail in Chapter 3, I used a multiple methods, experimental design. Faculty were randomly assigned to either a growth mindset intervention or a comparison group.

Administrative data were used to measure outcomes related to student course completion, student course success, and student resource use. The process data help explain how the interventions changed faculty and student perceptions. Combining methods provided measureable outcomes as well as explanatory feedback (Creswell & Plano Clark, 2007). Both types of information will improve future implementation of growth mindset interventions at community colleges.

Intervention faculty completed pre-test and post-test surveys and a series of reflections, and also participated in focus groups. Students completed individual response sheets with open- and closed-ended questions after each intervention session, as well as closed-ended pre- and post-intervention surveys. Furthermore, faculty submitted outcome data regarding student grades as measures of course completion and course success. This variety of data collection elements helped clarify how faculty changed their instructional practices, how students changed their perceptions and transferred the growth mindset practices beyond the intervention course, and which intervention elements were most important in improving student success.

Study Significance and Implications

The local and statewide response to the pilot study, and the ongoing calls for disseminating the strategies, suggest significant demand for this type of non-cognitive approach, especially since it is not discipline specific and can be integrated into both curriculum and non-curriculum environments (e.g., learning centers and counseling sessions). The current project built on the specific strategies of the pilot study to identify changes in instructional practice and also to verify improvements in student success. For example, the pilot study indicated that both students and faculty transferred growth mindset practices beyond the intervention course, and so the current study specifically sought to verify and explore this process. Verifying and

understanding this finding could be the most significant contribution of this study; if a series of brief interventions can change student behavior and improve student success beyond the specific intervention course, then this might be an exceptionally effective approach to improving student outcomes at the campus level. Further, if participation changes faculty practices, then this could influence future students as well. Based on the findings from the dissertation research, I hope to develop faculty mindset practices and develop an effective non-cognitive intervention in order to improve student retention, resource use, and success, which should help improve low transfer and graduation rates at the community college level.

Across California, community colleges have unsatisfactory student success rates, which are usually measured by student course completion, certificate and degree attainment, or transfer (California Community Colleges, 2012). Foundation College has low student retention, course completion, and course success rates, especially in basic skills classes. In fact, FC's first two goals for 2013–2014, promoting student success and reducing the achievement gap, demonstrate both these ongoing problems and the college's commitment to addressing them. Similarly, Colonial College has several related goals, including increasing staff development training for student success, decreasing the student achievement gap, and increasing the student success rate, in part by teaching college success skills in general curriculum courses.

Facing these systemic problems, state and campus leaders have identified the growth mindset as a potential strategy for improving student retention, course completion, and course success rates, especially in basic skills classes (Statewide 3CSN, Foundation Campus Basic Skills Committee, Foundation College Basic Skills Task Force, Foundation College Habits of Mind Workgroup). Therefore, the findings of this study can be used to inform professional development training across disciplines at both colleges, as well as through the 3CSN Statewide

Habits of Mind Network. As such, the findings will be presented at both colleges and through the statewide network.

Ideally, exposing faculty to a growth mindset and offering specific strategies and opportunities for reflection will encourage changes in instructional practice and even institutional change, as advocated by Farrington et al. (2012), as well as Yeager and Dweck (2012). One possible example of such institutional change can be found at Chaffey College, which is implementing a Hope and Mindset intervention (Guerro et al., 2011). Although they do not have published outcomes yet, their emphasis on staff as well as students is unusual, and it also integrates the teacher's influence on student mindset, as suggested by Anderman et al. (2001). Perhaps documenting student benefits and faculty participant reflections—as in the current research project—will encourage and contribute to institutional changes that could lead to long term benefits (Farrington et al., 2012).

Organization of the Dissertation

There are four remaining chapters. Chapter 2 presents a review of the literature related to growth mindset in educational settings. Chapter 3 describes the study's methods, including data collection and analysis procedures. In Chapter 4, I review the findings, organized according to the four research questions. In Chapter 5, I present the study conclusions and discuss the implications of the research.

CHAPTER 2: REVIEW OF THE LITERATURE

This literature review will explore the development of the growth mindset as a concept and its potential as an intervention to improve student success in community colleges. After establishing the significance of student course completion and success in community colleges (Academic Senate for Community Colleges, 2007; Bettinger & Long, 2005; Boylan & Bonham, 2007; California Community Colleges, 2012; Field, 2014; Illowsky, 2008; Kozeracki, 2002; Levin et al., 2010; McIntosh & Rouse, 2009), I will explore the development of Carol Dweck's growth mindset (American Psychological Association, 2011; Blackwell et al., 2007; Chiu, Hong, & Dweck, 1997; Dweck, 2006; Gerlaugh et al., 2007; Glenn, 2010; Jez & Venezia, 2009; Kozeracki, 2002; Liff, 2003; Heikkila et al., 2010; Vandewalle, 2012).

Next, I will examine the growing evidence for using growth mindset in education (Aronson et al., 2002; Good, Aronson, Inzlicht, 2003; Pretlow & Wathington, 2011; Robins & Pals, 2002; Yeager & Walton, 2011). While there is considerable evidence showing that growth mindset improves student success with K–12 and university students, only a few studies have been published that explore the effects of growth mindset for community college students (Guerrero et al., 2011; Paunesku, 2013; Paunesku et al., 2012; Yeager & Dweck, 2012). Moreover, there is little evidence about how growth mindset interventions impact faculty instructional practice.

Development of the Growth Mindset

In over 20 years of research, Carol Dweck and a long list of colleagues have identified two “implicit theories” that shape how individuals perceive themselves, set goals, and develop

patterns of behavior—*fixed* and *growth* mindsets (Blackwell et al., 2007; Dweck, 2006; Dweck & Leggett, 1988, Hong et al., 1999; Robins & Pals, 2002; Sririm, 2011; Yeager & Walton, 2011; Yorke & Knight, 2004; Vandewalle, 2012). Dweck and Leggett's (1988) foundational text proposed the growth mindset model to explain why people with similar skills respond to challenges and failure in different ways—a phenomenon documented in other research (Ames, 1984; Elliott & Dweck, 1988; Deiner & Dweck, 1978, 1980). This research demonstrated that students with *performance* goals (seeking favorable judgments of competence) often exhibited helpless responses to failure, the avoidance of challenge, or the failure to generate effective strategies to deal with failure. On the other hand, the research linked *learning* goals (seeking increased competence) to mastery-oriented response patterns, actively seeking challenges, and creating effective strategies while engaging in difficult tasks (Dweck & Elliott, 1988; Farrell & Dweck, 1985).

In their model, Dweck and Leggett (1988) demonstrated that goals and subsequent behaviors originate from either fixed or growth mindsets. Fixed and growth mindsets are two contrasting ways to think about the malleability of a personal trait, and they are largely unnoticed by the individual and must be drawn out. The two mindsets shape the goals and behaviors individuals use regarding the personal trait in question (Dweck, Chiu, & Hong, 1995; Dweck & Leggett, 1988; Vandewalle, 2012). While the psychological literature often uses entity theory and incremental theory for fixed and growth mindset respectively, (Dweck & Leggett, 1988; Vandewalle, 2012), following both popular literature and the current campus interventions, I will use growth and fixed mindset (Dweck, 2006; Glenn, 2010; Guerrero et al., 2011).

While the original research into growth mindset focused on intelligence (Dweck & Leggett, 1988), the model predicts behaviors in other domains as well, including moral and

social (Chiu et al., 1997; Dweck et al., 1995; Dweck & Leggett, 1988), stereotyping (Aronson et al., 2002; Levy, Stroessner, & Dweck, 1998), and sports (Corrion, D'Arripe-Longueville, Chalabaev, Roussel, & Cury, 2010; Ommundsen, 2001). Overall, the research in general—and this project specifically—focuses mainly on the growth mindset for intelligence.

In the intelligence domain, individuals with a fixed mindset believe that their intelligence is an unchangeable trait (like height). With a fixed mindset, failure demonstrates a lack of ability, so individuals avoid challenges and fail to develop appropriate strategies to overcome unavoidable challenges, such as difficult college coursework (Dweck & Leggett, 1988). Therefore, just as exercising to become taller would be illogical, to a person with a fixed mindset, working harder, or trying new strategies to change mental ability, would be similarly illogical. On the other hand, individuals with a growth mindset believe that their intelligence is changeable (like a bicep) and can be cultivated through appropriate strategies and suitable effort. With this mindset, failure represents a learning opportunity, so it should be faced with diligent effort and intelligent problem solving strategies (Dweck & Leggett, 1988). Therefore, just as exercising to become physically stronger would be logical, to a person with a growth mindset, working harder or trying new strategies to change mental ability would be logical.

Dweck and Leggett's (1988) model suggests that students who consider their intelligence fixed are more likely to practice performance goals and avoid challenges because failure is a judgment on their ability. In contrast, students who consider their intelligence to be malleable—i.e., capable of incremental change—are more likely to practice learning goals and seek challenges as a way to improve their competency. These different views of intelligence shape the goals students set towards learning, whether they seek or avoid challenges, and how they respond to failure. A key difference is that fixed mindset students emphasize their ability (or

lack of ability) and see challenges as undermining their self-esteem, while growth mindset students emphasize behaviors, such as learning strategies and additional effort, while viewing challenges as learning opportunities. In short, the model posits *growth* or *fixed mindset* as the framework shaping students' perceptions, the types of goals they set, and how they act based on their perceptions (Dweck & Leggett, 1988).

The mindset model originated from researchers' observations that manipulating goals created a coherent pattern of responses across the behavioral, emotional, cognitive fields: "What was most striking was the degree to which the manipulations [of the goals] created the entire constellation of performance, cognition, and affect characteristic of the naturally occurring achievement patterns" (Dweck & Leggett, 1988, p. 259). Researchers tested the claim that mindset caused goal selection and subsequent responses. In one reported example (Dweck, Tenny, & Dinnes, 1982), in order to manipulate participants' views of intelligence, children were informed that famous figures (e.g., Albert Einstein, Helen Keller) achieved their intelligence either through fixed trait ability or incremental effort. As predicted, the children directed towards a growth mindset adopted learning goals and chose harder tasks, unlike those directed towards the fixed mindset, who selected performance goals and easier tasks. The results indicate that the mindsets are the origin of goal selection, which in turn frames behavioral, cognitive and affective responses to challenge (Dweck & Leggett, 1988).

After considering mindset in the achievement domain, researchers explored mindset in other domains, such as the social domain and even morality. Preliminary findings suggested that holding a fixed concept of a trait creates similarly helpless responses, while holding a growth concept creates a desire to improve that aspect across domains. Dweck and Leggett (1988) concluded that fixed and growth mindsets represent two ways of conceiving of the self across

several domains. As such, the two theories offer a way to understand and predict goal setting and behavior patterns. These implicit theories offer a descriptive framework that shapes an individual's perception of the world and responses to experiences. In closing, the researchers highlighted the identification of the mindset models as basic variables that help structure, explain, and predict "major patterns of cognition, affect, and behavior" (Dweck & Leggett, 1988, p. 271). While noting that the proposed model has the potential to bring together existing lines of research and offer new areas of inquiry, Dweck and Leggett called for further research to build and test the model.

Answering the Call: Model Testing

After Dweck and Leggett identified the growth and fixed mindsets, a series of other studies emerged that helped create coherent measurement techniques to identify a student's mindset. These studies also replicated the findings that students with fixed mindsets created performance goals, avoided challenges, and did not generate successful adaptive strategies when faced with failure, while students with growth mindsets created learning goals, engaged with challenges and generated adaptive strategies when faced with failure (Erdley & Dweck, 1993; Hong & Dweck, 1992; Howell & Buro, 2009; Stipek & Gralinski, 1996). From Dweck and Leggett's (1988) introduction through the late 1990s, research into mindset focused on identifying a student's mindset, creating and testing methods to manipulate the mindset, and testing the results in laboratory settings (Chiu et al., 1997; Dweck et al., 1995).

Building and Validating the Measurement Tool

Early research tested the measurement tool used to identify an individual's mindset (Dweck et al., 1995, Hong et al., 1999). Researchers developed a questionnaire using a Likert-type scale to gauge agreement or disagreement with growth mindset statements. In an intelligence domain, for example, individuals use a 6-point scale (1=Strongly Agree to

6=Strongly Disagree) for the following items: “(a) ‘You have a certain amount of intelligence and you really can’t do much to change it’, b) ‘Your intelligence is something that you can’t change very much’, and c) ‘You can learn new things but you can’t really change your basic intelligence’” (Dweck et al., 1995, p. 269). A higher average score indicates a stronger growth mindset. Specifically, a score above 4.0 identifies a growth mindset, while a score below 3.0 identifies a fixed mindset.

The researchers reported that, on average, 15% of respondents were deemed “mixed” (with a score between 3.0 and 4.0), and were therefore excluded. The remaining 85% were roughly evenly distributed between growth and fixed mindsets. After reviewing the development of this questionnaire, Dweck, Chiu, and Hong (1995) reported on five validation studies that confirmed the reliability and validity of the measurement format. In one study (Henderson, 1990), separate interviews verbally confirmed questionnaire placement (Dweck et al., 1995). In their five-year study, Blackwell et al. (2007) reported internal reliability (.78) and a two-week, test–retest reliability (.77). The measurement tool and score cut off became standard across several domains (Aronson et al., 2000; Dweck et al., 1995; Howell & Buro, 2009; Vandewalle, 2012).

Theory Testing

Several studies have tested the ways in which mindset predicts behavior and motivation (Erdley & Dweck, 1993; Henderson & Dweck, 1990; Hong et al., 1999; Hong & Dweck, 1992). For example, Hong and Dweck (1992) found that college students with fixed mindsets responded to failure with ability and trait behaviors, while growth mindset students responded with effort. In 1997, Dweck, Chiu, and Hong presented another seminal text that reviewed where the mindset model research had been and looked forward to where it might go. They considered the mindset model new enough to require a review, yet they also indicated that the research to that point had

supported growth and fixed mindsets' effects in the intelligence domain and across other domains, creating significant implications for the mindset model.

In addition to establishing the validity of the measurement tool, early studies also tested researchers' ability to manipulate individual mindsets in specific domains. In order to test the claim that mindset causes goal selection and subsequent behaviors, researchers needed confidence that they could shape how participants chose their mindsets. Dweck et al. (1995) described one such study, where Bergen (1991) gave college students readings promoting either a fixed or growth mindset. As predicted, those who were given the reading promoting a fixed mindset were more likely to adopt helpless responses to failure. Another study (Chiu, Parker et al., 1994) is described using reading material to "induce" mindset in the character domain (Dweck et al., 1995, p. 279). In reviewing several such studies, Dweck, Chiu, and Hong summarized that mindset can be manipulated in experiments. Moreover, after an intervention changes a participant's mindset about intelligence, the participant practices behaviors associated with a growth, rather than a fixed mindset. In short, experiments suggest mindset creates goal selection and subsequent behaviors.

In addition to reviewing model testing, Dweck et al. (1995) also reviewed ways that researchers had answered Dweck and Leggett's (1988) initial call for model building. Dweck and Leggett initially called for exploration of mindset across other domains and further consideration of the mindset model in comparison to other explanations of motivation, such as locus of control and attribution theory. Both calls were answered. Dweck et al. (1995) reported that researchers expanded the initial model of intelligence to cover several other domains. Fixed and growth mindsets shape how individuals perceive and respond to the world around them, although a person can have a fixed mindset in one domain and a growth mindset in another.

Therefore, the model has significant implications in many fields, especially since mindset itself is malleable. Moreover, manipulating mindsets supports the claim that mindsets are the origin for other explanations, such as attribution (Dweck et al., 1995). Locus of control and attribution are derived from within the framework of the mindset, which shapes the initial perception and organization of information. Thus, the researchers concluded their seminal review by calling fixed and growth mindsets “two different perspectives” that orient practitioners in the world (p. 283). These perspectives shape perceptions, judgments, and behaviors.

As mindset research expanded, Hong, Chiu, Dweck, Lin, and Wan (1999) argued that mindsets are the origin of goal attribution. The researchers suggested that attribution theory has two flaws: It only comes into play when a person encounters a challenging situation and it does not address the beliefs that individuals bring into a situation and that shape their attribution. Therefore, mindset creates the framework that can explain and predict both the attribution and the subsequent response to failure. Hong et al. (1999) also suggested that mindset research better predicts achievement patterns than goals, which were part of the original formulation of the mindset model in Dweck and Leggett’s (1988) work. Thus, as the theory has been tested, it has also been modified; the emphasis on goals as been reduced, as the mindset model itself has become more predictive of responses and behaviors (Chiu et al., 1997; Hong et al., 1999; Stipek & Gralinski, 1996).

Hong et al. (1999) conducted three separate studies to test the relationship between mindset and ability or effort attribution. In the first study, 97 college students were measured for mindset and confidence and then given a challenging task and asked to reflect on their experiences. The results supported the hypothesis that mindset would successfully predict effort attribution. Growth mindset students had a stronger effort attribution. Hong et al. (1999)

concluded that this study, along with others (Henderson & Dweck, 1991; Erdely et al., 1997), “provide a body of evidence that consistently suggests that implicit theories set up the meaning system in which attributions occur and that having high confidence within an entity framework does not ward off vulnerable attributions” (p. 593).

Having shown that mindset model predicts effort (growth mindset) and ability (fixed mindset) attribution, the researchers presented two additional studies to demonstrate how mindset relates to remedial action. In one study, Hong et al. (1999) asked 168 University of Hong Kong freshmen if they would take a remedial English course proven to be effective, and they then separately administered the mindset questionnaire. Using grades to identify students who would benefit from remedial English, growth mindset students were, as predicted, more likely to take the course. On the other hand, fixed mindset students were less inclined to take the remedial course, although all coursework was conducted in English. In short, the test supported the hypothesis that fixed mindset students are more likely to adopt helpless behaviors.

In the final study, the researchers asked 60 University of Hong Kong undergraduates to read an article supporting either a fixed or growth mindset and then complete a series of questions, including a short math test. All participants were told that they had performed adequately and that they ranked at about the 66th percentile. To test how mindset influenced remedial action, students could choose a remedial tutoring session or an unrelated ability task during a brief break, before completing a second math test. The assigned readings successfully inducted participants into the appropriate mindset. Those who read the fixed article were less likely to take the remediation option and more likely to describe intelligence in terms of ability, while growth mindset students were more likely to take the remediation option and emphasize effort. In addition, those who read the fixed mindset article were more likely to see effort as

inversely related to ability, suggesting that they considered the need for effort to indicate low ability. This inverse view between effort and ability likely contributed to the helpless behaviors of the fixed mindset students. The researchers concluded their discussion of the final study by stating, “Study 3 showed that implicit theories play a causal role in effort attribution, persistence, and remedial effort after failure” (Hong et al., 1999, p. 597). In the final analysis, the research supported the claim that mindsets frame attributions, so these studies collectively answered Dweck and Leggett’s (1988) call.

Applying the Model to Change Student Mindset and Behavior

As the mindset model became established, the focus in the literature shifted from model testing to application (Aronson et al., 2002). One study erased gender differences between male and female math scores in junior high students in the mindset intervention group (Good et al., 2003), while another intervention taught college students a growth mindset and they achieved higher grades compared to both a control group that learned Gardner’s (1983) multiple intelligences theory and another group that received no treatment (Aronson et al., 2002). Aronson et al. (2002) decreased the achievement gap, as African American students showed greater improvement after the intervention. The mindset model represents a stable belief over time, and extends into the college experience (Blackwell et al., 2007; Good et al., 2003; Yeager & Walton, 2011).

Robins and Pals (2002) studied 508 UC Berkeley undergraduates with a series of surveys conducted primarily in a laboratory setting. Using path analysis, they discovered that students who started with fixed mindsets displayed more helpless responses and were subsequently more psychologically vulnerable on their academic paths. Further, the self-esteem gap between growth and fixed mindset students widened over their college experience. Although previous mindset research has explored responses to failure, mindset works for success as well (Robins &

Pals, 2002). Thus, the mindsets are relatively stable over time and unlikely to change without intervention, even while moving through the educational sequence, including transitioning from high school to college (Robins & Pals, 2002; Yorke & Knight, 2004).

Research shows that the mindset model works for college students and for students as young as third grade. For example, Howell and Buro (2009) studied 397 undergraduates and positively correlated fixed beliefs with procrastination, and negatively correlated procrastination with growth beliefs. Harju and Eppler (1997) used Dweck and Leggett's (1988) theory to compare non-traditional, older returning college students with traditional, younger students. The study found that traditional students with a growth mindset were more successful (they had more completed semesters and more learning strategies) than their counterparts who had a performance, or fixed, mindset. In particular, older, non-traditional students with a growth mindset reported more involvement in class. Another study demonstrated that mindset affects students as young as third grade (Haimovitz, Wormington, & Corpus, 2011). After studying 978 students (third through eighth grade), mindset was found to predict equally well across grade levels.

While some mindset researchers present simple, one-time studies, others have progressed to longitudinal studies and interventions. Several often-cited articles compile numerous studies, including longitudinal research (Grant & Dweck, 2003; Blackwell et al., 2007). For example, Blackwell et al. (2007) reported on a five-year longitudinal study in which they followed five successive cohorts of junior high math students. This study did not use an intervention, but rather identified students' mindsets and observed the outcomes for two years. The researchers followed 373 students at a single New York City public school that had racial and economic diversity: 55% of students were African American, 27% South Asian, 15% Hispanic, and 3% East Asian

and European American; 53% of participants were eligible for free lunch. Each cohort had only one math teacher.

The researchers measured incoming seventh graders' mindsets of intelligence and found that a growth mindset predicted more successful academic outcomes, more positive learning goals, greater willingness to employ positive strategies, and improved motivation (all the findings were significant, $p < .01$). More importantly, the growth mindset improved the *trajectory* of student grades in math. Although initial math scores did not differ significantly, over the two-year study, the growth mindset students earned higher grades ($t=2.93$, $p < .05$). At the start of the study, the average grade across both mindsets was 72%, but after four assessments ending in the spring of eighth grade, growth mindset students averaged 76%, while fixed mindset students averaged only 71%. The average grade for growth mindset students increased significantly, but fixed mindset students' average decreased (Blackwell et al., 2007; Yeager & Walton, 2011).

Growth Mindset as a Successful College-Level Intervention

In an effort to explain why growth mindset students achieve greater learning success, Mangels, Butterfield, Lamb, Good, and Dweck (2006) used EEG monitoring on 47 Columbia University undergraduates to observe neural activity during different phases of a test. About half the participants ($n = 22$) exhibited a fixed mindset, and the others ($n = 25$) exhibited a growth mindset, based on mindset survey results and subsequent interview responses. After a general knowledge test, and a surprise retest, the growth mindset students improved more. They also demonstrated more memory activity when they were given the correct answer, or *learning feedback*. The fixed mindset group paid less attention when given the correct answer and more attention when they were told if they were correct or incorrect—in other words, *performance feedback*—which matched with their performance oriented goals.

The researchers concluded that lower memory activity in fixed mindset participants during learning feedback contributed to their lower error correction rate on the surprise retest. Thus, mindset, or what the researchers called “theories of intelligence” (TOI), influenced learning success through “top-down biasing of attention” towards goals. In this case, the goal was learning, rather than outperforming others for the growth mindset group. Citing Corbetta and Shulman (2002), the researchers defined a top-down process as a “process that biases attention toward goal-relevant stimulus and response representations via a network of lateral and prefrontal and parietal regions” (Mangels et al., 2006). The fixed group paid less attention to errors and were less likely to correct errors on the retest. On the other hand, the growth group paid more attention during the learning feedback and were more likely to correct their errors. Based on their findings, the researchers “suggest that beliefs can influence learning success through top-down biasing of attention and conceptual processing toward goal congruent information” (Mangels et al., 2006).

In short, this research suggests that if you have a fixed mindset, you are more inclined to pay attention to whether you are right or wrong, and less likely to pay attention to the correct answer to improve your knowledge, as a result of your performance goals. On the other hand, if you have a growth mindset and learning goals, then you are more likely to pay attention to the correct answer and learn. This recent study began to use neural processing to explain why growth mindset students learn and to demonstrate that mindsets, or theories of intelligence, are the origin of goals and subsequent learning behavior, such as attentive memory activity.

Increasingly, researchers seek to explain how mindset changes learning. In a meta-analytic review of 113 studies Burenette, O’Boyle, VanEpps, Pollack and Finkel (2012) suggest that the relationship between mindset and self-regulation is complex, but promising. The

researchers used evidence such as the Mangels et al. (2006) results to conclude that mindset matters in self-monitoring. Noting that previous academic mindset interventions had improved motivation and sometimes improved performance, the authors used their model to identify self-regulatory mechanisms that “effectively promote goal achievement.” Reviewing findings from many domains and populations the authors consider “the adoption of mastery-oriented strategies and the avoidance of negative emotions regarding evaluations of goal-pursuits” the “strongest mediators” between mindset and “achievement” (p. 64). Burnette et al. observe that those with a fixed mindset emphasize “proving their ability” while those with a growth mindset “focus on improving their ability” because they view “struggle as part of the learning process and consequently, they remain optimistic that they can still succeed in the future” (p. 23). Those with a growth mindset remain optimistic and adopt learning strategies when facing challenge.

Other studies have questioned college students to identify the role of mindset. In a phenomenological study of 14 developmental math students at a four-year college, Howard and Whitaker (2011) found that all had been unsuccessful until they had a mindset change, at which point they became successful at math. All 14 students had struggled in math and all could identify 1) a negative turning point in their attitude towards math; 2) a positive mindset change; and 3) subsequent positive motivation and strategies. The students reported changes in motivation and strategies after their mindset change. In fact, all but one reported enjoying math. The researchers concluded, “Studying the perceptions and experiences of successful students demonstrated that when they switched from a fixed mindset to a growth mindset, they began to make the effort” (Howard & Whitaker, 2011, p. 12). Rather than trying to change student mindset, both Mangels et al. (2006) and Howard and Whitaker (2011) simply observed differences in student learning behaviors as a result of the student mindset that was there.

Some scholars have sought to change student mindset through interventions. In fact, recent meta-analyses comparing intervention approaches for college students have identified mindset interventions as among the most successful (Heikkila et al., 2010; Yeager & Walton, 2011). While conducting a comparison between several other approaches to university student learning, Heikkila et al. (2010) concluded that across various approaches, student mindset is key. The researchers reported that students who displayed a helpless, fixed mindset demonstrated increased stress and exhaustion compared to students who were more self-directed and used a growth mindset. The growth group also earned higher GPAs. Furthermore, Yeager and Walton's (2011) meta-analysis of successful non-content psychological interventions included three mindset interventions (Aronson et al., 2002; Blackwell et al., 2007; Good et al., 2003). They also reported that the Charles A. Dana Center at the University of Texas implemented mindset interventions with high school math students across the country and had dramatic results, including a reduction in the percentage of students repeating algebra, from 24% to 9%. Since mindset interventions are so successful and so brief, the researchers concluded that these interventions should be implemented more often. And because psychological interventions, such as mindset, are relatively quick, they are also cost effective (Yeager & Walton, 2011). Cost is a major consideration for remedial education and interventions, both on individual campuses and nationally (Pretlow & Wathington, 2011).

Emerging Online Mindset Approaches

In part to address cost and scalability, in 2008, Dweck and Blackwell created Brainology, an online four-unit intervention designed for middle school students. Researchers have recently begun to report preliminary results on its effectiveness (Donohoe, Topping, & Hannah, 2012; Romero, Paunesku, & Dweck, 2011, cited in Yeager & Walton, 2011; Yeager & Walton, 2011). Donohoe et al. (2012) use a mixed method study of 33 public school students in Scotland. The

researchers reported strong effects for the online mindset intervention between the pre-test and post-test, as well as qualitative changes in focus group responses. In a follow-up test and focus group three months later, however, these changes were not sustained. Moreover, one year later, there was no noticeable difference in students' grades. As the researchers noted, more extensive testing is necessary to demonstrate both the short- and long-term effects of online interventions (Donohoe et al., 2012).

Recently, citing extensive mindset model research, including Robbins, Allen, Casillas, and Peterson (2006), Sririm (2011) conducted a mindset intervention with 105 private university undergraduates in basic skills courses. In this dissertation study, the intervention group received a four-week online growth mindset intervention, while the control group received a four-week study skills program. The results indicated that the mindset intervention changed participants' mindsets and produced significantly higher levels of academic effort, controlling for pre-intervention effort levels. Interestingly, the mindset intervention also induced higher levels of study skills than the study skills program. However, there were no significant differences in course or semester grades.

Another recent dissertation study used focus groups and interviews to develop an online intervention based on Blackwell et al. (2007), this time for developmental community college math students (Paunesku, 2013). The researcher partnered with the Khan Academy, adding online growth mindset readings as well as growth mindset messages to the Khan interface². The study, with 200 community college students, showed promising results, including decreased course withdrawal rates as well as increased successful completion rates (Paunesku, 2013; also reported in Yeager & Dweck, 2012). This online intervention demonstrated the potential for

² Khan Academy is one of the largest free educational content providers.

adapting the growth mindset intervention for community college students, similar to our own pilot study results.

While Paunesku (2013) reported the advantages of online scalability and cost advantages, as well as ensuring more consistent presentation, he also noted the strong impact teachers have on students. Consequently, even Paunesku called for additional research into classroom intervention and faculty involvement. Rather than isolated online interventions for students, efforts involving faculty in promoting growth mindset would offer “high-impact research” (Paunesku, 2013). As Paunesku explained, the faculty member’s efforts are part of all aspects of the class, whereas the online process is a separate, and perhaps less integrated, approach. Therefore, as I will explain in the next chapter, I examined a “high-impact research” project by involving faculty in the delivery of six mindset intervention sessions and then measuring changes in faculty attitudes and instructional practices, as well as their plans to integrate a growth mindset in the future.

Increasing Recognition of the Teacher Mindset Influence

While the online interface has shown mixed results at this point (Donohoe et al., 2012; Paunesku, 2013; Sririm, 2011), there is growing evidence to suggest that the teacher plays an important role in developing the student mindset. For example, according to Rattan, Good, and Dweck (2012), teachers with a fixed mindset can demotivate students in math. Similarly, Lee (2009) contended that teacher mindset matters, advocating for math teachers to adopt a “growth” classroom. In fact, after reviewing several studies, Yeager and Dweck (2012) concluded that adults often impose their own fixed mindset on students (through praise, or by redirecting struggling students to other tasks), rather than encouraging effective learning strategies, resource use, and effort. In short, they concluded that educators and parents should focus more on *process* than ability.

Yorke and Knight (2004) used a matrix to measure the effects of fixed and growth mindset teachers paired with fixed and growth mindset students to demonstrate that teacher mindset matters. From this review of teachers in England, the researchers advocated for staff development that would inform teachers about mindset malleability and provide strategies for teachers to encourage growth mindset—strategies including more reliance on formative assessment. The researchers highlighted the importance of encouraging growth mindset training for teachers because teachers influence entire groups of students (Yorke & Knight, 2004, p. 30). In fact, in a critical literature review of non-cognitive strategies, Farrington et al. (2012) concluded that there was considerable evidence that “academic mindsets” are “critical levers” for increasing student engagement and persistence (p. 73) and that mindset is influenced by classroom and school practices. Specifically, the researchers concluded, “educators play a key role in building positive mindsets” (p. 35). Therefore, they advocated for institutional change within the school environment, specifically at the classroom instructional level.

Despite the desirability of fostering growth mindset practices in faculty instructional practice, there is little research on specific practices. As Farrington et al. (2012) asserted, the research shows that mindset interventions are effective, but “Unfortunately, the research does not directly translate into classroom strategies that teachers can use to support positive mindsets in their students” (p. 35). Consequently, Farrington and her colleagues considered the challenge of developing strategies to apply mindset research into mindset instructional practices a “central tension” (p. 35). Similarly, Yeager and Dweck (2012) advocated for training teachers to create growth classrooms, and emphasized the importance of the specific educational context, which highlights the need for additional research in the specific community college context.

The application of growth mindset strategies in community college classrooms has not often been studied. As noted earlier, most research has involved much younger students, often in elementary and middle school (Blackwell et al., 2007; Donohoe et al., 2012; Good et al., 2003; Haimovitz et al., 2011), or university students (Aronson et al., 2002; Howell & Buro, 2009; Mangels et al., 2006; Sririm, 2011; Yeager & Walton, 2011; Yorke & Knight, 2004). While university students are often the same age as community college students, based on their admission to universities and four-year colleges (which are often elite institutions), these students tend to have significantly different academic backgrounds than basic skills community college students (McIntosh & Rouse, 2009). When considering the effects of growth mindset interventions, it is important to recognize the specific context and experiences the students bring with them (Yeager & Dweck, 2012; Paunesku, 2013).

While researchers have recognized context, Yeager and Walton (2011) also called for collaboration between teachers, students, and researchers. In fact, in the current study, I explore the effects of a growth mindset intervention that created in a pilot study for the specific community college context; this intervention was developed in collaboration with teachers and informed by student feedback. Therefore, this study addresses context by integrating community college faculty in the process in order to study the effects on both the less studied community college basic skills students and the faculty.

Conclusion

The current study seeks to address two significant gaps in the considerable research on the benefits of a growth mindset—the limited research on interventions for community college basic skills students, and the gap in the research on how participation in growth mindset interventions impacts faculty attitudes and instructional practices.

Most growth mindset studies have considered students who are either younger than community college students or who are at four-year universities. Context matters, so this study examined the effects of a series of growth mindset interventions created specifically for community college basic skills students. Pilot study findings suggested that these interventions changed students' mindsets, resource usage, and success outcomes. The dissertation study examined these questions with a larger sample. Furthermore, although studies have demonstrated the teacher's importance in growth mindset and the benefits of encouraging it in instructional practices, there is very little research on specific strategies (Farrington et al., 2012; Yeager & Dweck, 2012; Yeager & Walton, 2011). Therefore, in the current project, I trained faculty in specific strategies and examined how having instructors present these strategies changed their attitudes and instructional practices.

Ideally, exposing faculty to a growth mindset and charging them with teaching specific practices will affect the student mindset. At the same time, however, it is hoped that these measures would also affect the faculty mindset, changing individual instructional practices and fostering growth in classroom practices, such as emphasizing process and formative grading practices (Dweck, 2010; Lee, 2009). Involving faculty in change has been identified as one of the "promising practices" for successful community college initiatives (Levin et al., 2010). Therefore, the current research project explored how participation changes community college faculty mindset and instructional practices.

CHAPTER 3:

DESIGN AND METHODS

In this chapter I describe the methods used to explore the research questions on growth mindset in community college settings:

1. According to student perceptions and student success data, what are the effects of six brief growth mindset interventions on students' mindsets?
2. In what ways, if any, do students report a transfer of growth mindset practices beyond the intervention course?
3. How does a series of growth mindset interventions change faculty perceptions about instructional practices?
4. Based on student and faculty feedback, how can we improve the series of growth mindset interventions?

I begin with an overview of the study procedures, followed by a description of the two sites and the participants. Then, I describe the data collection procedures, as well as the analytic procedures.

Overview of Study Procedures

I employed a multiple methods, experimental design to explore how growth mindset interventions changed faculty practice and student outcome at two California community colleges. Faculty participants were randomly assigned to either a growth mindset intervention group or a comparison group. Faculty in the intervention group were trained to present six brief growth mindset training sessions during a basic skills writing course in the fall 2014 semester.

After students enrolled in the course, they were informed about the study, and each student was given an opportunity to make informed consent. Therefore, random assignment took place at the teacher level, but students enrolled in a course that had already been assigned to the intervention or comparison condition, and they could choose whether or not to participate.

Intervention faculty completed pre- and post-treatment surveys and a series of reflections, and also participated in individual interviews and pre- and post-treatment focus groups. Intervention students completed closed-ended pre- and post-intervention surveys. They also completed response sheets with open- and closed-ended questions following each intervention. Comparison faculty and students completed pre/post surveys. Furthermore, all faculty submitted outcome data regarding student course completion and course success, which were compared between the intervention and comparison courses and with campuswide data. This variety of data collection strategies helped clarify how faculty changed instructional practices (see Appendix A, Faculty Notation Model), and how students altered their perceptions and transferred the growth mindset practices beyond the intervention course. It also allowed me to identify which intervention elements were most important in changing student attitudes and behaviors (see Appendix B, Student Notation Model).

The study combined outcome and process data collection. The outcome data measured course completion and course success. The process data helped explain how the interventions changed perceptions and behaviors among faculty and students. Thus, the combination of methods provides measureable outcomes as well as explanatory feedback to improve future community college growth mindset interventions (Creswell, 2014).

Research Site

Two southern California community colleges were selected for this research study. Both Colonial College and Foundation College are part of the same multi-college district. They both have diverse student populations and proportionately high basic skills enrollment, making them representative of large, urban community colleges in Southern California.

Colonial College (CC) was founded in the 1960s and serves a diverse community. The service area does not have a single majority population, and the largest demographic groups are White (47%), Hispanic (33%), and Asian/Pacific Islander (16%). According to the institution's 2011 Comprehensive Self-Study, Colonial College serves over 16,000 students with over 500 faculty members, full- and part-time. Over half of the students enrolled at Colonial College live outside the immediate service area. The student enrollment shows a plurality as well, with 40% Hispanic, 24% White, and 18% Asian/Pacific Islander. There are more females (53%) than males (45%) (California Community Colleges, 2014). As part of the California Community Colleges system, the open access institution offers associate's degrees in 58 fields, and 141 career certificate programs, including in nursing and mortuary science.

Foundation College (FC), founded in the early 1900s, serves an increasingly diverse suburban population. The college's service area lacks a majority population. According to the institution's 2011 accreditation self-study, the three largest demographic groups are White (45%), Hispanic (38%), and Asian/Pacific Islander (12%). The student population also does not have a majority population, and the largest group is Hispanic (47%), with White (26%) and Asian/Pacific Islander (13%) students making up the two other largest groups (California Community Colleges, 2014). Currently, 315 full-time and 480 part-time faculty serve nearly 19,000 students. As an open access institution, the college offers a wide range of associate's degrees (93) and vocational certificates (147).

Study Participants

All full- and part-time faculty who taught English 60 during the fall 2014 semester were sent a written invitation to participate in the study (Appendix C). Also, with the support of the Colonial College department coordinator, I conducted a brief presentation at a pre-semester staff development workshop to explain the study. The study targeted faculty who were teaching one level below college English because this is one of the highest demand basic skills courses. Also, English 60 meets four hours each week, affording time to conduct the six interventions throughout the 16-week semester. Moreover, the sessions could be integrated into the course effectively, as demonstrated by the pilot study. Therefore, this course was a practical choice informed by the pilot study and a larger effort to improve basic skills student success.

At Colonial College, approximately 30 faculty taught at least one section of English 60, and eight agreed to participate in the study. At Foundation College, approximately 40 faculty taught at least one section and 11 agreed to participate. All 19 initial faculty participants signed a consent form, designed according to the requirements of the Institutional Review Board (IRB) at the University of California, Los Angeles (Appendix D). The faculty consent form and other materials received approval from the UCLA IRB and the Foundation College IRB. Colonial College does not have such an approval process, but the department coordinator, college researcher, and president were all provided the materials and consented to the study.

After giving informed consent, half of the faculty volunteers at each college were randomly assigned to the intervention group (Shadish, Cook, & Campbell, 2002). Therefore, four Colonial College faculty were placed in the intervention group and four in the comparison group. One Colonial College comparison group participant dropped out later in the semester, leaving three faculty in the comparison group. At Foundation College, five faculty were assigned to the intervention and six were assigned to the comparison. All 11 completed the

project. Each faculty member selected a single section of English 60. Students who enrolled in the section selected by the faculty participant could choose whether or not to participate.

Faculty Demographics

The 18 faculty participants are evenly divided by gender (9 men, 9 women), and this balance held across campuses and treatment groups. The faculty in the intervention group had, on average, 13 years of teaching experience; those in the comparison group had an average of 10 years of experience (Table 3.1).

Table 3.1

Faculty Participant Characteristics

Letter	College	Placement	Years Teaching at this College	Years Teaching	GM Familiarity	View of Intell.	Stud View of Intell.
A	FC	Interv.	18	19	Familiar	Growth	Fixed
B	FC	Interv.	15	24	Familiar	Growth	Most Fixed
C	FC	Interv.	6	11	Familiar	Growth	Most Fixed
D	FC	Interv.	14	27	None	Growth	Most Fixed
E	FC	Interv.	6	8	Very Familiar	Growth	Most Fixed
F	CC	Interv.	2	2	None	Growth	Many Fixed
G	CC	Interv.	1	1	None	Growth	Many Fixed
H	CC	Interv.	5	5	None	Growth	No Response
I	CC	Interv.	14	19	None	Growth	Most Fixed
K	FC	Comp.	8	11	Very Familiar	Growth	Mixed
L	FC	Comp.	20	26	Very Familiar	Growth	Many Fixed
M	FC	Comp.	7	7	Familiar	Growth	Many Fixed
N	FC	Comp.	3	5	Very Familiar	Growth	Most Fixed
O	FC	Comp.	6	7	Very Familiar	Growth	Mixed
P	FC	Comp.	6	7	Familiar	Growth	Unsure
Q	CC	Comp.	8	8	None	Both	Most Fixed
R	CC	Comp.	1	2	None	Growth	Mixed
T	CC	Comp.	17	17	None	Both	Growth

There was greater variation in terms of employment status and teaching experience. Six of the intervention faculty were full-time, tenured teachers and three were part-time instructors. This pattern was reversed in the control group, with three full-time tenured faculty and six part-time instructors. Looking across the two campuses, two CC faculty were full-time and five were

part-time. At FC, seven faculty were full-time and four were part-time. Not surprisingly then, CC faculty participants had fewer years of teaching experience. CC intervention faculty had been teaching between one and 19 years, and the control group range was between two and 17 years. For FC intervention faculty, the range of experience was between 8 and 27 years, and the control group range was between five and 26 years.

Foundation College Faculty Previously Exposure to Growth Mindset

The preliminary data collection revealed that 10 of the 11 Foundation College faculty had been previously exposed to growth mindset. Importantly, all six of the FC comparison faculty were familiar with the concept (four were very familiar) (Table 3.1). Some of the comparison faculty even reported using strategies from the intervention. For example, Faculty K shared that the Cotton Ball exercise went very well in her comparison class (personal communication when returning student surveys). Considering this previous exposure at the faculty, and subsequently at the student level, the randomization at Foundation College failed. Pre-test data show faculty in both groups were already very familiar with the intervention, thus there was no control group. Consequently, I did not conduct comparative analyses of student intervention and comparison group data (e.g. growth mindset measures, and course outcomes data) for Foundation College. Thus, between group analyses were conducted using only Colonial College student data. Other closed ended measures were administered to intervention students only and were not intended for two group comparative analyses between intervention and thus data from all students were included in these analyses. Further, intervention student process data from both campuses was analyzed because this data examined only the intervention group, without referring to the comparison group. Similarly, open-ended process data from intervention faculty at both campuses was analyzed because it did not refer to the comparison faculty.

Student Demographics

After the semester started, faculty in both the intervention and comparison groups explained the study to their classes. They read a prepared announcement (Appendix H) and answered individual questions before providing students the chance to sign the informed consent (Appendix I). In total, 431 students completed the consent form and the pre-intervention survey. A total of 248 students were enrolled in comparison group classes, and 223 (89.9%) students completed both the consent form and the pre-intervention survey. In the three CC comparison classes there were 79 enrolled students, and 71 (89.8%) student participants. In the six FC comparison classes, there were 169 students enrolled, and 152 student participants (89.9%). Nearly one third of the comparison students were from Colonial College (31.8%, $n = 223$) and about two thirds were from Foundation College (68.1%, $n = 152$).

In the intervention group, there were 220 enrolled students, and 208 (94.5%) completed both the consent form and the pre-intervention survey. At Colonial College, one faculty member completed all of the training and conducted the first five sessions, but did not administer the final session or the post-intervention student survey. Therefore, while he is included in the faculty results, his class is not included in the student results. Consequently, there were three CC classes in the intervention group, with a total of 85 students enrolled and 80 student participants (94.1%). In the five FC classes, there were 135 students enrolled and 128 student participants (94.8%). Slightly over one third (38.5%, $n = 80$) of the intervention students attended CC, and nearly two thirds (61.5%, $n = 128$) attended FC.

In the comparison group, among the 205 who responded to the gender question, the number of female students (49.3%, $n = 101$) was very close to the number of male students (50.7%, $n = 104$). In the intervention group, there were slightly more female students (57.9%, $n = 114$), than male students (42.1%, $n = 83$). The comparison and intervention groups also had

similar distributions across race and ethnicity. Hispanics were by far the largest category in both groups, with 109 in the comparison (48.9%) and 109 in the intervention (52.4%) (Table 3.2).

Table 3.2

Student Race/Ethnicity

	Comparison		Intervention	
African-American	6	2.7%	2	1.0%
American Indian /				
Alaska Native	2	.9%	1	.5%
Asian	21	9.4%	11	5.3%
Filipino	5	2.2%	9	4.3%
Hispanic	109	48.9%	109	52.4%
Pacific Islander	1	.4%	0	0%
White	29	13.0%	34	16.3%
Two or More Races	31	13.9%	31	14.9%
No Response	19	8.5%	11	5.3%
Total	223	100.0%	208	100.0%

The next largest single group comprised students who identified as White (13% in the comparison and 16.3% in the intervention). Thus, for both groups, Hispanics made up about half the students, while the campuses reported Hispanic enrollment at 40% for CC and 47% for FC (California Community Colleges, 2014).

Treatment Group Totals

In all, 18 faculty members completed the project, with nine each in the intervention and comparison groups (Table 3.3). Seventeen classes completed all six sessions and the pre- and post-intervention surveys, with eight in the intervention and nine in the comparison group.

Table 3.3

Faculty and Student Participants by Treatment Group

	Comparison		Intervention	
	Faculty	Students	Faculty	Students
Colonial	3	71	4	80 ^a
Foundation	6	152	5	128
TOTAL	9	223	9	208

^aBecause one CC faculty member did not administer the final session or the student post-intervention survey, only three classes are included.

In the comparison group, 223 students completed the pre-intervention survey and, of those, 158 (70.8%) also completed the post-intervention survey. In the intervention group, 208 students completed the pre-intervention survey and of those 165 (79.3%) also completed the post-intervention survey.

Data Collection Procedures

There were three phases of data collection (pre-, mid-, and post). In brief, prior to the intervention, both comparison and intervention faculty completed an open-ended online survey. Intervention faculty also participated in a focus group, followed by intervention training. Before the intervention, comparison and intervention group students also completed a forced-choice survey. During the intervention, faculty completed reflections after conducting classroom sessions and participated in individual interviews. During each intervention session, students completed open-ended written responses to the session.

After the intervention, both intervention and comparison group faculty completed an open-ended survey. Intervention faculty also participated in either a small focus group at their respective campus or, when there were scheduling conflicts, an individual interview.

Comparison group students once again completed the same closed-ended survey that they had answered earlier. Intervention students completed an expanded survey, which also asked them to

evaluate the sessions and to answer additional questions about changes in their behavior and perceptions. Finally, student course retention and success data were collected from all faculty participants and compared between groups, and I obtained historical course outcome measures from campus researchers. Table 3.4 (below) describes the data collection methods used for each research question for students and faculty.

Table 3.4

Data Collection by Research Question

Research Question	Data Collection Method	Time
1. According to student perceptions and student success data, what are the effects of six brief growth mindset interventions on students' mindsets?	A. Intervention Survey	Pre-Post
	B. Resource Use Questions	Post
	C. Open-Ended Reflections	During
	D. Closed-Ended Reflections	During
	E. Course Completion and Course Success	Post
2. In what ways, if any, do students report a transfer of growth mindset practices beyond the intervention course?	A. Open-Ended Reflections	During
	B. Closed-Ended Reflections	During
	C. Intervention Survey	Post
3. How does a series of growth mindset interventions change faculty perceptions about instructional practices?	A. Qualtrix Survey	Pre-Post
	B. Reflection Journals	During
	C. Interviews	During
	D. Focus Groups	Pre-Post
	E. Intervention Mindset Survey	Pre-Post
4. Based on student and faculty feedback, how can we improve the series of growth mindset interventions?	A. Faculty Interviews	During
	B. Faculty Focus Groups	Post
	C. Qualtrix Survey	Post
	D. Student Intervention Survey	Post

In sum, the project combined process and outcome data to clarify how students changed their mindsets and behaviors, to classify how faculty changed instructional practices, to verify if faculty and/or students transferred growth mindset practices beyond the intervention course, and to identify the most important elements in improving student success.

Pre-Intervention

Faculty. First, faculty participants completed an open-ended Qualtrix survey to identify their current instructional practices (RQ3A; see Appendix E). This nine-question survey asked faculty about their non-cognitive teaching strategies and their views on intelligence. It also asked about their familiarity with the growth mindset before the intervention, and their concerns about participating in the intervention. All comparison faculty ($n = 9$) and all but one of the intervention faculty ($n = 8$) completed the survey.

Next, comparison and intervention faculty completed a closed-ended, 15-question paper survey to measure pre-intervention mindset (RQ3E; see Appendix F). First, the instrument asked faculty to respond to the three-question Dweck mindset measurement tool (Blackwell et al., 2007). Next, I asked faculty to respond to the same growth mindset questions described on the student survey. Faculty gave open and closed responses about their mindsets and behaviors, to establish their perceptions and practices before the intervention. The pre-test survey results were compared with post-test survey results as part of the experimental design (Creswell, 2014).

Intervention faculty also participated in a focus group or an individual interview (RQ3D). At Colonial College, two attended the focus group, while two required individual interviews due to scheduling conflicts. At Foundation College, all intervention faculty attended one of two focus groups. The semi-structured faculty focus group protocol was developed in response to the Qualtrix survey (Merriam, 2009). For example, the questions on faculty concerns were not covered in the focus group because the earlier Qualtrix survey indicated this was not an issue. The focus group questions followed up on faculty knowledge of growth mindset and any non-cognitive strategies they were using, and the reasons behind their decisions to use these strategies. Also, based on the survey responses, the questions emphasized the differences faculty perceived between their own mindsets and their students' mindsets. For example, the survey showed that most faculty had a growth mindset, but most thought students had

a fixed mindset. After reviewing these results, faculty were asked, “Why do you think there is such a contrast between the faculty growth mindset and the student fixed mindset? They also discussed, “What can faculty do to encourage students to take a growth mindset, rather than a fixed mindset?” (See Appendix G for protocol.)

The focus group and interview responses clarified faculty members’ reasoning for their current practices and views of growth mindset strategies in order to identify potential changes in perceptions, beliefs, and practices. As with all interviews and focus groups, these were audiorecorded and transcribed, and I checked the transcripts against the original recordings (Merriam, 2009).

Immediately after the focus groups (or interviews), faculty were trained to present the first three classroom sessions. Each was provided a binder containing all student handouts and faculty instructional material, including links to online teaching resources. They were also given complete class sets of all student handouts, which were pre-stamped with their class letter for data collection. After the training, all three faculty members who were teaching more than one section of English 60 asked for additional materials for use in all sections. Faculty, B, D, E were given additional copies, but these classes were not included in the analysis, because they would create an imbalance in the data.

Students. Throughout the study, students were only identified by a class letter and roster number. For example, Student A2 was enrolled in class A and listed second on the roster. Students who signed the consent form began the project by completing a survey (RQ1A), as part of a pre–post model (Creswell, 2014, Shadish et al., 2002). The 37-question, closed-ended pen and paper survey was administered before the first class intervention session (see Appendix J). The survey gathered student participant demographics and included the three-question Dweck mindset measurement tool (Blackwell et al., 2007). Further, students were asked to indicate their

agreement with 11 additional growth mindset statements on a 6-point Likert-type scale (1=Strongly Disagree to 6=Strongly Agree).

After reviewing the literature and the pilot study responses, I designed these 11 questions to capture growth mindset attitudes and behaviors, especially the elements of intelligent practice, an intervention focus. Sample statements included, “I am likely to ask others for help,” and “I use effort to overcome challenges.” Four of the statements were written so that a growth mindset response would reflect disagreement (e.g., “I ignore negative feedback”). Another asked students about their expected course success: “I expect to pass this course.” The remaining questions asked how frequently students used resources in the past two weeks (0 to 7 or more times) and how useful they found these resources (1=Not Useful to 6=Extremely Useful, or NA/Did Not Use This Resource). The resource choices were created based on the most popular open-ended responses from over 100 pilot study students. The pre-post method measured whether participation in the growth mindset intervention changed students’ mindsets, behaviors, and levels of resource use.

Mid-Intervention

Faculty. To track potential changes during the intervention, intervention faculty submitted reflections, participated in individual interviews, and received training on the final three sessions. Specifically, they wrote brief reflections after presenting the sessions to their classes. These unstructured reflections encouraged faculty to describe their initial reactions to the material, challenges in learning or presenting it, and their perception of students’ responses (RQ3B). This process also encouraged communication. Notably, no significant problems arose and no specific changes were made to the training session as a result of faculty reflections. All FC faculty submitted these reflections regularly, while CC faculty submitted between two and four over the semester. The process encouraged reflection and several ($n = 4$) faculty mentioned them during their individual interviews.

Midway through the intervention, each faculty member participated in a personal interview (RQ3C). These interviews lasted between 45 and 65 minutes, with a protocol informed by the focus groups and reflection journal results (Appendix K). The purpose was to explore their understanding of the interventions and ongoing changes to their views of mindset and instructional practices. For instance, faculty were asked, “As a result of our project, how has your view of growth mindset changed?” and “As a result of our growth mindset project, how have you changed your instructional practices?” Most interviews were face-to-face, while one was over the phone. Face-to-face interviews took place in faculty members’ offices, except for two conducted in a faculty workroom because adjunct faculty members’ lack of office space. The semi-structured interviews included probing questions to explore faculty mindsets and their reasoning behind instructional practice decisions (Merriam, 2009).

Students. During each session, students completed individual response sheets that were developed and revised from the pilot study (RQ1C, RQ2A). Reflection prompts were designed to answer individual research questions (Merriam, 2009). For example, to address the first research question, the final prompt asked students, “In our discussions, we have focused on how our brain grows, including the behaviors you use, which we called intelligent practice. Considering those ideas, how have our discussions changed your mindset?” (I6Q2). Some questions addressed both student research questions. For example, a question from the fifth session asked, “Describe at least one specific example of how you have practiced growth mindset. If our learning discussions have changed your view of mindset, describe how” (I5Q2). Both the second research question and this prompt sought to verify the surprise pilot study finding that most students transferred growth mindset practices beyond the intervention course, even when not prompted about experiences beyond the class (RQ2).

Each student response sheet typically asked three to five open-ended questions, creating roughly 23 separate open-ended responses per student throughout the semester. After each intervention, faculty collected and submitted the reflection sheets to the researcher, and all reflections were transcribed into in a password protected Excel file. For each intervention, at least 200 students submitted reflection sheets. Consequently, this process generated a great deal of data. Thus, to examine student changes, 80 students were assigned to a sample for careful analysis. To create this sample, I identified students who had competed all six interventions and then, from that subgroup, selected ten students from each individual class (Shadish et al., 2002). (As noted previously, one faculty member conducted sessions 1–5, but not the final session, due to time constraints at the end of the semester. Consequently, his class was excluded, leaving eight intervention classes.)

Overall, the open ended questions asked students to explain their understanding of brain function and growth mindset, their experiences applying growth mindset, possible changes in and perceptions about resource use, and the possibility of transferring growth mindset beyond the intervention course. Tracking changes over time, these qualitative responses were coded to identify patterns and these findings were triangulated with the quantitative data (Creswell, 2014).

The reflection sheets also included seven closed-ended questions (RQ1D, RQ2B). These included a combination of multiple choice and yes/no responses designed to address specific research questions. For instance, in the fifth session, students answered “Yes” or “No” to the prompt, “Have you used any of these strategies in other classes or outside of school?” They then explained their answers in the next open-ended question. Closed-ended responses were tabulated for both the sample group and across all submissions. Combining the qualitative and quantitative data helped measure changes and clarify student perceptions and attitudes.

Post-Intervention

Faculty. As one of the final steps, intervention faculty participated in focus groups or interviews (RQ3D). Two CC faculty had individual interviews due to scheduling, while all other faculty participated in one of three focus groups. The focus groups, held in reserved classrooms, followed a semi-structured protocol developed from the interviews and reflections (Appendix M). The protocol and resource materials were designed to verify or challenge the apparent consensus from the individual interviews and to explore the ongoing experiences and changes among intervention faculty. The dialogic social meaning aspect of focus groups encouraged additional information and explanation (Merriam, 2009).

Based on faculty responses from the interviews and reflections, the focus group had three main goals. First, faculty reviewed and discussed the Faculty Interview Preliminary Findings Handout (Appendix N). In particular, they were asked which findings they found most interesting. I then focused on identifying patterns among the most and least effective activities and on ascertaining how faculty had changed their views of students as a result of the intervention. Second, faculty explored instructional practices that encouraged growth mindset in students, especially grading and feedback, which was a major focus in the interviews (see Appendix O, Post-Intervention Grading and Feedback Handout). Finally, faculty reviewed and discussed a proposed new four-session model, which was developed from interview comments and suggestions (see Appendix P, Post-Intervention Focus Group New Model Handout). The interviews followed the same process, and both participants shared their preferences for collaboration.

After the intervention, as part of the (pre–post) comparison group design, both intervention and comparison group faculty completed the Post-Intervention Faculty Mindset Survey ($n = 17$) (RQ3E) (Creswell, 2014). The questions were the same as what was included in the pre-test, except the

intervention group answered four additional questions about transferring growth mindset, changing instructional practices, and observing changes in their students (Appendix L).

Faculty also completed a Post-Intervention Qualtrix Survey (RQ3A). Most of the intervention faculty ($n = 6$) completed the post-intervention survey (Appendix Q). The questions followed up on the focus group responses and asked faculty to review strengths and weaknesses, suggest improvements, and offer advice about the proposed new four-session model. The questions also asked about changes in faculty instructional practices and perceived changes in students. While the intervention faculty Qualtrix survey evolved from the focus groups, the comparison group Qualtrix survey repeated the questions from the pre-intervention survey to measure if they changed even without participating in the intervention (Appendix Q). Most of the comparison group ($n = 7$) completed the survey.

Students. As with faculty, both comparison and intervention students completed a post-intervention survey (RQ1A, RQ2C). Comparison group students completed the same survey questions as they had in the pre-test. Intervention students also responded to four new questions about possible changes in resource use and study strategies, and five questions about transferring growth mindset after the intervention (Appendix R). Finally, to address the fourth research question, intervention students were asked to rate the usefulness of 12 specific intervention activities (1=Not Useful to 6=Extremely Useful, and NA/Did Not Use This Resource). This quantitative data were triangulated with the qualitative student responses and with faculty comments about activity effectiveness (RQ4) and perceived changes in students (RQ1, RQ2).

At the end of the semester, intervention and comparison faculty submitted student success data (course completion and course success) and campuswide data were also collected from campus researchers (RQ1E). At both campuses, this was a basic skills, non-degree course with “Pass/No Pass” grades. The campus researchers provided course completion rates (i.e., the

number of students still enrolled at the end of the semester) and course success rates (i.e. the number of students who received a Pass). The campus researchers also provided past campus course completion and success data for comparison.

Data Analysis

In this multiple methods approach, data analysis was ongoing and iterative. Each step was informed by the results of previous responses. The quantitative instruments, including the pre-post surveys and closed-ended questions in the student reflection prompts, were designed in advance and remained unchanged. The pre- and post-intervention surveys were adapted from the pilot study, subjected to expert review, and tested again with several students and faculty who had completed the intervention. Similarly, from the beginning, the open-ended reflection prompts were unchanged, having been developed, piloted, and subjected to expert review in the earlier study.

On the other hand, most of the qualitative faculty protocols were developed in response to analysis from earlier data in the current study. For example, the Post-Intervention Focus Group Protocol was developed from the interviews. Moreover, during these focus groups, faculty reviewed the preliminary findings (provided as a handout and included as Appendix N) and explored the theme of grading and feedback, which repeatedly emerged as a focus and unanswered question in the interviews. Finally, the Post-Intervention Qualtrix Survey asked intervention faculty to reflect on the focus group discussion, as well as to look forward towards their future plans. Therefore, in this design, ongoing analysis often shaped subsequent steps and multiple methods allowed triangulation across methods and comparison across groups.

Faculty Data

Quantitative. Faculty completed pre and post closed-ended surveys. Demographic data were transcribed into a password protected Excel file. Descriptive statistics were generated for comparison between groups. Faculty responses to the pre–post mindset survey were entered into similar Excel files and extracted to SPSS. These data were compared using one way analysis of variance (ANOVAs) between groups, and t-test comparisons were made within and between groups. For responses completed only by intervention faculty and only on the post-test survey, descriptive statistics were generated.

Qualitative. For faculty, the primary emphasis was on open-ended questions to explore how they changed their perceptions and instructional practices. I conducted coding and thematic analysis on the qualitative data in a series of iterations with inductive and deductive strategies. Focus groups and interviews were recorded, transcribed using word processing software, and checked against original recordings. In preliminary coding, I used themes that had been previously developed via “open coding” with the pilot study co-researcher (Merriam, 2009, p. 178). Next, during “analytic coding,” I created new themes and developed a separate file for each theme (Merriam, 2009, p. 180). I generated descriptive statistics for each theme and shared preliminary findings with faculty during the post focus group sessions. Finally, faculty participants “member checked” individual quotations to ensure accuracy in the final document (Maxwell, 2013, p. 126).

Student Data

Quantitative. Student responses to the pre–post surveys were entered into Excel and extracted to SPSS. For demographic data, I generated descriptive statistics and group comparisons. I compared student pre–post responses to mindset, behavior, and resource use questions using one way analysis of variance (ANOVAs) between groups, and made t-test

comparisons within and between groups. Factor analysis identified two factors from the 11 growth mindset questions. One measured intelligent practice (using six questions) and the other measured fixed mindset (using three questions) (Appendix S). Also, growth mindset categories (fixed, mixed, and growth) were compared to course completion and course success using chi-square test for independence. For responses completed only by intervention students and only on the post survey, I generated descriptive statistics. I entered student closed-ended reflections completed during the interventions into Excel and generated descriptive statistics for the 80-student sample group and for all intervention responses.

Qualitative. All the student responses to open-ended intervention reflection prompts were transcribed into Excel. I created a separate Excel file for the 80 student sample responses, and coded these for themes. As with faculty responses, analysis combined iterative inductive and deductive strategies, beginning with the previous coding developed in the pilot study. Next, during the analytic coding phase, I generated new themes and recoded accordingly. I then generated descriptive statistics for these new categories. I also created separate files for each theme, organized to address specific research questions.

Summary

This multi-site study analyzed several types of data from students and faculty to address the dearth of research on the growth mindset in community colleges. The project triangulated process and outcome data to identify congruencies and inconsistencies and to add to the depth and validity of the findings. These findings are described in Chapter 4.

CHAPTER 4:

RESULTS

Using multiple methods and an experimental design (which worked at one of the two study sites), this study examined changes in students and faculty following participation in a series of growth mindset interventions. Faculty participants at two California community colleges were randomly assigned to an intervention or comparison group. At Foundation College, pre-test data showed that faculty in the control group were previously exposed to the intervention, so the experimental design did not work. Each of the participants in the intervention group was trained to present a series of six growth mindset interventions in one section of English 60, one level below college transfer English. Each intervention included presentation of a concept, an activity, and a written student reflection that was included in the study data. The sessions explained how the brain grows new connections and introduced intelligent practice (effort + good strategies + help from others) to encourage a growth mindset and promote student success. During one faculty focus group following the intervention, one professor described the project as “a series of lessons and activities that go beyond just encouraging students to try hard.” She continued:

[It] gives them the scientific grounding to know that their brains can change and that they can actually develop their intelligence and their abilities with effort, and with help, with good strategies....[I]t involves an introduction to what is going on neurologically. And it also gives students hands-on activities [and] an introduction to different research studies that have been conducted on the topic (Faculty C, Focus Group).

This participant summarized the interventions well; the project began with “research” and “scientific grounding,” and eventually added practical strategies to encourage students to adopt and practice a growth mindset.

This chapter will review findings related to each of the four research questions:

1. According to student perceptions and student success data, what are the effects of six brief growth mindset interventions on students’ mindsets?
2. In what ways, if any, do students report a transfer of growth mindset practices beyond the intervention course?
3. How does a series of growth mindset interventions change faculty perceptions about instructional practices?
4. Based on student and faculty feedback, how can we improve the series of growth mindset interventions?

In the first two sections of the chapter, I summarize findings from student reflections and pre/post surveys to address the first and second research questions. The third section reviews findings from focus groups with faculty before and after the intervention, as well as their individual interviews and written reflections in order to address the third research question. In keeping with the fourth research question, the final section of the chapter outlines suggestions for improvements to the intervention.

In the nine intervention classes, 208 students completed the pre-intervention survey, and 165 (79.3%) of those also completed the post-intervention survey. To make data analysis more manageable, I created a subsample of 80 students by identifying participants who had completed all six intervention sessions. Then, drawing from this list, I randomly selected ten students from each class and examined these students’ responses to the open-ended survey questions. For

reflections written during the interventions, results are reported based on this group of 80 students. For survey responses, results are reported on the 165 students from the intervention group as well as the 158 from the comparison group who completed both the pre- and post-intervention surveys. Finally, faculty reports and campus data are used to report course outcomes. As discussed in Chapter 3, faculty at Foundation College had previously been exposed to the idea of a growth mindset. All six FC comparison faculty were already familiar or very familiar with the concept. Since many of the Foundation College comparison faculty presented growth mindset elements, including some of the specific intervention activities, there was not an effective comparison group, despite the study design. Therefore, the statistical analysis comparing the intervention and comparison students considers only Colonial College student data.

To ensure anonymity, I identify students only by a class letter and roster number. For example, Student A2 was enrolled in class A and listed second on the roster. I also include a code to indicate the source of each quotation. For example, “I6Q2” indicates that the response was written during the sixth intervention, in response to question 2.

Research Question 1: Effect on Students’ Mindsets

In this section, I first present quantitative findings related to students’ beliefs. I then summarize the related themes from their reflective comments. Within this section I also describe the changes that students anticipated and reported in their behavior. These are the concrete manifestations of their belief systems, and therefore the two go hand in hand.

Quantitative Measures of Changes in Student Beliefs

Before turning to students’ own words, it is useful to explore the quantitative survey data, which reveal differences between students’ responses before the intervention and following it. Specifically, I performed comparative analyses to assess the influence of the interventions on the

three-question Dweck growth mindset measure to test the hypothesis that participants in the intervention would have a higher composite score post-intervention, controlling for the pre-test.

According to the student survey prior to the intervention, the majority of students from both the intervention and control groups started with a growth mindset. Of the 422 students who completed the growth mindset questions, only 55 (13%) scored as “fixed” (with a score of three or lower). Even fewer (38 or 9%) scored as mixed (between three and four), while 329 students (78%) scored as growth mindset (between four and six). (See Table 4.1.)

Table 4.1

Students’ Pre-Intervention Mindsets by Intervention Placement

Category	Number	Percent
Comparison Group (n=205)		
Fixed	23	11.2%
Mixed	22	10.7%
Growth	160	78%
Intervention Group (n=217)		
Fixed	32	14.7%
Mixed	16	7.4%
Growth	169	77.9%
Overall Sample (n = 422)		
Fixed	55	13%
Mixed	38	9%
Growth	329	78%

Although the students started with a high average score on the Dweck growth mindset measurement tool, the sessions nevertheless increased the number of students who reported a growth mindset and strengthened their view of growth mindset. After the activities in the first session, almost all students in the sample group (94%) said that intelligence grows. Only one reported a mixed mindset, and two said fixed (I1Q4).

An Analysis of Covariance (ANCOVA) revealed that the interventions had a statistically significant effect on the post-intervention Dweck composite score after controlling for the pre-

test ($F(1,106) = 6.06, p = .015$) (Table 4.2). Pairwise comparison showed that participating in the intervention significantly increased post-intervention growth mindset among students (.473 se .192 $p = .015$, 95% CI .855, .92). While the pre-growth mindset score accounted for 31.7% of the variance, the intervention accounted for 5.4% of the variance in the post growth mindset score (Table 4.2).

Table 4.2

ANCOVA Results and Descriptive Statistics For Students' Post-Intervention Growth Mindset by Intervention Placement and Pre-Growth Mindset

Intervention Placement	Post-Intervention Growth Mindset			
	Observed Mean	Adjusted Mean	SD	n
Comparison	4.86	4.74	1.02	47
Intervention	5.12	5.21	1.30	62
Source	SS	df	MS	F
Pre-Intervention Growth Mindset	47.62	1	47.62	49.30*
Intervention Placement	5.85	1	5.85	6.06*
Error	102.38	106	.966	

Note. $R^2 = .326$, Adj $R^2 = .313$

Note. When controlling for the pre-test, there were no statistically significant findings for gender ($p = .658$), race/ethnicity ($p = .550$), or semesters completed ($p = .203$).

* $p < .05$

Students also indicated agreement with 10 other growth mindset questions using a 6-point Likert-type scale (1=Strongly Disagree to 6=Strongly Agree). Two factors were identified through exploratory factor analysis, and comparative analysis was used to test the hypothesis that intervention participants would increase more on the intelligent practice factor (Cronbach alpha .774) and decrease on the fixed mindset factor (Cronbach alpha .708). Using an ANCOVA, there was not a statistically significant effect of the interventions on either the fixed mindset factor ($p = .494$) or the intelligent practice factor ($p = .099$), when controlling for the pre-test (Appendix S).

Further, students used the same 6-point Likert-type scale (1=Strongly Disagree to 6=Strongly Agree) to express agreement with the statement “I expect to pass this course.” Using an ANCOVA,

there was not a statistically significant effect of the interventions on this question ($p = .316$), when controlling for the pre-test (Appendix T).

I used correlation to measure the relationship between the pre and post growth mindset measures as well as the relationship to the students' expect to pass response. The pre- and post growth mindset scores were correlated, $r(107) = .536, p < .01$. (2-tailed). On the other hand, the correlation between the pre-growth mindset score and the "expect to pass" the class score was not significant ($p = .216$). Further, the post growth mindset score was only weakly correlated with the "expect to pass" score, $r(118) = .190, p < .05$. (2-tailed).

Student Reflections on Mindset Changes

Students who participated in the growth mindset intervention reported changes (sometimes drastic changes) to their mindsets, behaviors, and responses to challenge. As one student explained:

With practice, I completely changed my mindset. For instance, I used to procrastinate to the last minute doing homework or to study, but now I have a tendency to do everything on time or ahead so I will be able to do other things besides frustrate myself (I6Q2 G20). He also reported transferring his new mindset to other classes and his future plans. During the final session, he wrote about using growth mindset in the future:

I am choosing classes that I am motivated about and classes I need to transfer. Plus, these new practices I acquired keep me motivated to prosper to get my degree no matter the struggle I face. These practices keep me moving ahead to grow and become better than before (I6Q2 G20).

While this student found personal motivation, others saw more general potential in the intervention to motivate struggling students. For instance, another student explained that the series of interventions "helps by showing knowledge can be grown like roots of a plant. In other

words, by seeing that it can grow, it can motivate people who have very low confidence in learning” (I6Q1 D29). In this section I will explore these changes in thinking in greater detail.

Students’ perceived mindset changes. At the end of the project, most sample group students reported that they had changed their mindsets. For example, one student explained, “I now use intelligent practice and feel I have changed from a fixed mindset to a growth mindset” (I6Q2 B23). Overall, a strong majority of students (86%) described changes, while only ten students said the discussions had not had an effect (Table 4.3). Therefore, most students agreed with the student who explained, “My opinion of growth mindset has changed significantly in a positive way. Finding alternate strategies in order to learn overall helped me grow and become a better person” (I6Q2 E21).

Table 4.3

Student Perceptions of Whether Discussions Changed Mindset (n=80)

Category	Number	Percent
Described Changes	69	86%
Did Not Change	10	12.5%
No Response	1	1.25%

Note. Findings based on question: “In our discussions, we have focused on how your brain grows including the behaviors you use, which we called intelligent practice. Considering those ideas, how have our discussions changed your mindset?” (I6Q2).

Four main themes emerged when students described how the discussions shaped their view of mindset: (a) believing in growth mindset; (b) having a new approach to challenge; (c) emphasizing intelligent practice; and (d) adopting a new approach to learning (Table 4.4).

Table 4.4

How Intervention Changed Students' Mindset (n=80)

Category	Number	Percent
Belief in Growth Mindset	21	26.0%
Challenge	19	23.75%
Intelligent Practice	18	22.5%
New Approach	16	20.0%
Already Growth Mindset	3	3.75%
No Change	2	2.5%
Fixed	1	1.25%

Note. Findings based on question: “In our discussions, we have focused on how your brain grows including the behaviors you use, which we called intelligent practice. Considering those ideas, how have our discussions changed your mindset?” (I6Q2).

Roughly one fourth of students (26%) described a new belief in growth mindset. For instance, one student explained that the discussions “have changed my mindset by opening my eyes and giving me the realization that before, my thoughts or ideas weren’t very strong, and I wasn’t going at my full potential. Now I do more effort to have a growth mindset” (I6Q2 E25). Another student described how the intervention taught him “that the way you think is not permanent. You can always change it and become better. It made me realize that failure is okay. I just need to try harder” (I6Q2 C20).

Almost as many students (22.5%) described how they adopted intelligent practice; several identified the concept explicitly. For example, one student explained, “These discussions have changed my mindset on the way I learn and with the use of intelligent practice strengthen neural pathways” (I6Q2 I20). As will be discussed later in the chapter in more detail, others applied the concept with positive results:

It has changed my mindset by knowing that I can learn how to do anything. For example, I thought that math was one of my weaknesses as a student, but when I apply intelligent practice, I noticed I was able to do it as long as I practice (I6Q2 I10).

For some, combining growth mindset and practice made anything seem possible. As one student put it, “I learned to always have a growth mindset instead of a fixed mindset,” adding “I learned that with practice I can achieve everything, even if I thought I was bad at it” (I6Q2 G26).

For about one in five students (20%), the sessions created a new approach to learning. One explained, “It’s given me a new way to pursue certain situations” (I6Q2 G22). Another described a conscious struggle to apply growth mindset:

I can now catch myself going back to a fixed mindset. I am able to consciously notice it, catch it, and revert my thinking to a growth mindset. I am also focusing more on the ability to grow my brain instead of thinking negatively toward a subject (I6Q2 E7).

About one fourth of the students (23.75%) described new responses to challenges. One described how the “discussions have changed my mindset.” It helped him “strengthen my work ethic” and “seek any additional external assistance I may need.” This new approach helped him deal with challenges: “This therefore allowed me to comfortably reach out towards others in times of academic confusion” (I6Q2 G10).

Many participants became increasingly comfortable seeking help from others, and all but one embraced changes after learning about neural plasticity. In the final session, the students were asked, “How does the way the brain makes new connections (neural plasticity) help you think about how you learn?” One student responded, “I don’t know” (I6Q1 B23), but the remaining students all described changes (Table 4.5).

Table 4.5

How Neural Plasticity Helped Students Think About Learning (n=80)

Category	Number	Percent
Can Learn	32	40%
Practice	27	34%
New Process	20	25%
Unsure	1	1.25%

Note. Findings based on question: “How does the way the brain makes new connections (neural plasticity) help you think about how you learn?” (I6Q1).

For 40% of the students, learning how neurons grow encouraged a belief in their ability to learn. As one student put it, “Neural plasticity helps my mind perceive that there is always room for improvements. I might not know certain things as of now, but as my brain grows, I can learn new knowledge and skills in the future” (I6Q1 G5). For about one third of students (34%), lessons on building neural connections encouraged repetition and practice. Often, these students used the language of neural plasticity and intelligent practice: “It creates dendrites on our brains, and while we learn, those dendrites combine and become stronger over time. Our brain creates new connections over time when we do intelligent practice” (I6Q1 E18).

In another popular theme, one fourth of students (25%) revealed adopting a new process after learning about neuroplasticity. One student explained, “It gives me more knowledge on how you can learn. It shows that when you learn something new, new connections form and they become stronger” (I6Q1 C20), explicitly linking her new view of learning and the new connections. Even for students who did not change their view of mindset, learning about neural plasticity did change their view of how we learn.

It is perhaps not surprising that, when asked the “most interesting thing they learned” in the first session, 74% (59 of 80 students) specifically discussed neuroplasticity (I1Q5) (Table 4.6). Many explicitly referred to the intervention activities: “Intelligence is able to grow based

on the videos and knowing that the brain can be treated as a muscle” (I1Q4 E7). One student wrote, “Neuroplasticity, because when we learn, our brain physically changes. As we are learning about this, our minds are making pathways to make connections” (I1Q5 A3). Many students explicitly connected creating new neural pathways and the potential to learn. Another student highlighted, for example, “how neurons grow, because I feel like now that I know how they grow, and how they connect, that I can make my brain stronger and learn as many new things as I want” (I1Q5 F7).

Table 4.6

Most Interesting Thing Students Learned in Session 1 (n=80)

Category	Number	Percent
Neuroplasticity	59	73.75%
Brain	10	12.5%
Learning	4	5%
Neural Decay	4	5%
Other	3	3.75%

Note. Findings based on question: “The most interesting thing I learned in this discussion was _____” (I1Q5).

While most students identified growing neural pathways as the most interesting thing they had learned, several (5%) focused on neural decay, or the deterioration of unused neural pathways, as with a foreign language you no longer practice. For example, one student was interested in “brain decay, because learning about it makes me aware of it and I will try to do something to stop it or prevent it” (I1Q5 I24). Indeed, throughout the semester, this student reported using growth mindset and intelligent practice. For example, she wrote, “I have practiced growth mindset by first understanding that I am capable of doing what others might already be good at.” She identified her intelligent practices, adding, “I used tutoring and help

from peers and teacher to help me become better at something that I had said was not meant for me to understand—English. Everything I do makes me smarter” (I5Q2 I24). After our discussions, she expressed a new approach to challenges:

When I face a challenge in school, my response was frustration and giving up. My response has changed due to the learning discussions we had. Now I realized that I can ask for help and have a strategy to overcome my challenge. I don’t compare myself to others thinking that I just wasn’t good enough (I5Q1 I24).

Finally, she highlighted her new behavior and attitude: “I have used the information in a positive way to use intelligent practice and make smart decisions. It changed me a lot” (I6Q2 I24).

Behavioral changes such as these are the focus of the next section in the chapter.

Behavioral Changes

Most of the students in the study planned to change their behavior following the intervention. The final question after the first session asked students what one thing they would do differently, considering what they had just learned. Most (58.75%, or 47 of 80 students) described specific study strategies, or an emphasis on repetition and practice (Table 4.7).

Table 4.7

One Thing Students Would Do Differently Following the Intervention (n=80)

Category	Number	Percent
Study/Practice	47	58.75%
Learning	28	35.0%
No change	5	6.25%
No response	7	8.75%

Note. Findings based on question: “One thing I will do differently after this discussion is _____ because _____” (I1 Q8).

For some students, the focus on practicing was clearly related to neural plasticity. For instance, one student planned to “Actually practice what I’m learning, because I want the neurons to build into branches” (I1Q8 C2). Another combined growth mindset with repetition, and planned to “keep repeating a task because when I don’t get a task or subject right away, I don’t give myself time to learn it. I just end up getting frustrated and giving up” (I1Q8 I28).

More than one third (35%) of students focused on learning in general, such as the one who planned to “try connecting education to life outside of school, because that would make my neurons connect with each other, making my intelligence increase” (I1Q8 E11). Students often focused on how to build new neural pathways. For some who focused on learning in general, the major difference was in their attitude and their confidence. For example, after the discussion on creating neural pathways, one student vowed to “stop comparing myself to others, because seeing the success of others sometimes makes me feel dumb, but now I understand that they learned how, accomplishing the task a long time ago. I’m new to it” (I1Q8 A2).

The quantitative data on reported changes in student behavior were mixed. For example, on the post-intervention survey, a majority of intervention group respondents (51.5%) either agreed or strongly agreed that following the growth mindset sessions they used study strategies that they had not used before. Similarly, more than half (53.9%) also agreed or strongly agreed that they used study strategies more frequently. Many participants also agreed or strongly agreed that they used campus resources they had not used before (42.4%) or that they used campus resources more frequently following the intervention (33.3%). These self-reported measures indicate that most students adopted new study strategies and they used these strategies more frequently. However, there were more mixed results on trying new campus resources and using

the resources more often. (Within- and between-group comparisons are not possible because only intervention participants responded, and only after the intervention.)

Using comparative analysis to test the hypothesis that intervention participants would use resources more frequently did not reveal statistically significant results ($p = .117 - .937$), controlling for the pre-test in an Analysis of Covariance. Similarly, using an Analysis of Covariance to test the hypothesis that intervention participants would consider resources more useful did not reveal statistically significant results ($p = .169 - .817$) (Appendix U).

In contrast, however, most students who participated in the intervention sample group reported changing their behavior following the series of sessions. For instance, in the student sample group a strong majority of students (90%) reported using strategies to learn a new concept as a result of the discussions (Table 4.8). The pattern of responses followed the basic elements of intelligent practice. Specifically, many students described asking for help, while some emphasized practice and others focused on adding additional time to their efforts.

Table 4.8

Learning Strategies as a Result of Intervention (n=80)

Category	Number	Percent
Ask for Help	33	41.25%
Practice	26	32.5%
Additional Time	8	10%
No Change	8	10%
Challenge	5	6.25%

Note. Findings based on question: “As a result of our learning discussions, what strategies have you used to learn a new concept in school (write a paper, prepare for a test, complete an assignment)?” (I6Q3).

Asking others for help was the most common strategy, mentioned by 41.25% of participants. One student described her efforts “to get help from others” as “very important.” As

she explained, “I would usually just close myself and say I am not good at it, but now I get help to understand the given task and I practice and practice to keep improving” (I6Q3 I10). About one third of students (32.5%) identified intelligent practice, or even specific practices, as the key to their success. For example, one student described using “mind mapping,” which students practiced in the third session. She continued: “I didn’t realize that I was using mind mapping until I completed the assignment and with it, I got a 95% on my assignment” (I6Q3 E25). Some students (10%) added additional time, and several noted this created positive results. One student, for example, wrote that the discussions had “especially helped me prepare for a test because my first math test I did horrible, but for my second test I didn’t give up and I studied more and I got an A!” (I6Q3 D20). One of her classmates combined several strategies:

I have used different strategies such as making a study group to study for a math test. I have also been to the Writing Center to work on my essay and to get help from people.

My grades have definitely improved by changing some of my study strategies (I6Q3 D1). This student improved by combining multiple strategies in multiple disciplines. In fact, she described using campus resources, which was one of the elements in the student survey. Other students focused on their new attitude towards learning in general. For instance, one wrote, “The fact that you guys have enlightened me about the human brain has motivated me to continue using the strategies which work best for me” (I6Q3 A4).

Adopting Strategies to Improve Future Learning

Almost all of students (88%) identified strategies they would use to improve their learning in the future (Table 4.9). Some combined several approaches. For example, one student explained:

I could ask tutors for help or use other resources. I could also procrastinate less so I have time to practice a certain skill and do better. Another thing I could do is be positive and tell myself I could accomplish [it] instead of having a fixed mindset (I6Q5 G26).

Often, students talked about spending more time on learning. One in ten (11.25%) focused on time, and another 6.25% mentioned adding time along with other approaches. For instance, with a “focus on having a better growth mindset,” a female student “plan[ned] to seek extra help to improve my learning in the future. Making more time will also be an additional strategy to learn more” (I6Q5 E2).

Table 4.9

Additional Strategies Students Planned to Use in the Future (n=80)

Category	Number	Percent
Intelligent Practice	36	45%
Study/Effort	15	18.75%
Time	9	11.25%
Resource	5	6.25%
Challenge	5	6.25%
No change	7	9%
No response	3	3.75%

Note. Findings based on question: “What additional strategies can you use to improve your learning in the future?” (I6Q5).

Almost half of students’ responses (45%) focused on intelligent practice explicitly.

Many of these students also emphasized how they could respond to challenges. For example, one female student wrote, “I can use the strategy of effort + good strategies + help from others. That way I don’t feel like giving up so easily. I can also use the challenge as a learning

opportunity. To know what I am capable of” (I6Q5 A17). Another student reviewed memory strategies and recalled the importance of learning from challenges:

I should review information more actively, deliberately and in multiple ways so I can make a retrievable memory. I should be more open to challenges and see it as a better opportunity to become more intelligent. I need to be more open about discussing school related assignments so I can learn more (I6Q5 G21).

The discussions encouraged another student to “Have a positive outlook on all aspects. I can achieve better, if I apply myself. Try a little harder, to be a little better (not perfect)” (I6Q5 B18).

Faculty Perceptions of Student Changes

Although the focus of the first research question is on students’ self-reported data, it is also helpful to incorporate faculty observations of how students changed. Indeed, all nine of the faculty who delivered the growth mindset sessions in their classrooms reported changes in student attitudes or behaviors as a result of the intervention. All but two reported that students used growth mindset outside of the intervention sessions, in class discussions, conferences, and even writing assignments. For example, Faculty E considered the interventions “valuable and effective” after observing students “progress over the course of the semester.” He wrote that “students often adopted some of the language from the growth mindset sessions in the conversations during group activities or with me, and they also used some of the terminology in their writing, when they weren’t even prompted to do so” (Post-Intervention Online Survey).

In fact, five of the six faculty who responded to the Post-Intervention Online Survey agreed, and four of the six highlighted not just the students’ motivation, but also the strategies or “what they should do.” For example, another faculty member wrote, “students are already aware

that hard work is crucial to their success, but it was important for them to see that ‘hard work’ and ‘motivation’ is not enough.” He went on to highlight the importance of strategies:

Once students learned various strategies that combine hard work and motivation with other factors, they really saw and understood that hard work went beyond just saying that they work hard...and it made them more inclined to “do” rather than talk about hard work (Faculty B).

In a focus group, Faculty E underscored the importance of “strategy.” Before the interventions, he found students generally “get growth mindset.” They recognized that “if you work hard enough you will get it, but that strategy of the working hard is what I think means the most.” He believed that the concept of “strategy” from the interventions was what “students have grasped on to,” and they now recognized it as “necessary or integral to growth mindset.” In fact, all nine intervention faculty members considered the strategies crucial to the growth mindset interventions, because an emphasis on strategies made it more than just optimism.

Faculty B described the sessions as demonstrating a “fundamental shift” in how students “performed” and “felt” about learning. During a focus group he explained:

The whole idea here is that if we can...show our students that they can actually grow their brains, that that fundamental shift in how they think about their thinking can actually impact the way they perform in class, the way they *feel* about their education. So what we have been doing is this process of demonstrating how you do that just to get them to actually see, “Ahh, here is what happening in my brain, and I can translate this into other parts of my life” (his emphasis).

Four of the faculty members talked specifically about the importance of the research and scientific language in the intervention, saying this is what empowered students. In an interview,

Faculty G said she had “always known” that students could “improve and add to their intelligence,” but she lacked the “scientific language” to explain it to them. Further, she recognized that her “students have shown vast improvement,” in part “because we have incorporated the growth mindset program,” which has been “constantly reinforcing the idea of learning and about your brain and about your own capabilities.” As a result, she felt “it is reflecting in their grades. It is reflecting in their attitudes,” adding, “collectively they are a lot more proactive.” In the final focus group, she again emphasized the scientific language, calling it a “more scientific look at how knowledge and learning is not static. That it is an elastic endeavor. It is a way to get them to be optimistic about education.”

Similarly, Faculty H noticed that the brain language “was working” for his students. In both the interview and the focus group, he reported that his students “allude to growth mindset.” In his “classroom, the students were using it more.” Even though he “really wasn’t using the language, they would just throw it back at me” (Focus Group). For him, when students used the neuroplasticity language, with statements such as “My branches are extending,” that showed “them *believing* that the brain is growing” (Faculty H, Interview, his emphasis).

Student Course Completion and Success Data

According to the campus researcher, at Colonial College the intervention course completion rate was 95.73% (112) and the course success rate was 90.60% (106) (n=117). While these results are high, they are similar to the comparison results, where the course completion rate was 96.20% (76) and the course success rate was 87.34% (69) (n=79). In both the intervention and comparison courses almost all students completed and succeeded (Table 4.10). The intervention classes only lost five students and the comparison classes only lost three. These results differ from the results of the other English 60 courses on campus that semester, which had a completion rate of 85.68% (712) and a success rate of 71.12% (591) (n = 831). In

the non-study sections, 119 students did not complete the course and 240 did not earn credit.

Over the previous three fall semesters, the campus retention rate for English 60 ranged between 88.19% and 83.05%, while the success rate reached a high point of 79.86% and a low of 68.84%.

Table 4.10

Colonial College Course Completion and Success Data for Intervention, Comparison and Campus Courses

Category	N	Course Completion		Course Success	
		Number	Percent	Number	Percent
Intervention	117	112	95.73	106	90.60
Comparison	79	76	96.20	69	87.34
Campus	831	712	85.68	591	71.12

A chi-square test of independence was performed to examine the relation between the growth mindset categories (fixed, mixed, growth) and course completion. The relation between these variables was significant, $X^2(2, N = 120) = 8.71, p = .013$. Students with a fixed mindset were slightly more likely to complete the course. On the other hand, a similar test for course success no relationship was found between mindset category and course success, $X^2(2, N = 120) = 2.17, p = .338$. Very few students did not pass the course, and seven of the eight fixed mindset students did pass. However, there were very few students in either the fixed ($n = 8$) or mixed ($n = 6$) categories, and the results in both tests noted that these categories were below the expected minimum count.

In sum, most student participants reported changing their mindset and behavior. Students highlighted the value of learning about neural plasticity when explaining why they adopted many of the intelligent practices described in the sessions. At several points in the intervention, students described adding additional time and effort, seeking help from others and adopting new learning strategies. The post survey results also indicated that students scored higher on the

growth mindset measure, controlling of the pre-test and adopted new study strategies.

Furthermore, all nine faculty observed changes in student attitudes and behavior. All faculty also highlighted that value combining practical “strategies” with the growth mindset concept. Like the students, many (4) faculty also emphasized the role of the “scientific language” in changing student performance. The intervention courses had high completion and success rates, but not significantly different than the comparison courses.

Research Question 2: Student Transfer of Growth Mindset Practices

Most students transferred growth mindset beyond the intervention course, frequently to mathematics. They used intelligent practices in other classes and outside of school. Further, many students adopted new responses to challenges. For example, after adopting “a growth mindset” one student described “using intelligent practice in her daily routine,” adding “my mindset used to be a lot of the fixed mindset. I changed my way of thinking by taking risks and seeing new opportunities for a new life” (I6Q2 E18). For this student, and for many others, adopting a growth mindset and applying intelligent practice opened up new possibilities, both in school and in other areas of their life.

Transfer of Practices During the Intervention

During the third session, all 80 of the subsample students identified a specific example of applying intelligent practice. Although they were not prompted to refer to something in a discipline other than English, 86% did so. Similarly, reviewing all responses from session three, including the entire sample group, 79% (143/180) applied intelligent practice to an area other than English (Table 4.11). After only three growth mindset sessions, math was the most frequent response. In the subsample group, 29% (23/80) identified math; across all intervention responses, 24% (44/180) applied intelligent practice in math. By comparison, only 14% (11/80) of the subsample identified applications in English, and only 19% (34/180) of students across all

responses did so. The English figures resemble the responses for applications in sports or hobbies (13% and 19%, respectively). Students also transferred intelligent practice to other classes, with 39% (31/80) of the subsample and 25% (45/180) of the total responses indicating applications in classes other than math or English.

Table 4.11

Applications of Intelligent Practice After Third Session

Applied Intelligent Practice	Intervention Subsample (n=80)		All Intervention Students (n=180)	
Math	23	29%	44	24%
English	11	14%	34	19%
All Other Classes	31	39%	45	25%
Sports/Hobbies	10	13%	35	19%
General Non-Academic	5	5%	19	11%
None	0	0%	3	2%

Note. Findings based on question: “Thinking about intelligent practice (EFFORT + GOOD STRATEGIES + HELP FROM OTHERS), please describe one specific example where you used intelligent practice since our last discussion” (I3Q1).

It is surprising that so many students transferred these practices to math, since the interventions took place in English. Student E27, like many of her peers, achieved persistence and even success, as she explained, “I did some extra math problems, and I also asked for help. I didn’t give up and finally got the work” (I3Q1). Her classmate also tested intelligent practice:

I figured if the brain is a muscle then me being “bad at math” was false. I wanted to test this and also test myself. After that test, I don’t believe I am bad at math, I just never learned or tried to learn appropriate strategies to learn a subject I am not confident in (I3Q4 E7).

Other students focused on seeking resources. Some admitted they “did not know half of the places were on campus” (I3Q4 F10). Most students reported that the learning discussions

changed how they used campus resources. For example, one student explained that he changed “because I was struggling in my work, but then I remembered our class discussion. So, I went to seek help in the library” (I3Q4 D17). A majority of the subsample group (51.25%, 41/80) reported that our learning discussions had influenced their decisions to use campus resources; among all intervention respondents, the percentage was even higher (63%, 129/207) (Table 4.12).

Table 4.12

Did Sessions Influence Campus Resource Use?

Category	Intervention Subsample (n=80)		All Intervention Students (n=207)	
Yes	41	51.25%	129	63%
No	27	33.75%	56	27%
No Response	12	15%	22	11%

Note. Findings based on question: “If you have used any of the campus resources, did any of our learning discussions influence your decision? YES NO (Circle One). Why or Why not?” (I3Q4).

For some, seeking help required a change in attitude. One student explained that the sessions “made me realize some people already know how to do things and some don’t, so it made me push away my pride and ask for help, rather than being stubborn and being stuck in the same spot as before” (I3Q4 E25). Several students cited neuroplasticity language as their inspiration: “It helped by encouraging me to strengthen my neural pathways and practice new things I’ve been learning” (I3Q4 I20). Another practical student explained, “If I am offered these free resources that could help my skills grow, then use them. The worst that can happen is that you learn something new” (I3Q4 B18). After three sessions, students were applying the concepts and strategies beyond the intervention class, and seeking resources as a result of the discussion.

Transfer of Practices at Completion of the Intervention

During the final session, a very strong majority reported applying the strategies beyond the intervention class, both in the subsample group (87.5%) and across all intervention responses (86%) (Table 4.13).

Table 4.13

Transfer of Strategies Beyond Intervention Class

Category	Intervention Subsample (n=80)		All Intervention Students (n=159)	
Yes	70	87.5%	137	86%
No	8	10%	22	14%
No Response	2	2.5 %	0	0%

Note. Findings based on question: Have you used any of these strategies in other classes or outside of school? (Circle one) YES NO (I6Q4).

In fact, as a result of the learning discussions, students often identified the three elements of intelligent practice as well as an approach to learning from feedback and error:

When I really need help on something, I will ask a colleague or the teacher for help.

When I complete something, I look over it to make sure I understand it. When I write a paper, I sometimes like discussing with a peer about it. I went in during office hours for reviewing questions wrong from a math test (I6Q3 G21).

Like this student, most students applied growth mindset in other areas. The survey following the intervention asked if students had used growth mindset in other areas within the last two weeks. In four out of the six categories, at least 60% had used growth mindset at least once (Table 4.14).

Table 4.14

Students' Reported Use of Growth Mindset in the Last Two Weeks

Category	At Least Once		Did Not Use	
	Number	Percent	Number	Percent
This Course (n=164)	149	90.9%	15	9.1%
Another Course (n=163)	140	85.9%	23	14.1%
Work (n=160)	96	60.0%	64	40.0%
Sports (n=160)	69	43.1%	91	56.9%
Hobby (n=161)	98	60.9%	63	39.1%
Other (n=140)	18	12.9%	122	87.1%

Nine out of ten students (90.9%) had used growth mindset in the intervention course, and almost as many (85.9%) had transferred growth mindset to another course. Moreover, in the previous two weeks, 59.5% of the respondents said they had used growth mindset in another course three or more times (Table 4.15).

Table 4.15

Frequency of Use of Growth Mindset in Another Course in the Last Two Weeks

Range	Number	Percent
0	23	14.1%
1 or 2	43	26.4%
3 or 4	54	33.1%
5 or 6	27	16.6%
7 or more	16	9.8%

In sum, by the conclusion of the intervention, a strong majority of students transferred growth mindset to other course work, and most had done so several times in the previous few weeks. All but 19 of 164 respondents (12%) had transferred growth mindset to another area at least once.

Students' Responses to Challenge

For many, transferring growth mindset also meant adopting new responses to challenge. For instance, one student reported accepting challenges "more frequently in order to increase my

neural plasticity, rather than giving up, especially in my more difficult courses” (I6Q2 G10).

Another concluded, “The discussions we have had over Intelligent Practice have been very successful in my point of view. Every time that I encounter an obstacle I try to use Intelligent Practice, and so far it has been working” (I6Q2 A25).

When asked during the fifth session, almost half (49%) of the subsample group responded that the learning discussions had changed their response to challenge, while somewhat fewer (39%) responded that they had not changed their response to challenge (Table 4.16).

Table 4.16

Effect of Learning Discussions on Response to Challenge (n=80)

Category	Number	Percent
Changed Response	39	49%
Did Not Change Response	31	39%
Unclear	10	13%

Note. Findings based on question: “When you face a challenge in school, how do you respond? Based on these learning discussions, has your response changed? If so, how? If not, why not?” (I5Q1).

Many of the students delineated specific changes. For example, one wrote:

When I’m faced with a challenge, I usually seek help from others, like friends or classmates. If I can’t get it from any, then I ask the teacher. Yes, my response has changed. I now ask more questions when I don’t understand something and I try to have a positive mindset when I am faced with challenges (I5Q1 E2).

This student adopted what she called a “positive mindset,” as well as help-seeking behaviors.

Many of her peers also emphasized the benefits of intelligent practice. For instance, another student wrote, “Normally, I would look for the easiest solution to the problem, but not anymore.

I use intelligent practice strategies a lot more and have noticed what a much better student it has made me” (15Q1 A26).

When faced with a challenge in school, another young woman had previously simply studied for longer periods of time, but her behavior had since changed: “My response has changed, since I now find different ways of studying & seek help from others instead of just studying longer” (15Q1 E12). Later, her final reflection captured her new mindset and approach to challenge: “My mindset has gone from a more fixed mindset to a beginner’s growth mindset. I’m trying to embrace challenges more” (I6Q2 E12).

For many other students, practicing growth mindset meant embracing challenge as a learning opportunity. For example, one explained, “I see that challenges are a chance to learn and get better. If something doesn’t work, I will seek help” (I5Q2 D22). Another student, who struggled even after visiting his math professor and a tutor, and joining a study group, saw his struggle as a chance to improve:

Although I still struggle with the concept, I know that w/ good effort and strategies & help from others I can grasp concepts. The discussions have taught me to continue to struggle. Just because I struggle doesn’t mean I am not good at it, it simply means I need to work harder and change my strategies (I5Q2 E7).

His female classmate set aside time to “do the [homework], and review, then take notes” for her more challenging classes, and to “connect it to past experiences, that way it is easier to create neural pathways” (I5Q2 E11). Like many of her peers, she began to approach challenge with intentional strategies based on the concept of neural plasticity.

Following the intervention, many students intentionally adopted a new response to feedback and grades. Throughout the series of reflections, 19 subsample students (23.74%)

described seeking out and learning from criticism, or viewing failure as a learning experience. For example, one student described new strategies that included “extra time to study for tests” and using other “people’s opinions on my work to build on their criticism” (I6Q3 I15). The discussions caused another student to “view any of my failures as a learning experience to improve” (I6Q2 C7). Her classmate described revision as “extremely stressful” and “before I learned of Growth Mindset,” she explained, “I would have given up.” However, now she “took those comments and instead of harsh criticism, I turned them into learning steps. It really helped me get my essay done and not play the victim” (I5Q2 C6). For a third classmate, learning intelligent practice and neural plasticity “made me see that everything is a learning experience, even failure” (I6Q2 C13). Interestingly, all ten subsample students from class C described this feedback-as learning-approach. No other class had more than two students who made comments that fell into this category.

Students in class C adopted a new approach to learning, recognizing challenge, and even “failure,” as an essential part of the learning process, which they apply beyond the intervention course. One student finished the first session most interested in “how neurons are strengthened by learning, because it helps me understand why the brain grows from challenge,” and he left ready to “embrace challenge because it grows the brain” (I1Q5 C1). As the intervention progressed, he continued “to embrace the challenge and learn from it” because he saw challenges “as a sort of puzzle to be overcome or solved. My response has changed in that I didn’t use to embrace them the way I do now that I have learned about growth mindset” (I5Q1 C1). As a result, when faced with a challenge now, he has “learned to stick with it and figure it out, and from this, I learn much more than I would have otherwise” (I5Q2 C1). After learning that his “brain is changing (plastic),” he is now “more proactive in [his] learning strategies” (I6Q1 C1).

Further, he said that he “understand[s] that failure, criticism and challenge is all part of learning and growth” (I6Q2 C1). Thus, learning about neural plasticity helped this student embrace challenge and rethink failure.

Similarly, learning about brain research and practical strategies in the intervention helped the faculty member who was teaching Class C further embrace a growth mindset and rethink her teaching. Previously, she said that many of her students had “a somewhat fuzzy understanding of the growth mindset,” thinking it was only “a positive attitude (and thus missing out on the brain part of the picture),” or a “magic pill that will quickly (easily) make them great students.” Thus, they were missing the strategies and effort. During the intervention, this faculty member observed changes in herself and in her students. Since our interventions “focused on the brain research,” she now had “a lot more faith” in growth mindset when she faced her own challenges during the semester. The growth mindset intervention, she explained, “affects students, but it could really affect every aspect of your life, not just learning in the classroom” (Faculty C, Interview). Reflecting on the changes in her students and in her self, she concluded:

The interesting thing about the growth mindset concepts is that they’re not presenting anything revolutionary. We all know that we should persist instead of giving up, use smart strategies, seek help, etc. However, these concepts—when presented within the growth mindset framework—suddenly become powerful in that they can actually bring about real change (Faculty C, Post-Intervention Online Survey).

Even though this professor had taught growth mindset before, the experience was transformative for her, and this begins to address the third research question.

Research Question 3: Changes in Faculty Perceptions

Prior to the study, some faculty participants were already teaching growth mindset, while others had not heard of it before. After the “scientific grounding” of the intervention, all nine

faculty participants changed their instructional practices and planned to integrate growth mindset as a fundamental part of their teaching. As described above, they observed changes in their students. They also changed their personal views, professional practices, and views of students. In short, participation energized faculty, changing how they integrated growth mindset as a fundamental aspect of their instructional practices, including how they created assignments, interacted with students, and assigned grades.

In this section I trace how faculty perceptions and behaviors changed, and how they planned to apply and embed growth mindset practices in the future. After a review of faculty views of intelligence, I will present two faculty case studies and then consider the changes reported by the nine intervention faculty participants.

Faculty Views of Growth Mindset and Intelligence

As described in more detail in the previous chapter, the 18 faculty participants were evenly divided by gender (9 men, 9 women) (Refer to Table 3.1 for details). The intervention group had four women and five men, while the control group had five women and four men. CC faculty participants had fewer years of teaching experience. CC intervention faculty had been teaching for between one and 19 years, and the control group range was between two and 17 years. For FC intervention faculty, the range of experience was between eight and 27 years, and the control group range on that campus was between five and 26 years.

As discussed in Chapter 3, based on the Pre-Intervention Online Survey, the faculty participants at Foundation College had a greater initial awareness of Carol Dweck's theory of growth mindset. At FC, 10 of the 11 faculty were familiar or very familiar with her concept. On the other hand, none of the seven faculty at Colonial College had any familiarity with Dweck's concept. Despite these differences, almost all faculty at both colleges expressed a belief that intelligence can grow. When asked if they considered intelligence fixed (like a person's height)

or capable of growth (like a person's bicep) almost all (16/18) faculty reported that intelligence could grow. The remaining two faculty members (both from the CC comparison group) described a mixed view of intelligence. For example, one stated that some basic elements, such as "how quickly we process and acquire new information," are fixed, while the brain is still "extremely malleable and, therefore capable of more and more complex thinking as we are exposed to 'the good things' (literature, travel, art, music, math and science)" (Faculty T, Pre-Intervention Online Survey).

While faculty began the project believing intelligence can grow, they generally reported that students held a more fixed view of intelligence. Over half responded that most students (7/17) or many students (4/17) have a fixed view of intelligence. Three other faculty members considered the student view mixed, one was unsure, and one reported that students had a fixed mindset. Only one faculty member reported that students had a growth view of intelligence.

While some intervention faculty were previously familiar with growth mindset and others were not, both groups learned from the interventions and adopted growth mindset practices. In order to illustrate these changes, this section explores how two faculty members changed as a result of their participation in the intervention. I begin with two case studies—one faculty member from each of the research sites—to provide an overview of the issues and ideas that the faculty members shared during the study.

A "Transformative" Experience: Faculty I Colonial College

Faculty I, from Colonial College, described the experience with the intervention as "transformative" (Focus Group). She had been full-time at CC for 14 years, and had not heard of growth mindset before, but she had taught other non-cognitive practices, including readings and assignments encouraging study skills, resource use, and motivation. Like most faculty, she expressed a growth view of intelligence. Further, she thought, that most students believed that

intelligence is fixed, which she attributed to “traumatic experiences in K–12.” Based on her experience, students “begin English saying they don’t like English (usually because they’ve been told they’re ‘bad’ at writing)” (Faculty I, Pre-Intervention Online Survey).

Although she was similar to many of her colleagues at CC in her growth view of intelligence, her lack of familiarity with Dweck prior to the study, and her that belief students hold a fixed view of intelligence, she differed in the fact that she already had a strong focus on non-cognitive strategies in her instructional practice. Nevertheless, in an interview she called her experience with the project “mind blowing,” and said it changed student performance:

It blew my mind that it had never occurred to students that they had control over their intelligence, or their ability to grow as students. And so just that concept alone can alter how they perform in the classroom.

Further, she explained, “there is a way to incorporate those workshops into our regular curriculum, so it doesn’t necessarily have to take away from what we are doing in the class.”

Although she already presented non-cognitive lessons, the experience changed her instructional practices, because “for the students it was pretty mind blowing.” She integrated the three parts of intelligent practice into classroom discussions:

I try to think of them in the context of growth mindset. And make sure that the three sections are included so that students are not only aware of the process, but also thinking about, “What strategies are they going to use? How are they going to employ them into their assignments?” (Interview).

In class she recalled thinking, “How can I use the language from the growth mindset workshops to remind students” to “work smarter, not harder?” In an interview she explained that she

returned to the concept “that students can control their intelligence.” Consequently, she planned to integrate growth mindset into the “framework” of future courses:

It was transformative for me and for the students. For the students to recognize that they have the ability to change their intelligence. And just to see the shift in how they approach the material of class. And for me as an instructor to recognize that this basic belief, or fact, isn’t understood by them, by the students, or even faculty (Focus Group).

Faculty I’s students told her that they had “found themselves changing as a result” of the intervention; she also observed changes in their behavior, both individually and collectively. Students began asking more strategic questions. For instance, when one student found the answer to a difficult documentation question, another asked not for the answer, but “How did you find the answer?” She shared with her class (and with me) that this approach exemplified the intelligent practice strategy. She was excited because typically students would just write down the answer and move on, but now a student wanted to know how to solve the problem in the future. In the end, she wrote, “Throughout the remainder of the semester, I overheard several students asking another student how s/he accomplished success on an assignment. The students who were asking were looking for effective strategies they could use” (Post-Intervention Online Survey).

Participation in the intervention also changed how she viewed students. For her, the main change was “just recognizing that they don’t recognize they have the power in this situation,” adding, “the students didn’t understand that they had the ability to change their mindset” (Focus Group). During the intervention, her students began to recognize this power and, for “the most part changed their behaviors and attitudes” (Interview). Reflecting on the Vote with Your Feet activity, she contrasted the effective strategies of “the students who really embraced the growth

mindset philosophy and began to apply it” with the lone student who felt unable to change.

Faculty I found this student’s mindset “surprising” because, “It seems like she is choosing not to do things that will help her.” Going forward, Faculty I was “not sure yet” how to approach such students (Focus Group).

Overall, however, Faculty I felt students changed their views of success: “The light in their eyes. Their renewed engagement in the learning process. Their excitement. All speak to the power of believing they can alter their intelligence” (Post-Intervention Online Survey). In the end, she described being “more conscious about implementing growth mindset practices” (Post-Intervention Online Survey).

A “Very Positive” Experience: Faculty D Foundation College

Faculty D, at Foundation College, began with no knowledge of growth mindset. He had been teaching full-time at FC for 14 years (27 years overall), making him the most experienced of all of the participants. Like all of his FC intervention colleagues, he viewed intelligence as capable of growth, and on the Pre-Intervention Online Survey he indicated that he believed most students have a fixed mindset about intelligence. Three of his intervention colleagues attributed this mindset to past educational experiences, leaving them feeling “defeated by years of the same types of methods of learning, especially in math and English” (Faculty E, Pre-Intervention Survey). Faculty D wrote that students “tend to resist the college experience, partly out of fear that they will never be able to do it because they lack the intellectual capability of doing so” (Pre-Intervention Online Survey). In short, like his colleagues, he himself held a growth mindset view of intelligence, and believed students had a mostly fixed view.

While his FC colleagues were familiar (3/5) or very familiar (1/5) with growth mindset, Faculty D knew nothing about it. Further, his classes included fewer non-cognitive aspects. In the pre-intervention survey, he indicated that he used “some” non-cognitive reading discussions,

while his peers all reported significant assignments and class time spent on mindset, study skills, or motivation. Although initially unfamiliar with growth mindset, in his interview he said, “it is something that I find of value and I think the students *see* it” (his emphasis). In fact, he saw it early and described the first three sessions as “effective strategies for teaching students to think about their education.” After presenting the second session, he told his class he was “excited to learn what was in sessions 4, 5, and 6,” sparking a class discussion that “reflected his own growth mindset” (Faculty Training Session 2). After presenting three sessions, he had begun to recognize changes in himself and his students.

During our interview, he described changing his personal and professional practices because “growth mindset is constantly in the back of my head.” He recognized the growth mindset in his own learning experience. Growing up with dyslexia, he started as a “math science guy” because he “read much slower than most people.” He was labeled “incapable” of succeeding in English. Now, growth mindset “really demonstrates to me my own educational experience in terms of how my brain has grown and I am able to do things that I wasn’t good at when I first started college and became good at since.”

He also came to a realization about music. Before, he had been “too embarrassed” to play with others, but after leading the Vote with Your Feet activity, he “realized—help from others (laughing)...It is a good strategy to play with other people,” adding, “I have developed a good strategy to begin sort of learning something musically” (Interview). He overcame his own fear, and changed his view of teaching. With a degree in biology, he was familiar with the basic brain information, “but I never really thought about applying it to actually teaching.” However, “now it has become more of a thing I think about as I teach.”

Faculty D praised the sequence of intervention activities, saying “the way you set this up makes it very clear why the brain works the way the brain works. That we can learn things and that we can grow our brain in different ways.” In the focus group he connected his reflections on growth mindset with teaching: “It really does show how the mind can grow and that students can actually take away from this experience the same sort of thing that their mind, their brains can change and they can do things that they never thought they could do.” In fact, students applied growth mindset, and throughout the project, Faculty D observed changes in their attitudes and behaviors. After just the second session, he reported that more of them were seeking help and more frequently asking more substantial questions.

Before, he said, a “typical email” would ask what was due; after the second session, students were writing “deeper questions,” such as “I did not understand the concept we went over today, can you explain it further?” (Faculty Training Session 2). He also later reported in an interview that student conferences had changed. Students were “far more attentive than they have been in the past. They feel like this is what they should be doing, right. And so, they come with less trepidation.” Moreover, he noted that students had begun seeking additional help, and that he observed “more trips to the Writing Center and more eager collaboration” (Post-Intervention Online Survey).

Faculty D also urged other instructors to seek help and collaboration. He proposed “forums for best practices,” because “many people have some of these strategies embedded into their system.” He argued for “more opportunities for faculty to talk about what they do in their classes” because “I have already learned some ideas from both you and [Faculty C] about what I can do better the next semester just from this session” (Focus Group).

Early in the focus group, Faculty D said his view of students had not changed, because “I always thought of them as on a pathway of struggle.” He believed his students’ challenges had “nothing to do with me and my class. It has more to do with their life than it has to do with anything else.” After listening to his colleague, however, Faculty D started questioning this view. Faculty C focused on students as individuals and shared one student’s growth mindset experience. Faculty D realized, “Maybe that is something I should be doing more of, is focusing on individual students, rather than thinking about the whole, or as a group” (Focus Group). For Faculty D, participation in the growth mindset project, including the faculty collaboration, evoked new ways of seeing students.

Even before the focus group, this faculty member had changed his instructional practices. After our first training session, he requested materials and used the interventions in all three sections of English 60, rather than just in the intervention class. In fact, all three faculty with multiple sections of English 60 conducted the interventions in all of their English 60 classes, and reported positive experiences. Faculty D reported that the intervention even engaged a section of his class that typically had “no critical mass whatsoever.” It was often like “pulling teeth to get them to do anything.” For the intervention, however, “They all got up and did it.”

He explained that the active and collaborative strategies from the interventions were “very different from the way I normally teach. I don’t get students up and moving around.” And he concluded, “I am constantly thinking about it because I think it works really well for the students in the English 60 level, who sort of learn new strategies about how to approach college” (Interview). Consequently, he planned to integrate the activities into future English 60 classes and his higher-level classes. He explained, “I think it could definitely go much, much better, if I

get some of the growth mindset ideas in there. And get the students working as a community, rather than as individuals on projects.”

The Faculty I and Faculty D case studies illustrate several patterns. Both began the project with the belief that students had a fixed mindset, often because of past educational experiences. During the interventions, both observed changes in the majority of their students, especially in their level of engagement and how they asked questions and sought help from others. As a result, they both changed their views of students and their instructional practices. Going forward, they planned to integrate growth mindset into the framework of their courses, and they had even begun to advocate for faculty collaboration to encourage growth mindset practices. These patterns were widely shared. I turn now to a more general discussion of the themes that emerged from the faculty data, beginning with their comments about how they planned to integrate growth mindset principles into other classroom settings.

Transfer of Growth Mindset to Different Academic Levels

In addition to transferring growth mindset to their personal lives, seven of the nine faculty members had already transferred it to other classes by the end of the intervention. They transferred it in many ways. Faculty F, for instance, changed his class activities and assignments, and transferred growth mindset strategies to another college and another level. In the focus group, he noted that many developmental students wrote well, but they “might not be as confident knowing that they are in a lower-level writing class.” Therefore, he used the strategies because it was “really important for them to understand the philosophical component here. And understand that intelligence isn’t this fixed thing. It can change. It can grow.” He also used the growth mindset philosophy with an English 100 transfer-level class. He mapped the “Effort + Good Strategies + Help From Others” language of intelligent practice onto the pre-writing and revision process, giving students “practical variables.” The class discussed the types

of effort, strategies, and help students used in their writing process. Moving forward, he was eager “to see how it would work in different student populations” (Faculty F, Focus Group).

Other faculty also used growth mindset practices with different student populations. At FC, Faculty A and Faculty E were both familiar with growth mindset before the intervention, but the experience changed how they implemented it in lower-level classes. Since attending a workshop a year ago, Faculty A had been discussing growth mindset with students. However, the intervention experience changed her understanding: “now, going through the interventions with my students this semester, I really understand how it works.” In her interview she explained that she had changed her planning process across her courses. For example, “On more than one occasion in English 39 this semester, I have tried to imagine different ways to give tools and skills to my students so they can see that *they* could also learn and have a growth mindset” (her emphasis). Rather than conducting in-class interventions, she has “been imagining and reminding myself that these students, just given the right tools and help from others and having an open mind, that they *can* learn it” (her emphasis). She summarized her new outlook by saying “Before, I was just talking the talk, but now I really understand that it is indeed true” (Focus Group).

Similarly, when Faculty E transferred the growth mindset interventions into his English 59 sections, he observed a higher level of engagement and excitement during the interventions. In fact, all nine faculty reported increased student engagement during the growth mindset interventions. Faculty E reported that when he conducted the first three sessions in English 59, the students were eager for the next session. He said, “the experience makes teaching—your curriculum, reading and content—it makes it, how do I explain it, almost three-dimensional.” He explained that now, “as I’m preparing my lessons, I am thinking of how to link it back to the

previous intervention we did, without being so blunt,” because he wanted “the students to make the connection, and they did” (Focus Group).

For example, in his English 60 class, when Faculty E read an article on income gap and income mobility, the “students identified the intelligent practice formula” in the argument of the article, although it was not an intended element. The students, he said, used “the interventions as experience that they have, that they are bringing into the content of the class” (Faculty E, Interview). Therefore, even though he was very familiar with growth mindset before, he concluded that the interventions made his teaching more dynamic because it changed his planning, the course content, and his students’ experience.

Faculty B also transferred growth mindset practices, although in a slightly different way; he gave his daughter the second session reading material. He described her as bright, but explained that when “she hits a road block” she responds by saying “I can’t do that. I am not good at that.” After reading the article, they discussed it, and she “definitely understood the concept,” although he was not sure if she was “putting it into practice” yet (Faculty B, Interview). In fact, all nine of the intervention faculty applied the growth mindset practices to their personal lives in some way.

Changes in Faculty Understanding of Students

The primary goal of the research project was to explore how faculty might adopt specific growth mindset strategies and whether doing so might change their views of learning and growth mindset. Thus, learning that all nine intervention faculty also changed their views of students—especially struggling students—as a result of participation in the project was a surprise.

Initially, in the interviews, three faculty explained how participating in the early interventions changed their views of students and their responses to struggling students. For instance, when asked to “describe the growth mindset experience to a colleague,” Faculty B

explained that previously, facing students who “make the same mistake over and over and over again” he tended to feel, “well, I guess I am just not reaching them. I am speaking Farsi to them. And they don’t pay attention—end of story.” However, after the intervention, he considered student mindset. In the interview he noted, “I have realized now that it may be because they don’t believe that they can do it. So, that’s changed.”

In another example, Faculty C described changing her previous “mental scripts,” or the automatic responses she had when students struggle. Part of her change emerged in response to a student essay arguing that often it was not the student’s fixed mindset but rather the teacher’s fixed mindset that caused failure. Since then, she began questioning, “In what ways do I view my students with too much of a fixed mindset? And how can I change that?” She described changing her response to students who were not getting something, even after “I have said something to them ten times and it’s not getting through.” In the past, she would “just get frustrated” and maybe even “mentally write them off.” Now, however, she said she is “more aware of where my brain automatically goes” and she knows that she needs to “find some other way to get through, instead of just assuming that they are tuning me out, or they’re hopeless (laughs).” She admitted, however, “it is definitely a process. It is very much a process” (Faculty C, Interview).

When shown portions of this response from Faculty C during the focus groups, the other eight faculty members all confirmed that they had changed their views of students as a result of the growth mindset interventions. For instance, reflecting on the interventions, Faculty H said the experience had changed his understanding of “how students learn.” He recalled in the earlier interview that he had “talked about being optimistic and always believing in the students.” He recalled seeing student learning in “just a philosophical way, you know, or if you believe in the

students, they will believe in themselves, and you will have this mutual relationship, where the student will eventually grow from it.” In the focus group, he explained that the interventions “let me see the scientific aspect of learning.” He elaborated: “There is actually something going on in the brain; it is not just a spiritual thing or a philosophical thing. There is actually a machine in there.” He concluded that, as a teacher, the growth mindset experience “allowed me to view teaching through a different perspective.”

Four of the nine intervention faculty developed more patience for students as a result of their experience with the growth mindset intervention. Faculty G, for example, admitted that she is “not the most patient person,” but she said she is “understanding it is just a mindset in particular students. And it is a difficult one to break for particular students” (Focus Group). As a result, she was developing strategies to encourage class participation. Faculty A also admitted her frustration and her new approach, saying sometimes “you get really frustrated. You think that students can’t go any further. So working with you this semester was really helpful for me over the course of the time.” After the growth mindset intervention, she “really changed the way I start to approach students who I think, you know, they are not putting the effort in; they are struggling. I have just been so much more patient” (Focus Group). After the interventions, she was “willing to view my students in another way, with patience and plenty of strategies” (Post-Intervention Online Survey).

Productive Struggle from Increased Awareness of Growth Mindset

While some faculty felt confident to go forward with new patience and new strategies, close to half (4 of 9) were still struggling with strategies to incorporate this new awareness of the growth mindset into their teaching, assignments, and grading. Often, this struggle produced new strategies. Although he said he was “not sure how to proceed,” Faculty F changed his instructional practices and embedded growth mindset into his classes. He remembered being in

high school and thinking, “I’m just dumb and I can’t do it. I just don’t have the capacity” (Focus Group). A community college class helped him see his ability differently, and participation in this study “solidified” his view of growth mindset. In the focus group, Faculty F said he believes that growth mindset “requires some explicit explanation.” While he recognized that discussing growth mindset might take time away from traditional course content, he found it valuable because it is a “series of activities that gives student strategies. It helps students to succeed not only in English classes, but in other classes” (Focus Group). Therefore, the struggle to find just the right approach was worthwhile to him.

Faculty B became “more aware of the applications” of growth mindset, and through his reflection he changed his grading and feedback. Worried that he “may be guilty” of giving “back the bleeding essay,” with too many marked errors, the growth mindset experience “has got me rethinking. Maybe I need to find, to look at a different way of approaching error.” As he reconsidered his feedback, “the main thing is just thinking about the students, the impact on the students of the information they receive...is it going to encourage or discourage?” (Faculty B, Interview). After the interventions, he was still “rethinking what do you do with failing students,” especially those who “are trying their hardest.” He said he now considers mindset, and he has come to realize, “‘Ah, and you don’t think you can do it.’ And you’ve never had a successful experience writing for a classroom that made you think, ‘Oh, I guess I can do that’” (Focus Group). Further, in the Post-Intervention Online Survey, he wrote that “this experience added to my perception that students’ awareness of their challenges and overcoming those challenges is an important layer to success that needs to be discussed MORE” (his emphasis). He also noted the difficulty in assessing and recording student beliefs and its role in overcoming challenges, adding, “This cannot be captured in a number or percentage or annual report.” In the

focus group, he reflected on the emotions that struggling students face and admitted, “I haven’t got an answer yet, but it is really making me rethink how am I approaching these people.”

Even after our project, Faculty B continued to reflect on these issues, both personally and professionally. Personally, he posted to social media how growth mindset helped him succeed in his creative activities. Professionally, he wrote to me about embedding growth mindset into his course the following semester. He said that his first day prompt grew out of last semester’s interventions; he asked students to describe something they were good at and how they learned it. Based on the responses, he suggested we consider “motivation,” because in the examples, “the students all had a clear buy-in, a reason they wanted to get good at this thing. That seems like something that, for some, is lacking with academics.” (Revisions to the growth mindset intervention are discussed in a later section of this chapter.)

Changes to Pedagogy and Classroom Practices

Both during and after the intervention, faculty reported changes in how they graded student work, communicated feedback to students, and designed assignments to foster elements of a growth mindset. I address these themes in this section.

Changes to grading and feedback. Five of the nine intervention faculty reported that they had already changed their grading as a result of their experience in the project. They changed how they allocated points, emphasizing growth by making early assignments less valuable, and requiring more revision. In addition, they added self-reflection opportunities for points. They also placed greater emphasis on preparing students intellectually and emotionally to use feedback to grow and improve.

After the intervention, Faculty E, for instance, explained that his “biggest focus” would be “to grade to/for growth mindset.” Therefore, he planned to weigh early assignments less and focus on the process by grading for a “progression of skills.” His goal was to design the grading

to show students that “the more one practices and overcomes challenge, the greater the stakes are and the greater the reward” (Post-Intervention Online Survey). Later, as the next semester started, he shared with me he had changed his grading in all of his courses. His students could now learn and develop new skills on “low stakes” assignments, worth few points toward the final grade, so that by the end of the semester, when they had mastered the skills, they could demonstrate their learning on “high stakes” assignments with a greater influence on the final grade. He also planned to synchronize growth mindset discussions with returning graded work.

Faculty B also added growth mindset to his grading practices, not just in developmental classes, but in transfer classes as well. For example, he said he would include “more low-stakes assignments at the beginning of the semester, building to more high stakes assignments” (Post-Intervention Online Survey). This would allow students to learn the necessary skills and then be rewarded for learning and applying the concepts.

Even for faculty who were committed to integrating growth mindset, it was a challenge. After the intervention, Faculty C’s “perception about the meaning of student success had changed as a result of the growth mindset sessions,” but she was “now struggling with figuring out how to reconcile my new attitudes towards student success with certain standards I need to uphold as a professor.” As she explained in the Post-Intervention Online Survey, before she was “pretty focused on acquisition of content (e.g., “Did Blythe learn how to correct a run-on sentence?”) and performance (e.g., “Can Brandon write a clear thesis statement now?”).” Following the project, her emphasis had changed: “I now think that a student has clearly succeeded in important ways if she can actively apply a growth mindset in the face of challenges—even if that student has failed my class.”

In the focus group, Faculty C also expressed her challenges. Before, she “was focused on the product, and even if it is the product in the midst of process, like a rough draft, or a quiz score, but I think I am looking at those intangibles more.” Now, she clarified, she is “thinking more about where they are in terms of their growth mindset.” The challenge is that, unlike the writing product, the intangibles “are really hard to assess.” While she did not want to “rely solely on self-reporting,” she was “very actively thinking about their growth mindset and where they are in terms of their growth mindset towards writing and growing as a writer.” And so she struggled for ways to assess “their mindsets towards their own learning.”

In spite of this struggle, Faculty C had made two significant changes to her feedback and grading process. First, she added an extensive growth mindset discussion just prior to returning the first graded essay. In the past, when she returned the first graded essay, she would simply review the rubric and a few marginal comments. Now, however, she had developed a series of steps, and took “a good 20 minutes” to help students respond to feedback with a growth mindset. Students discussed how a person with a fixed mindset would respond to the feedback and how a person with a growth mindset would respond. Rather than focusing on good or bad grades, they focused on asking, “What can I learn from this?” Next, the professor shared her own experiences with a fixed mindset, and described how she used to respond with that mindset, and how she would respond with a growth mindset. While this new model took more time, and it “doesn’t ease all their anxieties,” it “does shift the perspective a little bit in a really positive way. I feel like it puts them in a mind space where they can actually take feedback” (Faculty C, Interview). It is worth noting that after making these deliberate changes to emphasize growth mindset with her students, all ten of her sample students described adopting a new learning from feedback and failure response to challenge (as described earlier).

Moving forward, Faculty C plans a second significant change. After the intervention experience, she will end the semester with a new “intensive, high stakes revision” because it “would be an effective way to encourage growth mindset when it comes to developing as a writer” (Post Intervention Online Survey). She planned to start with some readings to familiarize students with the research on growth mindset. Next, building on the intervention reflection sheets used in this research, students would explain how they were applying growth mindset and intelligent practice, including how they were “getting help from others, using smart strategies, putting in effort in a very specific area” (Faculty C, Focus Group). In this self-reflection essay, students could focus on English or another class where they were applying growth mindset practices, to encourage them to transfer the concept to other areas.

Strategic timing for grading and feedback. As discussed above, faculty changed their grading practices and became more aware of the importance of careful timing of different types of feedback. Faculty E, for example, explained that he had begun timing growth mindset interventions so that they aligned with returning graded work, especially the first essay, because he recognized that students are often nervous and their grades are often lower, or as he put it “kind of really sucky.” So, in the future, he planned to “do a growth mindset intervention there, so that they are not totally bogged down and feeling hopeless” (Faculty E, Focus Group).

Both colleagues in his focus group planned to adopt the practice of timing growth mindset discussions strategically to align with feedback. In Faculty B’s final remarks, for example, he referred back to the concept again. He had “emphasized for a long time the idea that writing is performance, and that you have to just keep working at it to get better at it.” However, following the study, he realized he needed to be more direct and explicit. He concluded that based on “what I have learned,” it “needs to be done in a much more direct kind of way than

what I have done in the past.” As a result, said he would approach growth mindset “more directly now, based on what we have been doing, I am going to talk more about the whole idea of growth mindset and sell them on the idea.”

He planned to borrow the idea “of hitting them with interventions on the days when they are seeming the most discouraged” (Faculty B, Focus Group). He also highlighted the strategic timing feedback approach in his advice to teachers implementing the sessions (Faculty B, Post-Intervention Online Survey). In a separate focus group, Faculty G focused on using it as a motivational tool to get students thinking about “how you grow and how you move forward” (Faculty G, Focus Group). In the end, all eight participants who learned about strategically timing growth mindset sessions to align with feedback planned to adopt the practice.

The one faculty member who did not hear about this approach—because he had a separate final session—still focused on new grading strategies. In his final remarks, Faculty F said the growth mindset experience “was beneficial for both me and my students. No question,” and going forward his main goal was “to think about grading strategies. Including more concrete approaches in grading strategies that I can apply. I think that would be great for me.” Further, he said he would appreciate “any sort of recommendations about grading practices or evaluation techniques” that might emerge in the future (Faculty F, Focus Group). So, his views about grading and feedback also changed as a result of his growth mindset experience, and he was seeking greater collaboration and strategy sharing in the future.

As a result of their participation, all nine of the faculty participants had already changed, or were in the process of changing their grading and feedback process to emphasize growth mindset. Moreover, the collaboration and dialogue were essential to the new strategies they developed, both through sharing ideas and developing them in the focus groups themselves.

During the focus group, they all shared their plans to embed growth mindset into their course design and teaching practices.

Changes to class assignments. During the grading and feedback discussion in one of the focus groups, three faculty members discussed plans to develop new assignments based on the reflection sheets used in this study. Faculty A noted that self-reflection, “sometimes just forces whatever is going on in here [pointing to her head] to actually be verbalized.” This opportunity to review their own thoughts could help them grow; as she said, “I think the reflection is important.” Both of the other faculty participants suggested alternative reflective assignments built from the reflection sheets. Faculty E suggested using the collected sheets as part of an end-of-semester review portfolio, asking, “How has anything from the [reflection] sheets prepared you for these entry-level skills” of the next class? (Focus Group).

Although Faculty D was in a separate focus group, he planned to add similar reflection assignments, because “it would be good to get them to write about what they have to do in order to improve on the next paper. To make them reflect on what went on in the conference would be a good.” But he also planned to add assignments that would require students to seek outside help. Reflecting on the three parts of intelligent practice, he proposed “requiring a certain number of contacts.” Students would have to visit campus resources, such as counseling or the Writing Center, and then have a “graded assignment” that described their experiences. His intention was to encourage his students to “develop the strategies to think about how to be successful” and to make “help-seeking part of the equation” (Faculty D, Focus Group).

During yet another focus group, Faculty G and Faculty I came to a similar conclusion about requiring students to seek help. Discussing strategies faculty could use to “encourage a growth mindset environment” they focused on “smart strategies” that would require help-seeking

as part of lessons or assignments (Faculty G, Focus Group). Faculty I agreed that “requiring students to visit you in your office hour” could become “part of your lesson, or part of your assignment.” And once students practiced “these smart strategies” they “will see that hopefully they are benefiting from it” (Faculty I, Focus Group). And Faculty G replied that her goal was to incorporate more opportunities for the “shy or hesitant [students] to participate.” Faculty also discussed sharing resource options and strategies, to “give them a list of things that they could be doing” (Faculty I, Focus Group). Together, they developed a series “smart strategies” to include in the future, and also suggested that faculty could benefit from sharing because they too “don’t know the strategies.”

Institutionalizing Growth Mindset and Faculty Collaboration

Most faculty agreed that the faculty collaboration was both productive and exciting and therefore should continue. For instance, in the focus group Faculty A proposed meeting after the intervention because “we are rejuvenated and we are excited, and we are, I just, I like to be excited about teaching and I think that is what has happened this semester. I feel excited about teaching.” As the group discussed integrating growth mindset she planned to “make growth mindset part of what we are doing, not a separate thing.” She was also excited by the change she observed in her students. Reflecting back, she wrote “they view learning in another way, and they have been encouraged to succeed,” adding “The mindset class was my best class this semester, and I believe that it was their attitude about learning that helped them. It was the sessions that helped” (Post Intervention Online Survey).

As faculty observed changes in their students and planned to embed growth mindset approaches, some even planned to institutionalize the concept. In fact, Faculty C suggested that growth mindset “should be adopted in all our comp[osition] classes.” She is “already planning” on making growth mindset “one of the fundamentals that you have to include in your course” as

she develops a campus wide special topics composition program (Interview). Faculty D actually joined this special program “because it had growth mindset in it” (Focus Group).

Research Question 4: Improvements to Growth Mindset Interventions

While they all appreciated the experience and planned to integrate growth mindset into their teaching, faculty were also able to identify areas for improvement. Their primary concerns had to do with time and excessive repetition. Further, two of the five Foundation College faculty were concerned about “saturation” if students encountered growth mindset material, or even the same activities, in multiple classes. Since many of these areas of concern emerged during the individual interviews, the subsequent focus group discussions explored strategies to address the concern. They also offered several suggestions to improve the project in the future. Further, part of the focus group was spent reviewing and evaluating a new model, which was developed in response to their earlier concerns. Consequently, as part of this research into growth mindset, the faculty spent considerable time reflecting on and improving the growth mindset project itself.

In this section, I review faculty observations and concerns regarding the current model and present their suggestions for improvement. Then, I present that faculty feedback on the proposed new model as well as the student usefulness data. Finally, I summarize lessons learned to improve the intervention.

Time Concerns Regarding Preparation and Duration

Faculty expressed two concerns about the time involved in the project. First, the project got a late start as I awaited IRB approval. Faculty did not receive the training until the third or fourth week of the 16-week semester. The delay prevented them from integrating the material into their syllabi, and it made integrating sessions into lesson plans difficult. It also meant students did not experience the first session until the third week at the earliest. Second, faculty expressed concern about the class time required to conduct the series of six interventions. While

they all reported increased student engagement during the sessions, as well as positive changes in student attitudes and behaviors, four of the nine reported that the session time competed with the planned course material.

Present training earlier. Four faculty members said they would have preferred that the training was scheduled earlier, so that they could integrate the sessions into their syllabus before the start of the semester. For example, Faculty D had never taught growth mindset before, and his “only concern [was] finding the time for the interventions to fit into the syllabus” (Pre-Intervention Online Survey). Faculty H shared this concern. During the interview, he mentioned it would be better if “we could incorporate into our course outline before.” After the semester, he again highlighted the importance of advance planning and integrating the sessions and concepts into the syllabus. Asked about this experience and suggestions for improvement, he said, “I did enjoy it, though I wish I would have had more preparation. More time, especially with you.” Now, he “absolutely” plans to “implement some of this material” in his “syllabus and my course outlines.” With more time, he said he would not separate the workshops, but rather integrate them because they are “beneficial” for “the students and the teacher” (Faculty H, Focus Group).

Combine sessions. Another common request was to combine or reduce the number of sessions. Four of the nine faculty members said the project would have been better with fewer sessions. Faculty G concluded her interview by suggesting that future projects “collapse some of the activities or condense them, because the students, they get it and they get it quickly.” Therefore, she considered four to be the ideal number of sessions. Likewise, Faculty C also suggested decreasing the number of sessions: “Witnessing how the students seemed to lose steam over the course of the semester, I’d rather have fewer sessions.” Rather than having

separate sessions on application, she felt it would “be more effective to have students end up with application at the end of **every** session” (her emphasis). She planned to customize the reflection and discussion, and “recommend[ed] that instructors really make the material their own and adapt it as they see fit, especially if instructors could figure out a way to sync specific sessions with other material/assignments in the class” (Faculty C, Post-Intervention Online Survey). Her focus group partner, Faculty D, also wanted to present growth mindset earlier and then have students apply and reflect on it throughout the semester, especially if you “pair them in with what you were working on with your syllabus.”

Present sessions earlier. Faculty suggested decreasing the number and increasing the length of sessions while aligning them with course material. Later, upon reviewing and discussing the new four-session model (presented below), Faculty D approved, saying:

I like the way you have combined them. I think it would work better this way. And you could probably get it done in, by week 5. ...Then you could have them reflect on how they are using these practices, rather than being done, and then the semester is over (laughs) (Faculty D, Focus Group).

As Faculty D observed, most faculty did not present the final session until at least week 11 (following the late project start and given the spacing of all six sessions). Therefore, many aspects were presented late. In the focus group, Faculty D proposed “front-loading” the sessions early, “so the students can apply the growth mindset to their own learning.” Similarly, Faculty F said he would be “starting with some of these good strategies early in the semester,” because that would be beneficial to both the students and his teaching, “without a doubt” (Focus Group). In fact, overall, five of the nine faculty suggested “front-loading” the sessions.

Repetition & Reflection

Six of the nine faculty emphasized the value of reflection. At the same time, however, throughout the project, eight faculty indicated that there was too much reflection in the current model. Faculty D recommended a front-loaded model partly to decrease repetition. Students “forget what they have done and then you have to go back and ask, ‘Remember that thing you did like six weeks ago?’” (Focus Group). For both Faculty D and Faculty C there was too much repetition, especially in the final session. In their focus group, Faculty C said “they were really done with the mindset stuff by then,” and Faculty D replied, “Yeah, right, they were mindsetted out by then.” Consequently, looking back, both would now consider session six “the least effective.”

Often, the same person would praise reflection, but then suggest there was too much, especially towards the end of the series. Faculty F considered the reflection “the more interesting parts of this, because you can actually hear how they are applying this or are not applying” growth mindset. He explained that this “writing paired with the dialogue is great,” because “students are just more comfortable responding if they have something in front of them,” even when they are being asked “complex ideas” and “interesting philosophical questions” (Faculty F, Focus Group). Yet, Faculty F found “the first sessions” had “much higher engagement” than the “review sessions towards the end of the sequence.” The “more active” sessions, like the Cotton Ball and Vote with Your Feet activities, were “more effective in getting the class to participate” and “most successful in terms of changing students’ attitudes and behaviors” (Faculty F, Focus Group). Faculty F found value in the repetition and the reflection activities, but also felt there was too much of it, especially towards the end.

This view was strongly supported in the Post-Intervention Online Survey. When asked to identify weaknesses in the sessions, five of the six faculty members who completed the survey

focused on excessive repetition. For instance, Faculty A wrote, “repetition is important, but sometimes it seemed too much”; Faculty E concluded the “review session at the end of the semester may have been overkill, as they seemed like they had already heard it all and didn’t need to be reminded of all the things they’d learned.” Therefore, even with only a partial response rate, it is significant that a majority of intervention faculty (5 of 9) identified the repetition problem, and for three of them it was the only weakness they identified.

Patterns of Effectiveness

As part of the interview, each faculty member was asked to identify the most and least effective activities. Only two activities were selected more than once as “least effective.” During the interviews, two faculty identified the partial outline from the memory discussion in session three as least effective. Three faculty identified the mindset article and the partial outline activity from session two. During the focus group discussions, faculty were shown these results and asked if they noticed any patterns. Most noticed the partial outline connection, and pointed out that these were less active than other strategies. Although some found the partial outline and reading-based activities least effective, Faculty C and F found these strategies highly useful and even transferred them to other classes.

Although faculty lacked a clear consensus on which were least effective, they had strong consensus on the most effective strategies. During the interviews, five strategies were selected as the most effective by three or more faculty. Three faculty singled out the video showing neuron development, and the Number Order Sequencing and Vote with Your Feet activities each received four votes. The Mind Mapping activity was selected five times, and six faculty chose the Cotton Ball activity.

Many faculty identified *both* the Vote with Your Feet (session five) and the Cotton Ball activity presenting neuroplasticity (session one) as the most effective. For Faculty D, the Cotton

Ball activity “embodied what you were trying to teach them” and “got the whole project off to a really good start.” He observed the students “got up, they got to have fun with it,” and it had an effect: “I think they also saw that ‘Yeah, this actually works. You know, with practice you can get better at something.’” Moreover, he felt students took away “that you are definitely at a deficit if you don’t have that effort and develop a strategy for doing it.” Retrospectively, he compared the Cotton Ball activity to a “microcosm” of what we were “trying to do,” because “It allowed the students to sort of feel it, and see it, and experience it at the same time as sort of seeing the presentation up on the board” (Faculty D, Focus Group).

Active is effective. Not only did faculty have a general consensus on which activities were most effective, but they were unanimous—in the focus groups and the survey following the intervention—that the active and physical activities were the most effective. For example, asked about the project’s strengths, all six Post-Intervention Online Survey respondents identified activities “where the students had to perform activities” (Faculty D, Post-Intervention Online Survey). In fact, five respondents only mentioned the physical activities, identifying strategies “when the students were able to actively engage with a concept, like mind mapping and ‘voting with your feet’” (Faculty B, Post-Intervention Online Survey). In general, the idea that strategies “where the students get up out of their seats worked best” was a recurring theme (Faculty A, Post-Intervention Online Survey). Faculty F advised other teachers to “integrate activities to get people out of their seat, especially with today’s students” (Focus Group).

Power of dialogue. Other faculty connected students’ ability to learn concepts to the class dialogue. Faculty G, for example, made an explicit connection between student engagement and subsequent dialogue. For example, concerning Vote with Your Feet, she noted, “they are physically moving, and it becomes a dialogue. They were compelled by it.” She

challenged them, asking the students under the “No” sign, “Are you doing well in those classes where you need help, but aren’t getting it?” She “was trying to push them to think like ‘Okay, what is no? Is it positive, or is it negative? It is negative. So then you can look at it as if you are negating your educational experience.’” This dialogue had a noticeable effect, eliciting several student “Woahs!” (Faculty G, Focus Group).

Faculty I also used dialogue after active sessions. She recognized her students’ engagement “when they figured it out. And their faces just lit up.” She encouraged extra dialogue to help them apply “the larger idea of working smarter, not harder” and using intelligent practice, and “it was mind blowing for them” (Faculty I, Focus Group). Likewise, in another focus group, Faculty A and D discussed adding more dialogue after the activities. Eventually, they proposed a “group activity where they all brainstorm for strategies and come up with some, and then have a class discussion where they are sharing their ideas with each other about different strategies that they could use” (Faculty C, Focus Group). Faculty D even suggested linking this to new reflective writing assignments that would ask students to “reflect on how you are using growth mindset practices to improve your learning.”

Discipline-Specific Strategies

In addition to praising the active interventions and expanding dialogue, six of the nine faculty requested adding more direct application to the intervention, especially with discipline specific strategies. In the Post-Intervention Online Survey, Faculty I offered two suggestions: “more active interventions and application to the English classroom” (Faculty I, Post-Intervention Online Survey). Faculty H requested “anything else that you could incorporate that is English-related” to avoid making the growth mindset discussions a “digression,” and to help students master the “course material that we have to teach” (Faculty H, Focus Group).

For four of the nine faculty, the Mind Mapping activity (session four) was the first place

to introduce discipline-specific approaches. In the interview, Faculty F asked about developing this into a “hands on activity” that would address composition strategies, such as paragraph organization. In the focus group, he proposed building on the already interactive strategy with discipline-specific activities. For instance, he said that his “students struggle with coherence at the sentence level and the paragraph level,” and so building a mind map with “specific variables about topic sentences or paragraphs organization, that would be very helpful.” Further, Faculty A proposed sharing the mind mapping strategies at the beginning of the semester and then creating a group assignment, where each group would sign up to teach a grammar concept using the technique (Faculty A, Interview). Moreover, Faculty E reported how his students already applied mind mapping strategies to their reading. In the interview he noted, “It really struck through to me that they can do it and talk about it, but it didn’t matter until they actually used the manipulatives and then applied it to the reading.”

Feedback on New Growth Mindset Intervention Model

Based on these observations, a new model was prepared and shared with faculty during the focus groups. First, they reviewed seven key suggestions that were derived from the suggestions they offered during the interviews (see Appendix P):

1. Address time issues
 - a. Start earlier in semester, so activities can be planned into syllabus
 - b. Create more time for dialogue and application
2. Decrease the number of sessions
 - a. Avoid over repetition, although some repetition is valuable for learning and application
 - b. For example, when sharing three sessions with other classes, there was more excitement—(fewer, felt newer)
3. Involve more hands-on, engaging group activities, and fewer paper-only or outline completion activities
4. Incorporate dialogue and application after each session
5. Time sessions strategically
 - a. For example, when returning graded essays, have a strategic discussion about growth mindset responses to feedback and help-seeking during improvement/revision

6. Create opportunities for teacher collaboration
7. Remain attentive to “saturation” or repetition from class to class if this becomes a dominant motif on campus

Faculty expressed agreement with these suggestions and then reviewed the new four-session model in the focus groups. Each of the four sessions in the new model was designed to take about 45 minutes (suggestions 1b, 2). The extended time allowed for more in-class discussion, and many were already extending past the 20 minutes to allow for discussion and application (suggestion 4). The first session was largely unchanged, adding only a more explicit discussion of growth mindset to the existing neuroplasticity focus. The second session combined sessions two and three from the original model, as Faculty C had suggested. The main change was converting the article and partial outline from the original session two into a brief video to convey the content (suggestion 3). The third session extended the memory and Mind Mapping activities to include more discipline-specific activities, and removed the partial outline activity (suggestion 3). Finally, the fourth session combined the old sessions five and six. In an effort to decrease repetition (suggestion 2a), the Vote with Your Feet activity was expanded for more dialogue (suggestion 4), and the mindset scenario activity from the original fifth session was eliminated (suggestion 3). With fewer sessions, faculty could more easily integrate them into their syllabi, especially if they were given the materials before the semester started (suggestions 1a, 1b). Finally, with fewer sessions and advance planning, it would be easier to align the sessions strategically with feedback in order to encourage help-seeking in the writing process (suggestion 5).

After they reviewed the suggestions and the new model, all nine faculty expressed strong support. Four explicitly referred to the new model as “great” in either the focus group or the Post-Intervention Online Survey (Faculty A, E, F, & I), and the other five either referred to the

new model as “good” (Faculty B & C) or “liked the way you combined them” and said they thought the model would work (Faculty D, G, & H). For example, Faculty H said he felt the new model “should work” in the future, “if they have plenty of time, to plan ahead” and we “incorporate English-related material” (Faculty H, Focus Group). Faculty F felt the original model was “great,” but concluded that this new model “is better,” and “front loading would be the best thing,” because he finished “around week 11” this time (Faculty F, Focus Group).

Length of Sessions

Although there was strong support for the new model, four of the six faculty who responded to the Post-Intervention Online Survey expressed concerns that it was too long. Three worried about the 45-minute sessions (Faculty B, D, & I), and one recommended a three-session model, removing the fourth session and including application each time (Faculty C). Three of these participants suggested allowing faculty flexibility to adapt the time. For instance, Faculty I suggested creating “20–45 minute version of the sessions. Let instructors know what to do if only 20 minutes is available, and what can be added if 45 minutes is available.” In addition, Faculty C advised “instructors [to] really make the material their own and adapt it as they see fit, especially if instructors” could “sync specific sessions with other material/assignments in the class” (Faculty C, Post-Intervention Online Survey).

Saturation and Collaboration

Two faculty expressed concern that students might encounter the same strategies in multiple classes and therefore experience saturation. In fact, many of their students had done the Number Order Sequencing activity in a previous class. Despite this concern with saturation, they both remained committed to finding ways to integrate the growth mindset, and even planned to use it at different levels. Faculty B wanted new activities to “introduce the concept and come up with other ways of teaching that class (Focus Group). Faculty A suggested ongoing faculty

workshops to generate additional ideas, and even suggested that groups brainstorm and “compete for a prize” for new growth mindset activities (Focus Group). In fact, six of the nine faculty requested ongoing opportunities to collaborate and share strategies, and eight of the nine requested access to the new revised material. The faculty were committed to integrating growth mindset and were actively seeking out ways to collaborate to develop new strategies, both for developmental courses and transfer-level courses, in part to avoid saturation, and also because they believed that this approach would benefit students across levels.

Student Usefulness

Although faculty were receptive to the new model, it is worthwhile to also keep in mind students’ perceptions of the intervention activities. In particular, it is important to ensure that those aspects of the intervention that they found most useful are not lost. As part of the survey following the intervention, students rated the usefulness of each activity on a Likert-type scale (1=Not Useful to 6=Extremely Useful, and NA/Did Not Use This Resource). More than half rated each of the 12 activities at least a four. Interestingly, the faculty rated Vote with Your Feet as one of the two most effective activities, and students found it useful, but not among the most useful. More than half (52%) rated it at least a four or above, and 34% rated it a five or above, but those were still the lowest in each category. On the other hand, a higher percentage of the students rated the intelligent practice lesson (59.8%) and the Number Order Sequencing activity (59.9%) at least a five (Figure 4.1).

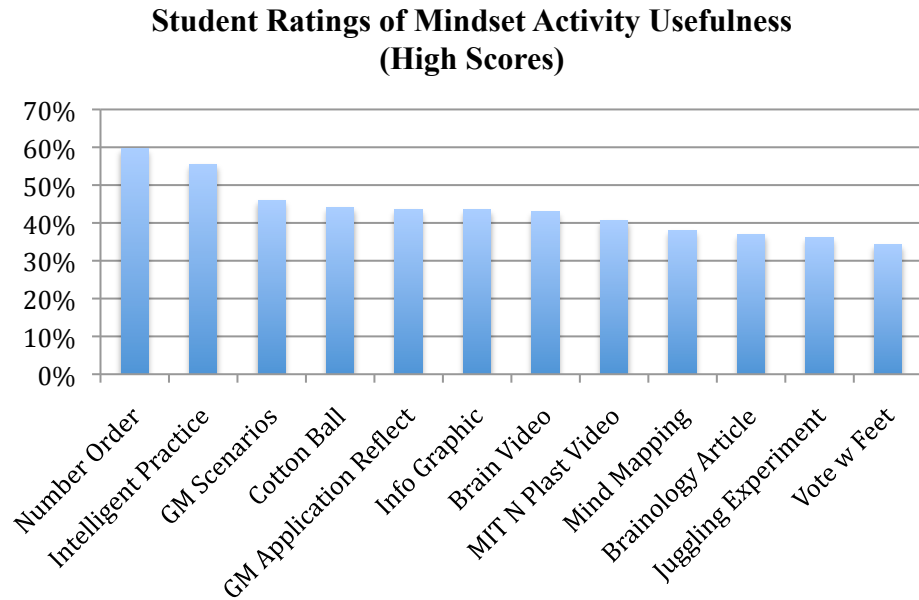


Figure 4.1. Percentage of students rating the usefulness of each mindset activity “5” or “6.”

While at least 34% of students rated each activity as useful (with a score of five or above), fewer students rated the activities as not useful. Mind Mapping earned the most scores of two or below (21.5%). All of the other activities were scored a two or below by fewer than 17% of respondents (Figure 4.2).

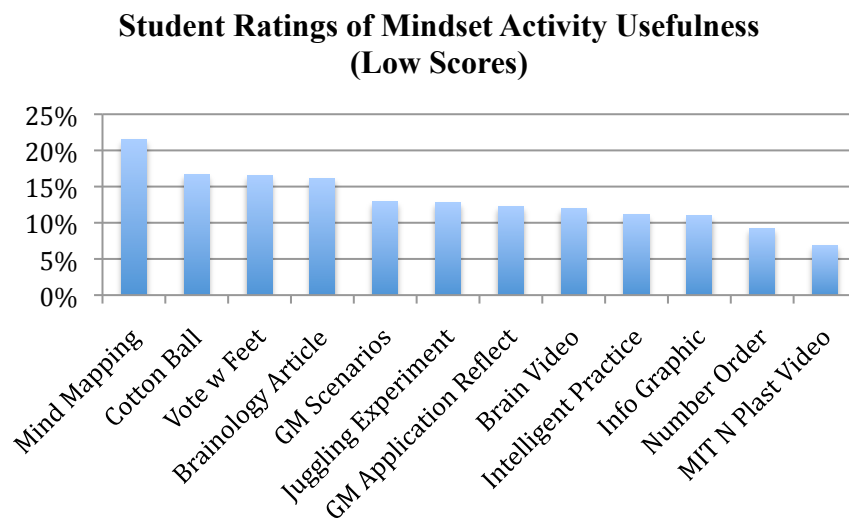


Figure 4.2. Percentage of students rating the usefulness of each mindset activity “1” or “2.”

Faculty and students identified similar activities as useful. Most faculty identified the Cotton Ball and Number Order Sequencing as the most effective. Students were also more likely to identify these as useful. Likewise, faculty frequently discussed intelligent practice strategies, and students rated this among the most useful features of the intervention. Faculty and students both tended to rate the two videos as more useful (43% and 40.7% scored them at least a five).

At the same time, however, there were some disparities between students and faculty. Students did not share the same high opinion of the Vote with Your Feet activity. While faculty highlighted this activity, the fewest students rated it a five or above, and over 16% of the students rated it a two or below. Also, while many faculty considered the final session's Growth Mindset Application Reflection one of the "least effective," 43% of the students rated it at least a five, and only 12% rated it a two or below. Faculty indicated there was too much reflection, especially in the final sessions, but students did not seem to agree. Students also seemed to find the Growth Mindset Scenarios more useful (46% scored it a five or above) than faculty. Overall, most of the students found the sessions useful, suggesting the new model should also be perceived as useful to students.

Overall Perceptions of New Model

Faculty feedback and student usefulness responses suggest implementing a more flexible version of the proposed new four-session model, and presenting it to instructors early, so they can integrate the concept into their syllabus. Faculty expressed strong support for the new model, and indicated that it addressed the goals they identified as important in the interviews. Faculty unanimously agreed that the new model highlighted the more active strategies, which they found to be the most engaging and effective. The decreased number of sessions was

appreciated, and faculty recommended “frontloading” the presentations early in the semester to give students more time to apply the lessons and to avoid some repetition.

Faculty appreciated the extra time for extended dialogue, but also expressed concern about the extended 45-minute session length. Two solutions were proposed: First, faculty suggested preparing a long and short version, giving faculty the ability and guidance to adapt each session to their own needs; second, they suggested integrating discipline-specific activities (such as paragraph development) so the sessions would be more connected to content instruction.

Adding more discipline-specific strategies might help address one of the few discrepancies between faculty perceptions and student usefulness scores. For example, perhaps integrating specific writing skills into the Mind Mapping session, as several faculty suggested, would make it more effective for both faculty and students. Overall, students found the activities useful and faculty support the new model.

CHAPTER 5:

DISCUSSION

This study used a multiple methods experimental design to examine the short-term effects of a brief growth mindset intervention on basic skills English faculty and students at two California community colleges. Faculty were assigned to either a growth mindset intervention or a comparison group. Because faculty were already familiar with the intervention at Foundation College, the randomization worked only at Colonial College. Intervention faculty at both campuses were trained to present six growth mindset sessions over the 16-week semester. The sessions were designed to encourage students to adopt a growth mindset—the belief that one’s intelligence can grow through intelligent practice (i.e., effort, good strategies, and help from others).

Intervention faculty completed pre-test and post-test surveys and a series of reflections, and each also participated in an interview and focus group. Students completed individual response sheets with open- and closed-ended questions during each intervention, as well as closed-ended pre- and post-intervention surveys. Furthermore, outcome data regarding student course completion and course success were collected. Combining process and outcome data provided measureable outcomes as well as explanatory feedback (Creswell & Plano Clark, 2007).

Combined, the data helped clarify how faculty changed their instructional practices following the intervention. At the student level, the data showed how students changed their perceptions, transferred growth mindset practices beyond the intervention course, and experienced changes in student success outcomes. Overall, the findings yielded strategies to improve future interventions based on faculty and student feedback. In this final chapter, I

provide a summary of these results for both faculty and students, before discussing the implications of these findings for future growth mindset interventions and future research.

Summary of Results

There were dramatic changes among the intervention faculty. In fact, all nine faculty members changed their instructional practices and planned to embed growth mindset as a fundamental aspect of future courses. Prior to the intervention, five faculty had no familiarity with growth mindset. After the intervention, they had all adopted a growth mindset approach. Even the four who were already familiar with the concept strengthened their commitment, and created new strategies to integrate growth mindset into their classes.

All of the faculty participants reported changes in students, including increased engagement and increased help-seeking behaviors. They also reported improved student performance. As a result, faculty changed their view of students, and created new assignments and adopted new grading practices. Further, six of the faculty members advocated for continued collaboration to create additional growth mindset teaching and grading strategies. Some had begun to institutionalize growth mindset into campus programs.

Student results, on the other hand, were mixed. After participation in the intervention, most students indicated in their open-ended responses that they had changed their mindset and behavior, and many had adopted a new response to challenge. Four main themes emerged when students described how the intervention discussions shaped their view of mindset: (a) believing in growth mindset; (b) having a new approach to challenge; (c) emphasizing intelligent practice; and (d) adopting a new approach to learning. The changes began in the first session, when almost all students reported that learning about neural plasticity changed how they thought about the learning process.

Further, over 85% of students reported transferring growth mindset practices beyond the intervention course, on both the open-ended responses and the post intervention survey.

Surprisingly, about a quarter of the students reported transferring their growth mindset strategies in math. For example, during the third session 29% (23/80) of the student sample and 24% (44/180) of the whole intervention group described using growth mindset in math, even when asked about using the concept in the last two weeks, and not about transfer.

While responses from intervention students on the post-intervention survey supported the open-ended responses, there were few statistically significant findings comparing the intervention students with the comparison group students on the closed-ended pre/post survey data, or on course outcome data. An analysis of covariance indicated the interventions increased the post-intervention growth mindset measure, when controlling for the pre-growth mindset measure ($p = .015$). On the other hand, comparison measures did not demonstrate statistically significant differences between the intervention and comparison students on resource frequency or resource usefulness from the pre-intervention to post-intervention survey responses. Moreover, the intervention courses achieved high retention and success rates, but they were not significantly different from the comparison classes.

Student Case Study

Perhaps we can better understand the effects of participating in the intervention by observing the transformation of a single student. Student I17 developed increased motivation and additional effort and learning strategies, similar to the other students in this intervention and students in other growth mindset interventions, such as Sririm's (2011). Student I17 also transferred growth mindset to her math coursework and adopted a new growth mindset response to challenge.

Like most of her peers, Student I17 changed early and dramatically. From the first session, she focused on neural plasticity, or “brain growth,” because previously she “had no idea that by reviewing things more frequently it could become familiar and easy to get” (I1Q5). After learning about neural plasticity in the first session she planned to “review more often because it will help me with my education if hard subjects become more familiar” (I1Q7–8). In the final session, she observed, “Our discussions have changed my mindset because I now know that if I use intelligent practice I can actually alter my brain” (I6Q2).

Moreover, the interventions changed how Student I17 responded to challenge: “When I face a challenge in school [now], I seek help from fellow classmates and the teacher. My response has changed because I used to try to find the answer on my own, but now I use help from others” (I4Q1). Later, she explained that the discussions had changed her view of mindset, because “I used to just give up on where I was stuck” (I5Q2). In a final reflection she wrote, “Neural plasticity makes me really think about how I learn, because if I use certain techniques I can actually enhance my learning and actually grow my brain” (I6Q1). Similarly, many students use the language of neural plasticity and describe practicing intelligent practice strategies when explaining their new approach to academic challenges. Farrington et al. (2012) argued that “academic mindsets and learning strategies” are “critical levers” for increasing student engagement and persistence (p. 73). For many students, including Student I17, the interventions did just that.

In fact, Student I17 reported transferring her persistence to other classes, including mathematics, by adopting new strategies and seeking help from others. She explained that following the intelligent practice discussion, she “tried very hard to understand” the course content while utilizing the campus Math Learning Center and available tutors. During the

discussion she said she “learned that help from others could help my understanding, so I decided to try it out and it worked” (I3Q4).

Discussion of Findings Related to Faculty

Considerable research indicates that growth mindset interventions improve educational outcomes (Aronson et al., 2002; Blackwell et al., 2007; Good et al., 2003; Yeager & Walton, 2011; Yorke & Knight, 2004). There have been very few studies with community college students, however, and in education, context matters. Community college students, especially basic skills students, often have very different educational experiences from either K–12 students or university students—in other words, students who have been the focus of most previous research (McIntosh & Rouse, 2009; Paunesku, 2013; Yeager & Dweck, 2012).

Moreover, there is growing recognition that teacher mindset matters, and that it can influence student mindset. Advocates frequently suggest preparing teachers to integrate growth mindset strategies in the classroom (Farrington et al., 2012; Dweck, 2010; Lee, 2009; Yeager & Dweck, 2012, Yorke & Knight, 2004). However, there is very little research on specific instructional strategies (Farrington et al., 2012; Rattan et al., 2012; Yeager & Dweck, 2012; Yeager & Walton, 2011).

Thus, despite growing research in this area, questions remain: If we want to encourage growth mindset in community college faculty, what do we do? If faculty want to encourage growth mindset in their students, what should they do? And if faculty present specific growth mindset strategies, how will they affect community college basic skills students? To address these questions, I examined community college faculty implementation of growth mindset strategies.

Implementation of Growth Mindset

The faculty results support Yeager and Dweck's (2012) claim that scaling up mindset interventions is not just about providing "the same worksheets and workshops to more students" (p. 29). Recognizing that faculty play a key role in promoting growth mindset, researchers have advocated for researcher and teacher collaboration to promote greater understanding of the psychology behind the intervention and appropriate methods for the specific educational context (Yeager & Dweck, 2012; Yeager & Walton, 2011). Yorke and Knight (2004) also advocated for training faculty in mindset and providing classroom strategies, because faculty influence whole groups of students. Therefore, as part of this study, faculty were provided intervention materials. More importantly, they were trained to present the interventions and encouraged to reflect and collaborate with their peers, which gave them a greater understanding of growth mindset. This reflection and collaboration promoted further learning and the development of new growth mindset teaching strategies.

All nine participants said that they would embed growth mindset into their future practice. Faculty recognized their role in creating a growth mindset learning environment through their instructional practices, which requires more than giving students worksheets or workshops. Likewise, these findings suggest that combining activities designed for a particular student population with faculty training, reflection, and collaboration changes faculty mindset and practice, and promotes the adoption of growth mindset strategies as a fundamental part of teaching practices.

In fact, the faculty participants adopted practices aligned with what some have called a "growth classroom," which emphasizes process, formative grading, and classroom discussion of effort and strategies (Dweck, 2010; Lee, 2009, Yeager & Dweck, 2012). As part of the change, faculty participants not only changed their own mindset, they also changed how they viewed

students. Recognizing the role mindset plays when students struggle, faculty developed new growth mindset teaching strategies. Therefore, participation in the intervention prepared them to present growth mindset strategies in the classroom, as earlier research has suggested (Farrington et al., 2012; Dweck, 2010; Lee, 2009; Yeager & Dweck, 2012).

Furthermore, these participants went beyond presenting the existing material and created new materials, assignments, and specific grading practices to encourage growth mindset in future classes. Although there is limited research on specific teaching practices (Farrington et al., 2012; Rattan et al., 2012; Yeager & Dweck, 2012; Yeager & Walton, 2011), these participants collaborated to create their own practices, which suggests that the best researcher and teacher collaboration will not only inform practitioners about the psychology behind the mindset, but also inform researchers about best practices for specific contexts.

Beyond the changes to their own mindset, the reflections of faculty participants provide three important lessons. First, the experience with the intervention changed their view of students. Second, it changed their instructional practices, especially with respect to how they integrated growth mindset into class discussions, assignment design, and most importantly, grading and feedback. And third, faculty highlighted the importance of reflection and collaboration for effective professional learning. I address each of these lessons in turn.

New View of Students

Surprisingly, all nine faculty members—even those who had already been familiar with growth mindset—said that participating in the intervention changed how they viewed students. They discussed how the intervention helped them recognize the role of mindset when their students struggled. In the past, working with basic skills students, they might have become frustrated or resigned that what they were doing was not going to work. After participating,

however, they said they practiced more patience and sought out new strategies, because they now recognized that struggling students might not believe they could do it.

New Instructional Practices

The change in how they viewed students motivated the teachers to create new approaches in the classroom. It appears that actively involving faculty in presenting and developing a growth mindset will create more change than simply sharing existing handouts and workshops. As Baldwin and Chang (2007) report, collaboration is “a powerful tool to promote learning and professional growth” (p. 30). While workshops might give students new insights, the daily classroom environment and faculty attitude can also motivate, or demotivate, students (Rattan et al., 2012). The instructors’ new approaches focused on more explicitly discussing growth mindset in class, developing new assignments that emphasized self-reflection and help-seeking behaviors, and changing their approach to grading and feedback.

In this study, faculty reflection and collaboration led to the creation and adoption of growth mindset strategies to motivate students, and some participants even became advocates for institutional change. Thus, participation changed individual faculty mindset as well as instructional practices. It is possible that this could lead to broader changes in institutional policies, as Farrington et al. (2012) advocated.

Growth Mindset Discussion

Faculty participants observed increased student engagement and performance, and they transferred growth mindset to their personal lives and across their professional practice. When describing how to present growth mindset in class, they highlighted the value of presenting the scientific basis of the model and concrete strategies as a way to move beyond an overly simplistic focus on just effort. As a result, faculty said they would combine neuroplasticity and strategies (especially intelligent practice) in class discussion, not just as part of separate

interventions, but integrated throughout their teaching. Moreover, they planned to continue using active intervention strategies, especially those that got students “out of their seats,” because these helped students practice and understand the concept.

The three key features that faculty developed for classroom practices—science, strategies, and active presentations—support the elements outlined as essential in Yeager and Dweck’s (2012) analysis of successful approaches customized to the specific content, in this case with community college basic skills students. These researchers noted that community college students often put forth effort, but do not employ effective strategies or seek adequate help. Further, they indicated that effective mindset interventions are given in context and “delivered using methods that lead students to quickly internalize those messages” (p. 29). Interestingly, faculty participants were not informed of this research, and they developed these ideas from experience and reflection. This suggests that effective interventions will support faculty with specific practices and strategies as well as opportunities for reflection and collaboration. This approach will encourage changes in faculty beyond the interventions themselves.

Growth Mindset Assignments, Grading, and Feedback

As a result of their experience, faculty participants integrated growth mindset approaches into their syllabi and described new assignments to encourage the concept. They created assignments that emphasized self-reflection and required students to employ help-seeking behaviors. These new assignments emerged from their reflection on strategies to encourage growth mindset in students. This supports the conclusion drawn by Yeager and Dweck (2012) that previous mindset interventions were effective because they “changed the meaning of challenges” into opportunities for learning (p. 13). Faculty participants reported changing their teaching, including their assignments, to foster this growth mindset response to challenge.

Since what gets measured—and how it gets measured—often matters most, the most significant changes are in grading and feedback. Most faculty had already changed their grading by the end of the study, and they all said they would do so going forward. In fact, they often developed process oriented and formative grading practices to encourage a growth mindset, as promoted by Dweck (2010) and Lee (2009). For example, faculty described low to high stakes grading, where early assignments give students a chance to recognize and learn from error while developing mastery to earn higher grades. Faculty also proposed awarding points for self-reflection, revision, and grading for “a progression of skills.” As a result of the intervention, they described putting a greater emphasis on growth, awarding points to encourage process oriented thinking, including question posing, resource use, student revision and self-reflection, which supports the development of a growth classroom (Dweck, 2010; Lee, 2009).

In addition to changing how they allocated points, faculty also changed how they communicated feedback to students. They focused on feedback that would encourage students and help them see criticism as a learning opportunity. As part of the collaboration, all planned to strategically time growth mindset discussions so that they coincided with when they returned graded assignments. Several had already done so, and they shared this practice in the focus groups. As a result, faculty participants proposed timing these discussions to encourage students to learn from criticism, embrace challenge, and rethink failure.

Faculty Collaboration for Professional Learning

It is worth noting that the strategic timing described immediately above was not part of the original intervention, but emerged from faculty collaboration during the intervention, highlighting the value of professional learning opportunities for faculty and students. New assignments and approaches emerged from faculty reflection and were shared during discussions. The specific details often emerged during faculty focus group collaboration where participants

eagerly developed new strategies to move beyond those provided in the intervention. The focus group dialogue was informative, as a space to share strategies and develop new attitudes. In fact, for a few faculty members, significant mindset changes occurred through the focus group collaboration itself. The faculty experience (training, presenting, reflecting and collaborating) was an effective form of professional learning, as research has indicated (Goddard, Goddard & Tschannen-Moran, 2007; Hill, Soo La, & Lagueux, 2007). Not surprisingly, most participants advocated for additional faculty collaboration because the dialogue helped them grow.

Summary

Overall, participating in the intervention encouraged faculty to adopt growth mindset practices and to implement them beyond the interventions. Paunesku (2013) highlighted the potential to involve faculty since online interventions are limited, and faculty influence the overall learning environment. In the current study, given specific classroom strategies and a chance for reflective collaboration, community college faculty not only practiced growth mindset themselves, they created new approaches to encourage students to adopt the concept.

Participants had adopted growth classroom practices and were actively developing new strategies, which supports the ideal of training teachers to promote growth mindset strategies called for by many researchers (Farrington et al., 2012; Dweck, 2010; Lee, 2009; Yeager & Dweck, 2012, Yorke & Knight, 2004). As these faculty members embedded growth mindset into their instructional practices, and proposed ongoing collaboration, some even advocated for institutional change. These faculty results indicate that it is possible to support professional learning and that, with encouragement, faculty can create new growth mindset strategies in the community college context.

Discussion of Findings Related to Students

The answers to the student questions are promising, but not quite as clear. Specifically, the qualitative data suggest changes in student mindset and behavior, but results from statistical analyses were mixed. With this in mind, reviewing the student results reveals three noteworthy findings. First, most students changed their mindset and reported new attitudes and behaviors, confirming previous growth mindset research with students in other contexts. Second, most students reported transferring growth mindset attitudes and behaviors beyond the intervention class. And third, many students reported adopting a new response to challenge.

Community College Student Growth Mindset

Although there are limited studies on community college students, reviewing previous research from other contexts suggests a pattern of attitudes and behaviors in students with a growth mindset. Several studies, some using observational methods and others using interventions with students ranging from elementary to college age, reveal a pattern of improved motivation, increased effort, and adoption of learning strategies, including additional study skills (Blackwell et al., 2007; Donohoe et al., 2012; Howard & Whitaker, 2011; Sririm, 2011). For example, Sririm (2011) found that an online growth mindset intervention increased effort and study skills for basic skills students at a private university. Controlling for pre-intervention effort, participants used more academic effort and even adopted more study skills than the control group that was given a study skills intervention. Sririm intervened with private university students, and the community college students participating in this study confirm this pattern.

First, according to both qualitative and quantitative results, a majority of participants changed their mindset, which indicates that the specific intervention strategies were appropriate to this academic context and student population. For example, almost all student participants

reported changing their view of learning after the first session's scientific grounding in neuroplasticity. These students often reported that they had a new view of learning or a new appreciation for practice as a learning strategy, replicating the pattern from previous studies. The fact that almost all students reported this change at the end of the *first* session suggests the specific intervention activities were effective and encouraged students to “quickly internalize” the growth mindset message, which is one of the essential features for contextualizing interventions, according to Yeager and Dweck (2012).

In terms of behavior, most students in this study reported using new study strategies and using them more frequently as a result of the intervention. In particular, most students reported using the intelligent practice strategies (“effort + good strategies + help from others”) emphasized during the intervention. Yeager and Dweck (2012) reported that developmental math community college students often used effort, but did not practice effective strategies or help-seeking behaviors. Therefore, it is noteworthy that students also reported using new strategies, employing strategies more frequently, and asking for help as a result of the interventions, because these behaviors contribute to academic success. Like the faculty participants, students emphasized both the neuroplasticity language and the weight given to intelligent practice and learning strategies. As they adopted intelligent practice, they reported seeking more help from others, a change that faculty also observed. Thus, like Sririm's (2011) university students, participants increased academic effort and study skills.

Transfer of Growth Mindset

Students not only reported using new academic strategies during the intervention class, but also transferring growth mindset strategies to other classes and even non-academic settings, such as work. While this study did not measure success in math, about a quarter of the students described transferring growth mindset to their math coursework, and many reported success.

This supports the findings of Howard and Whitaker (2011), who interviewed 14 students and found that all of them went from struggling to succeeding in math after changing their mindset. In addition, Paunesku (2013) reported improved course outcomes after providing online growth mindset strategies to basic skills community college math students.

In their article, “Mindsets that Promote Resilience,” Yeager and Dweck (2012) considered transfer of mindset across contexts “an important question,” especially if “novel intervention methods might facilitate such transfer” (p. 31). The student results suggest that this intervention method encourages transfer, which first emerged as a surprise finding from the pilot study. Furthermore, all faculty participants reported transferring growth mindset to their personal lives as well. The student and faculty results suggest that the active strategies and reflection in this intervention model promotes transfer. This is a key finding from this study that warrants further research, including examining if such transfers persist, and if they lead to measureable student outcomes in other classes.

New Response to Challenge

One way students can transfer growth mindset is by adopting a new response to challenge. In this study, almost half the students did so. When discussing “the crucial” role of encouraging students to see challenges as a way to increase intelligence, Yeager and Dweck (2012) concluded that “if students can be redirected to see intellectual ability as something that can be developed over time with effort, good strategies, and help from others, then they are more resilient when they encounter the learning opportunities presented to them” (p. 13). During the session reflections, many students echoed this sentiment, and even focused on three parts of intelligent practice described by the researchers.

Moreover, nearly one fourth learned to respond to challenge by viewing failure as a chance to learn and criticism as feedback. Similarly, Burnette et al. (2012), in their meta-

analysis, found that those with a growth mindset see “struggle as part of the learning process and consequently, they remain optimistic that they can still succeed in the future” (p. 23). Many students, in their written reflections, reported adopting such strategic optimism.

As students redefine struggle and failure as new opportunities to grow their intelligence, they become more resilient. While students with a fixed mindset may see faculty comments as negative criticism, students with a growth mindset may view them as informative feedback. Both the general transfer of mindset findings and this more specific growth mindset response to challenge attitude are important, because together they suggest the intervention encouraged students to adopt practices and attitudes that are likely to improve student success beyond the specific course.

Mixed Results and Measurement Tools

While the student qualitative data suggest strong changes, the quantitative data showed few significant findings, which raises questions about the effectiveness of both the intervention and the measurement tools. On the one hand, as faculty reported, having students write during the intervention encouraged both individual reflection and class discussion, which faculty valued. In fact, faculty considered the reflection so useful that most modeled future reflection assignments on the approach. On the other hand, the closed-ended outcomes data did not support the positive open-ended reflections.

One possibility is that students, in their reflections, overstated the changes, either deliberately or because they did not follow through with the changes they described. Other possibilities have to do with the closed-ended measurement tools. For example, on the pre-intervention survey, almost all students scored as “growth” on the three-question growth mindset measurement tool. This differs from the expected distribution—about 15% mixed, with the remaining 85% nearly evenly divided between growth and fixed mindsets (Blackwell et al.,

2007). Therefore, even though the intervention increased the Colonial College post-intervention growth mindset measurement, controlling for the pre-growth mindset measurement ($p = .015$), the meaning of the data is uncertain, because the average student moved from growth to more growth.

Summary.

Student participants adopted a more growth mindset, and reported using more effort and academic learning strategies, similar to students in previous studies outside community college. They also reported transferring growth mindset and learning strategies beyond the intervention course, most frequently to math. Further, many students reported adopting a new growth mindset response to challenge, recognizing it as a learning opportunity. These student results indicate it is possible to adapt growth mindset materials for the community college context.

Study Limitations

Like all research, this study has limitations. In particular, the qualitative elements relied on the researcher as the instrument of analysis, and this may have introduced bias into the study. The experimental design used systematic data collection methods, triangulation across a variety of methods, and random assignment features (faculty assignment and student sampling) to safeguard reliability and validity.

To address concerns of researcher bias, data from a variety of sources were triangulated. Data were collected using several methods, from several groups, before, during, and after the series of interventions. Data were also collected from multiple sources (students and faculty) and within each group multiple forms of data were collected. For instance, faculty data were taken from pre- and post-intervention surveys, written reflections, interviews, and focus groups. In addition, faculty participants reviewed the preliminary findings during the focus group and “member checked” the faculty findings after the intervention (Maxwell, 2013, p. 126). As

described above, the open-process data were also checked against the closed-ended outcome data. Therefore, in this design, ongoing analysis often shaped subsequent steps and multiple methods allowed triangulation across methods and comparison across groups.

Although the design called for random assignment at the faculty level for two campuses, this was not possible because almost all of the faculty at Foundation College had previous exposure to growth mindset. On the other hand, none of the faculty at Colonial College had previous exposure to the concept. All faculty at each campus who were teaching the intervention course were invited to participate. Despite the similar recruitment methods, the outcomes were different. Therefore, at a minimum, future studies should solicit previous knowledge of growth mindset before enrolling faculty. In addition, future researchers should inquire into the general campus knowledge of growth mindset before confirming site selection.

Another limitation of this study was the delayed start while awaiting Institutional Review Board approval. The delay created challenges for faculty to integrate the sessions, but more importantly, students did not complete the pre-intervention survey until several weeks into the semester, following the first intervention. Since many faculty taught growth mindset anyway, students were often exposed to the concept before the pre-intervention survey, thereby affecting data collection. As a result, it is possible that student responses reflected previous exposure to the concept, rather than accurately measuring attitudes before exposure.

Also, some students dropped the course before the first intervention, affecting student experience and data collection. If the goal of the intervention is to encourage student resilience and view challenge as a learning opportunity, students should be exposed to the intervention as soon as possible. This might change the decision of students who would consider dropping the class early in the semester. I had planned to complete faculty training in advance and start the

classroom interventions immediately—and this approach was supported in faculty feedback—but logistical concerns intervened.

Implications

In spite of the limitations described above, the results of this study yielded valuable insights into growth mindset interventions. They point to important implications for future interventions, campus-wide policies, and areas of future inquiry. I discuss each of these in turn.

Future Growth Mindset Interventions

Although this intervention was conducted in basic skills English, future interventions should be considered in mathematics courses. In fact, when evaluating the intervention, two faculty participants suggested conducting interventions in math, indicating that both students and faculty recognized that growth mindset can help students face this challenging discipline. In addition, faculty agreed on several other specific recommendations. During the focus groups and post-intervention survey, they strongly supported the new four session model. Most importantly, they unanimously identified the emphasis on neuroplasticity, specific practical strategies beyond simple optimism, and active strategies that “get students out of their seat” as most effective. In addition, they appreciated that the new model created additional class dialogue opportunities.

Intervention faculty agreed that training participants early so they could integrate the new model into their syllabi would address previous concerns about time and repetition, by decreasing the number of sessions, removing some reflection activities, and enhancing flexibility. Further, learning the strategies well in advance would allow faculty to “front-load” the interventions so students could apply and reflect on the growth mindset strategies throughout the semester. In addition, this early training would allow flexibility so faculty could adapt the material to their own needs. Faculty also recommended developing long and short versions of

each session, so that they could conduct the brief, active session similar to the approach used this time (approximately 20 minutes), or extend the dialogue (approximately 45 minutes).

Faculty participants suggested three other important changes. First, they recommended strategically timing the growth mindset sessions so they coincided with when they returned graded work to encourage students to learn from feedback and challenge. Second, they proposed creating discipline-specific activities to integrate growth mindset into particular courses (such as mind mapping paragraph development). Third, they advocated for maintaining faculty collaboration opportunities, since the reflection and strategy sharing facilitated their own growth mindset and instructional practices.

In the end, faculty endorsed the new model. Here, again, the research design proved effective because the sequential opportunities for feedback and faculty collaboration allowed me to review faculty feedback and propose a new model. In addition, on the post-intervention survey, students evaluated the session activities as useful. This corroborated the faculty view and suggested that the new model would benefit future students and faculty.

Institutional Implications

As community colleges strive to improve student success, it is important to discover cost effective methods that do not require excessive extra time (Pretlow & Wathington, 2011; Yeager & Walton, 2011). For the campus, if a series of brief interventions in one subject encourages students to adopt useful learning strategies to persist and adopt learning strategies (including intelligent practice) in other disciplines, then that would be a cost effective intervention that could be presented to students through a uniform approach.

For example, students could be exposed to growth mindset in English courses, or as part of a campus orientation process, and therefore be “inoculated” with a growth mindset approach. If an effective intervention only requires a few brief sessions, as suggested by this study, then

they would not take excessive time away from more traditional course content, and they could be presented in a variety of disciplines. As another possibility, growth mindset could be presented as part of extracurricular opportunities, such as a first year experience programs or counseling sessions. Furthermore, growth mindset training could be offered to tutors and support staff so they could encourage growth mindset in other students.

Implications for Future Growth Mindset Research

Considering the faculty and student results, this study offers several lessons for future research. Just as we can improve future interventions by adopting faculty and student recommendations, we can improve future research by reconsidering the methods and measurement tools (Ravitch & Riggin, 2012). In fact, the faculty results and recommendations combined with the mixed student results suggest ways to have a growth mindset about future growth mindset research.

This study suggests four lessons for future research involving community college faculty. First, because most faculty at Foundation College had previous exposure to growth mindset, and many already taught the concept, it is clear that future research should take into account previous faculty exposure. Then, depending on the research goals, it might be desirable to recruit and select faculty participants who are not already familiar with or practicing the concept.

Second, this study demonstrates the value of including faculty collaboration in the research design. Faculty collaboration not only benefitted the research findings (including the creation, and evaluation of the new intervention model), it also benefitted the faculty. The reflection, dialogue, and strategy sharing facilitated changes in faculty mindset, faculty views of students, and instructional practices. The collaboration also elucidated the final two lessons.

When including faculty in research it is essential to train and prepare them well before the start of the semester, so they have adequate time to integrate the material into their plans. In

addition to advance training, it is useful to prepare flexible options so faculty can adapt the material to their needs (such as the long and short session plans). Levin et al. (2010) argued that including faculty in change is one of the “promising practices” to create successful community college initiatives. This study supports that claim, since the faculty participants are all now embedding growth mindset into their courses, and some are also working towards institutionalization. The faculty were motivated in part by the increased engagement, help-seeking behaviors, and student performance they observed.

Another area to consider in future research is the course completion and course success data. In this study, the Colonial College intervention courses had high course retention and success rates. This was not significantly better, however, than the comparison classes. Both groups achieved excellent results, so it is hard to create significant improvement. Thus, future research should examine courses that offer grades to allow more robust analysis of how growth mindset effects student performance. Future studies should consider classes that have lower course retention and success rates. This would create an opportunity to change student outcomes more, and, if successful, improve student success more.

Perhaps, as I have suggested elsewhere, future research could consider basic skills math courses. For example, Paunesku (2013) found that community college basic skills math students who participated in the online growth mindset intervention were more likely to earn a passing grade than the control group. Further, he found that the intervention decreased “the rate of unsatisfactory math course completion by 13.3%” (p. 87). It would be worthwhile to build on this study to deepen our understanding of the potential for growth mindset to improve student outcomes in these essential classes.

During this study, two faculty discussed the difficulty of measuring the effects of growth mindset. For example, Faculty A shared concerns about using course success to measure growth mindset. She suggested that “even if that student has failed my class” they could “clearly succeeded in important ways if she can actively apply a growth mindset in the face of challenges.” Sometimes, growth mindset is most useful when students fail, if they respond to the challenge and improve. Since research suggests that growth mindset can improve student persistence, future research could follow students over time to measure persistence. This research could measure if students who pass then enroll in the next class and succeed. It could also measure how students who encounter failure respond over the subsequent classes. A long-term research design could also examine if students report sustaining the types of changes reported in this study through process data (Donohoe et al., 2012).

As noted above, some students moved from “growth” to “more growth” on their mindset measurement. At present, the literature does not address whether moving to a higher growth score changes other outcomes. It is worth exploring this topic, in part to determine the extent of resources that should be invested in growth mindset interventions.

It is worth noting that there were no significant differences in the growth mindset measure across gender, race/ethnicity, or semesters enrolled. In other words, the intervention seemed to influence all student participants similarly. It would be worthwhile to focus in on student demographics more specifically, in order to understand whether there are subtle differences that were not detected in the current research.

Final Remarks

After participating in the intervention, faculty embraced growth mindset and plan to make this a fundamental element of their teaching. Through reflection and collaboration, they created new assignments, developed new grading practices, and they continue to advocate for

future collaboration and even institutionalization. After participating in the intervention, students also adopted a more growth mindset and reported using increased effort and learning strategies. Many students also reported a new growth mindset approach to challenge, including learning from feedback and failure. Further, after the intervention, students reported transferring growth mindset, which could make this a cost effective student success strategy. Community college students, especially basic skills students, often experience academic challenges. Therefore, promoting growth mindset is way to encourage resilience as they face these learning opportunities. Based on these results, especially the finding that students transfer growth mindset attitudes and approaches, future research should examine the long-term effects in students' mindset, behaviors and course outcomes. Also, based on these results, professional learning to promote growth mindset should provide faculty with specific strategies, and encourage reflection and collaboration.

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Appendix A

Faculty Notation Model

Faculty (Fall 2014)

Group A 0³--0⁴--X⁵--0⁶--X⁷--0⁸--X⁹--0¹⁰--X¹¹--X¹²--0¹³--X¹⁴--0¹⁵--0¹⁶--X¹⁷--0¹⁸--0¹⁹
 Group B 0^a-----0^b

X = Exposure to an experimental variable, the effects of which are to be measured

0 = Observation or measurement

(Campbell and Stanley [1963] notation model, as explained by Creswell [2014] p. 171.)

³ Faculty Intervention Pre-Survey (Qualtrix Survey and Mindset Survey) (8/25–9/15)

⁴ Faculty Pre-Intervention Focus Group and Faculty Training A
 (Growth Mindset Sessions 1-3) (9/5–9/16)

⁵ Faculty Present Session 1

⁶ Faculty Session 1 Reflection

⁷ Faculty Present Session 2

⁸ Faculty Session 2 Reflection

⁹ Faculty Present Session 3

¹⁰ Faculty Session 3 Reflection

¹¹ Faculty Training B (Growth Mindset Sessions 4-6) (9/30–10/17)

¹² Faculty Present Session 4

¹³ Faculty Session 4 Reflection

¹⁴ Faculty Present Session 5

¹⁵ Faculty Session 5 Reflection

¹⁶ Faculty Interview (11/11–11/21)

¹⁷ Faculty Present Session 6

¹⁸ Faculty Session 6 Reflection

¹⁹ Faculty Post-Intervention Focus Group (Mindset Survey) (12/5–12/8, 1/23, 2/17)

^a Faculty Comparison Group Pre-Survey (Qualtrix Survey and Mindset Survey)

^b Faculty Comparison Group Post Survey (Qualtrix Survey and Mindset Survey)

Appendix B

Student Notation Model

Student (Fall 2014)

Group A 0²⁰--X²¹--0²²--X²³--0²⁴--X²⁵--O²⁶--X²⁷--0²⁸--X²⁹--0³⁰--X³¹--0³²--0³³--0³⁴
 Group B 0^d-----0^e--0^f

X = Exposure to an experimental variable, the effects of which are to be measured
 0 = Observation or measurement

(Campbell and Stanley [1963] notation model, as explained by Creswell [2014], p. 171.)

-
- ²⁰ Student Pre-Survey
 - ²¹ Session 1
 - ²² Session 1 Student Response Sheet
 - ²³ Session 2
 - ²⁴ Session 2 Student Response Sheet
 - ²⁵ Session 3
 - ²⁶ Session 3 Student Response Sheet
 - ²⁷ Session 4
 - ²⁸ Session 4 Student Response Sheet
 - ²⁹ Session 5
 - ³⁰ Session 5 Student Response Sheet
 - ³¹ Session 6
 - ³² Session 6 Student Response Sheet
 - ³³ Student Post-Survey
 - ³⁴ Student Course Completion & Success, Data Collection
 - ^d Student Pre-Survey
 - ^e Student Post Survey
 - ^f Student Course Completion & Success Data Collection

Appendix C

Faculty Recruitment Letter

My name is Miguel Powers and I am an English Professor and a graduate student in the UCLA Educational Leadership Program. I would like to invite you to participate in a growth mindset study in the fall.

Growth Mindset: A Growing Solution for Fixing Education?

How can incorporating growth mindset strategies improve learning strategies and help students respond to educational challenges? With growth mindset, students believe that intelligence can grow with effort and view challenges as learning opportunities.

Although several studies demonstrate that teaching Carol Dweck's growth mindset can change student behavior and improve student success, there is scant research regarding community college students, and less on faculty.

Last year, my UCLA partner and I conducted a successful pilot study at Foundation College (English) and Western College (English, ESL and Math), which showed improved course retention, course success and student resource use.

Building on this pilot study, as part of my sabbatical and my UCLA dissertation, this new study will examine how growth mindset interventions influence student success, effort, and resource use. Faculty who join the study will be trained to conduct six (6) brief interventions in one section of English 60 over the course of the semester. Each session takes approximately 20 minutes.

In total, students will use three hours of their scheduled class time. Students will complete a pre-intervention survey (30 minutes) and a post-intervention survey (30 minutes). Students will also complete six sessions, each twenty minutes long. These sessions will be conducted during their regular class time. This will take three hours over the course of the 16 week semester, however it will not require any time beyond the existing course. In addition, students who agree to participate in a focus group will give an additional two hours.

Faculty will participate for approximately 20–25 hours over the Fall 2014 semester. The initial training (3–4 hours) and pre-survey (30 minutes) will be in August. The additional trainings (3 hours each) and session presentations (20 minutes each) will be spaced out over the first twelve weeks of the semester. The individual interview (1 hour) and the reflections (20 minutes each) will be spread throughout the semester. The final post-intervention survey (30–40 minutes) and faculty post-intervention focus group (2 hours) will be in the final weeks of the semester.

There is considerable interest in this approach. For example, based on our earlier action research, my partner and I have been hired by the statewide community college network (3CSN) to conduct a cross-disciplinary community of practice, training faculty to use growth mindset in their classes.

If you are interested, or have questions, please let me know. I appreciate your time and I look forward to hearing from you.

Gratefully,
Miguel Powers



Student drawing
from the Pilot
Study.

Appendix D

Faculty Consent Form

University of California, Los Angeles
CONSENT TO PARTICIPATE IN RESEARCH
Colonial College Faculty Participants
Growth Mindset: A Growing Solution for Fixing Education?

Miguel Powers, as part of a dissertation, and Professor Christina Christie, as faculty sponsor, from the Educational Leadership Program at the University of California, Los Angeles (UCLA) are conducting a research study. Your decision whether or not to participate will not adversely affect your relationship with Colonial College

You were selected as a possible participant in this study because you teach English 60: Preparation for College Writing. Your participation in this research study is voluntary.

Why is this study being done?

This dissertation studies the effects of a growth mindset intervention on community college faculty and students. For over twenty years, Carol Dweck and others have documented growth mindset as an effective strategy to improve educational outcomes. However, there is very little research for community college students, and less for faculty. This specific study builds on a successful community college pilot study and uses six brief classroom sessions to help students adopt a growth mindset.

What will happen if I take part in this research study?

If you volunteer to participate in this study, the researcher will ask you to do the following:

- Attend three faculty training sessions covering growth mindset and the six brief classroom sessions.
 - The sessions will be held at Colonial College**
- Complete an online pre-intervention survey, exploring
 - your previous knowledge of growth mindset*
 - and your current instructional practices.**
- Present six brief (approximately 20 minutes each) growth mindset sessions in one section of English 60
 - The first session will be presented in the first two weeks of class*
 - Additional sessions will be presented approximately every two weeks**
- Complete online reflections after training sessions and classroom presentations*
- Participate in an individual interview scheduled at your convenience and held at Colonial College*
- Complete an online post-intervention survey, exploring
 - your current knowledge and perceptions of growth mindset,*
 - your current instructional practices**

- *and if you have have adopted growth mindset practices.*
- *Participate in a post-intervention faculty focus group held at Colonial College, further examining the online post-intervention survey responses on*
 - *your current knowledge and perceptions of growth mindset*
 - *your current instructional practices*
 - *and if you have have adopted growth mindset practices.*
- *Half the initial participants will be randomly assigned to a control group*
 - *Control group faculty will only complete the online pre- and post-intervention surveys in the fall semester*
 - *Control group faculty will be eligible for the full training in the spring semester, if they wish*

How long will I be in the research study?

Participation will take a total of about *twenty to twenty-five hours over the Fall 2014 semester. The initial training (3–4 hours) and pre-survey (30 minutes) will be in August. The additional trainings (3 hours each) and session presentations (20 minutes each) will be spaced out over the first twelve weeks of the semester. The individual interview (1 hour) and the reflections (20 minutes each) will be spread throughout the semester. The final post-intervention survey (30–40 minutes) and faculty post-intervention focus group (2 hours) will be in the final weeks of the semester.*

Are there any potential risks or discomforts that I can expect from this study?

- *There are no anticipated risks or discomforts.*

Are there any potential benefits if I participate?

You may benefit from the study by learning about growth mindset, and specific instructional practices. Further, you may benefit from the shared dialogue with other teachers. All six pilot study participants indicated that they would continue to use growth mindset in their future teaching practices.

The results of the research may improve student course completion and course success rates as well as improve student resource use. If implementing growth mindset in basic skills courses improves student success rates, it will benefit the individual students who progress more quickly to transfer level courses, as well as community colleges and the taxpayers who support them.

Will I be paid for participating?

- You will receive a \$25 dollar gift card for your participation, at the conclusion of the fall semester

Will information about me and my participation be kept confidential?

Any information that is obtained in connection with this study and that can identify you will remain confidential. It will be disclosed only with your permission or as required by law. Confidentiality will be maintained by means of pseudonyms for individual participants and for the campus. During the faculty focus groups, all participants will be asked to keep what is said during the group discussion between participants only. However, complete confidentiality cannot be guaranteed.

All audio recordings will be transcribed and both the original audio files and the transcripts will be kept on a secure, password protected electronic device. Only the primary researcher and the supervising UCLA professor will have access to these files. However, you have the right to review the tapes and the transcripts made as part of the study to determine whether they should be edited or erased in whole or in part.

On the checklist at the end of this consent form, you will be asked to indicate if you would permit the researcher to include transcripts of your written responses, individual interviews, focus group participation, and classroom observations to be used for articles and conference presentations.

What are my rights if I take part in this study?

- You can choose whether or not you want to be in this study, and you may withdraw your consent and discontinue participation at any time.
- Whatever decision you make, there will be no penalty to you, and no loss of benefits to which you were otherwise entitled.
- You may refuse to answer any questions that you do not want to answer and still remain in the study.

Who can I contact if I have questions about this study?

- **The research team:**

If you have any questions, comments or concerns about the research, you can talk to the one of the researchers. Please contact:

Miguel Powers at mpowers@fullcoll.edu

Or

Christina Christie at 310.825.0432 or tina.christie@ucla.edu

- **UCLA Office of the Human Research Protection Program (OHRPP):**

If you have questions about your rights while taking part in this study, or you have concerns or suggestions and you want to talk to someone other than the researchers about the study, please call the OHRPP at (310) 825-7122 or write to:

UCLA Office of the Human Research Protection Program
11000 Kinross Avenue, Suite 211, Box 951694
Los Angeles, CA 90095-1694

You will be given a copy of this information to keep for your records.

Checklist

Please check the appropriate box below and initial:

___ I agree to allow transcripts of my written responses, individual interviews, and focus group participation to be used for this study and future research, including articles and conference presentations.

___ I do NOT agree to allow transcripts of my written responses, individual interviews, and focus group participation to be used for this study and future research, including articles and conference presentations.

SIGNATURE OF STUDY PARTICIPANT

Name of Participant

Signature of Participant

Date

Appendix E
Pre-Intervention Faculty Qualtrix Survey

Q1: What is your first name?

Q2: Briefly describe a typical class session.

Q3: Do you incorporate any non-cognitive aspects (such as mindset, study skills, or motivation) into your course? If so, please describe.

Q4: How do you define intelligence?

Q5: Some people consider intelligence to be fixed (like a person's height) or capable of growth (like a person's bicep). Which view do you take and why?

Q6: How do you think your students view intelligence – is it fixed or growth? Please explain/describe.

Q7: Briefly describe what you know about Carol Dweck's growth mindset model.

Q8: Please discuss any concerns or questions about implementing the growth mindset intervention in your class section.

Q9: What support would help you to implement the growth mindset intervention in your class? Please explain.

Appendix F **Pre-Intervention Faculty Mindset Survey**

Name: _____

Years Teaching at Current College: _____

Total Years Teaching: _____

Read each statement. Circle the number that matches how strongly you agree, or disagree, with each statement.

STRONGLY AGREE	AGREE			DISAGREE	STRONGLY DISAGREE
1	2	3	4	5	6

Circle One Number for Each Item

1. You have a certain amount of intelligence and you really can't do much to change it.	1	2	3	4	5	6
2. Your intelligence is something that you can't change very much.	1	2	3	4	5	6
3. You can learn new things but you can't really change your basic intelligence.	1	2	3	4	5	6

Pre-Intervention Faculty Mindset Survey (cont.)

Read each statement. Circle the number that matches how strongly you agree, or disagree, with each statement.

STRONGLY DISAGREE	DISAGREE			AGREE	STRONGLY AGREE
1	2	3	4	5	6

Circle One Number for Each Item

4. I am likely to ask others for help.	1	2	3	4	5	6
5. I have to work hard at school, which means I am not smart.	1	2	3	4	5	6
6. I consider a challenge an opportunity to learn.	1	2	3	4	5	6
7. I learn from criticism.	1	2	3	4	5	6
8. I avoid difficult challenges.	1	2	3	4	5	6
9. I am inspired by the success of others.	1	2	3	4	5	6
10. I ignore negative feedback.	1	2	3	4	5	6
11. I use effort to overcome challenges.	1	2	3	4	5	6
12. I use Intelligent Practice, which is “Effort + Good Strategies + Help From Others.”	1	2	3	4	5	6

Appendix G

Pre-Intervention Focus Group Protocol

Ask permission to record.

Question Type	Question	Follow-up/Probe
Welcome Introduction – topic and norms	Cell phones, comfortable exploring this as faculty collaborators.	
Opening Question (Warm up-ice breaker-sense of community)	Please tell us your name, and one of your favorite educational experiences (either as a student or as a teacher).	
Introductory Question (General topic of discussion—open ended-speak about how you see the subject)	When did you first hear about growth mindset, and what was your initial reaction? Or, What made you want to join the growth mindset intervention?	
Transition (Easy discussion questions—envision the topic in broader scope, logical link from intro to key questions)	How do you see non-cognitive skills fitting into your course?	Probe: Tell us about one specific way you integrate non-cognitive skills into your Basic Skills English course.
Key Question (Usually 2–5 key, controversial or difficult questions—up to 15 min each, spend most of the time here, be prepared with probes and use pauses, start about 1/3 of the way through the session)	In the survey, many of you explained that you have moved from a fixed mindset about intelligence to a growth mindset about intelligence. Question: When did that happen and what helped you make that change?	What influences or factors went into your definition of intelligence?

Pre-Intervention Focus Group Protocol (cont.)

Question Type	Question	Follow-up/Probe
Key Question Present stimulus— earlier survey questions on the handout: <u>Survey Question 4:</u> <u>How do you define</u> <u>intelligence?</u> <u>Survey Question 5:</u> <u>How you do you think</u> <u>your students view</u> <u>intelligence—is it fixed</u> <u>or growth? Please</u> <u>explain/describe.</u>	In your surveys, as a group, you have a growth mindset about intelligence. However, as a group, you think students have a fixed mindset about intelligence. Why do you think there is such a contrast between the faculty growth mindset and the student fixed mindset?	
Key Question	What can faculty do to encourage students to take a growth mindset, rather than a fixed mindset?	Why does student mindset matter? How does faculty mindset matter?
Key Question	As we prepare to develop and implement the growth mindset intervention, what are your personal concerns and what can we do to help you be successful?	
Facilitator Summary	Facilitator gives brief oral summary-presenting key points and checking adequacy of summary with the group members (2–3 Min).	How well does that capture what we have said here today? Are there points you would like to clarify or add?
Ending Question (All things considered, summary, final, could be written, bring closure, encourage reflection and critical analysis)	Is there anything that we should have talked about and we didn't?	
Wrap-up/Thank you.		

Appendix H
Growth Mindset Research Study
Student Recruitment Announcement
(Read to the class by the faculty member)

I have agreed to participate in a growth mindset research study. For over twenty years, Carol Dweck and others have documented growth mindset as an effective strategy to help students succeed.

However, there is very little research for community college students. This specific study builds on a successful community college pilot study and uses six brief classroom sessions to help students adopt a growth mindset.

As a student in this class, you can choose to participate. The whole study will take place during our regular class time. Together, we will learn about growth mindset. The sessions describe how your brain learns and suggest learning strategies.

I will pass out and collect a consent form with more details, and I will try to answer any questions you might have.

Appendix I
Student Consent Form
University of California, Los Angeles
CONSENT TO PARTICIPATE IN RESEARCH
Colonial College Student Participants

Growth Mindset: A Growing Solution for Fixing Education?

Miguel Powers, as part of a dissertation, and Professor Christina Christie, as faculty sponsor, from the Educational Leadership Program at the University of California, Los Angeles (UCLA) are conducting a research study. Your decision whether or not to participate will not adversely affect your relationship with Colonial College, or your grade in this course.

You were selected as a possible participant in this study because *you are enrolled in a section of English 60: Preparation for College Writing with a faculty member who is participating in this study*. Your participation in this research study is voluntary. If you do not wish to participate in the study, your grade will not be affected, you will remain in the class and do not need to submit the study paperwork. If you wish, an alternative assignment can be provided during the brief classroom sessions.

Why is this study being done?

This dissertation studies the effects of a growth mindset intervention on community college faculty and students. For over twenty years, Carol Dweck and others have documented growth mindset as an effective strategy to improve educational outcomes. However, there is very little research for community college students, and less for faculty. This specific study builds on a successful community college pilot study and uses six brief classroom sessions to help students adopt a growth mindset.

What will happen if I take part in this research study?

If you volunteer to participate in this study, the researcher will ask you to do the following:

- *Complete a pre-intervention survey, reporting*
 - *your basic demographic information (age, gender, previous coursework, etc.)*
 - *your previous knowledge of growth mindset*
 - *your current learning strategies*
 - *and your current resource use.*
- *Participate in six brief (approximately 20 minutes each) growth mindset sessions in your section of English 60*
 - *The first session will be presented in the first two weeks of class*
 - *Additional sessions will be presented approximately every two weeks*
 - *During each session, you will complete a brief student response sheet (approximately 3–5 questions).*

- *Complete a post-intervention survey, exploring*
 - *your current knowledge and perceptions of growth mindset*
 - *your current learning strategies*
 - *your current resource use*
 - *and if you have have adopted growth mindset practices.*

How long will I be in the research study?

In total, students will use three hours of their scheduled class time. Students will complete a pre-intervention survey (30 minutes) and a post-intervention survey (30 minutes). Students will also complete six sessions, each twenty minutes long. These sessions will be conducted during regular class time. This will take three hours over the course of the 16 week semester, however it will not require any time beyond the existing course.

In addition, students who agree to participate in a focus group will give an additional two hours. Your decision whether or not to volunteer for the student focus groups will not adversely affect your participation in the study, or your grade in this course.

Are there any potential risks or discomforts that I can expect from this study?

- *There are no anticipated risks or discomforts.*

Are there any potential benefits if I participate?

You may benefit from the study by learning about growth mindset and specific learning strategies.

The results of the research may improve student course completion and course success rates as well as improve student resource use. If implementing growth mindset in basic skills courses improves student success rates, it will benefit the individual students who progress more quickly to transfer level courses, as well as community colleges and the taxpayers who support them.

Will information about me and my participation be kept confidential?

Any information that is obtained in connection with this study and that can identify you will remain confidential. It will be disclosed only with your permission or as required by law. Confidentiality will be maintained by means of using only the class letter and the student roster number, provided by your faculty member, to identify student written responses. Names will not be included on individual written responses. Written responses will be kept in a locked cabinet.

On the checklist at the end of this consent form, you will be asked to indicate if you would permit the researcher to include transcripts of your written responses, identified only by the class and roster number, to be used for this study and future research, including articles and conference presentations.

What are my rights if I take part in this study?

- You can choose whether or not you want to be in this study, and you may withdraw your consent and discontinue participation at any time.
- Whatever decision you make, there will be no penalty to you, and no loss of benefits to which you were otherwise entitled.
- You may refuse to answer any questions that you do not want to answer and still remain in the study.

Who can I contact if I have questions about this study?

- **The research team:**

If you have any questions, comments or concerns about the research, you can talk to the one of the researchers. Please contact:

Miguel Powers at mpowers@fullcoll.edu

Or

Christina Christie at 310.825.0432 or tina.christie@ucla.edu

- **UCLA Office of the Human Research Protection Program (OHRPP):**

If you have questions about your rights while taking part in this study, or you have concerns or suggestions and you want to talk to someone other than the researchers about the study, please call the OHRPP at (310) 825-7122 or write to:

UCLA Office of the Human Research Protection Program
11000 Kinross Avenue, Suite 211, Box 951694
Los Angeles, CA 90095-1694

You will be given a copy of this information to keep for your records.

Checklist

Please check the appropriate box response and sign:

- ☐ I agree to allow transcripts of my written responses, identified only by the class and roster number, to be used for this study and future research, including articles and conference presentations.
- ☐ I do NOT agree to allow transcripts of my written responses, identified only by the class and roster number, to be used for this study and future research, including articles and conference presentations.

SIGNATURE OF STUDY PARTICIPANT

Name of Participant

Signature of Participant

Date

Appendix J
Student Pre-Intervention Survey

Class _____

Student Roster # _____

Mindset Survey

Instructions: Please complete the following survey. Please write your class and roster number, as instructed by your faculty member. You will only be identified by this roster number and your name will not be included with your response. Your answers will be confidential, to the extent allowed by law. Your accurate, honest answers are very important for research purposes. Thank you for your participation.

1. What is your gender?
 - a. Male
 - b. Female
 - c. Other
2. What is your age?
 - a. Under 18
 - b. 18–22
 - c. 23–27
 - d. 28–32
 - e. 33 or above
3. What is your race/ethnicity?
 - a. African-American
 - b. American Indian/Alaska Native
 - c. Asian
 - d. Filipino
 - e. Hispanic
 - f. Pacific Islander
 - g. White
 - h. Two or More Races
4. How many semesters have you completed at the college?
 - a. It's my first semester.
 - b. I have completed 1–2 semesters.
 - c. I have completed 3–4 semesters.
 - d. I have completed 5–6 semesters.
 - e. I have completed more than 6 semesters.

Student Pre-Intervention Survey (cont.)

5. How many classes are you taking this semester?
 - a. I am taking 1 class this semester.
 - b. I am taking 2 classes this semester.
 - c. I am taking 3 classes this semester.
 - d. I am taking 4 classes this semester.
 - e. I am taking 5 classes this semester.
 - f. I am taking more than 5 classes this semester.
6. Is this your first time taking this class?
 - a. Yes
 - b. No
7. What is your major? _____
8. Have you ever taken any classes at any other community colleges?
 - a. Yes
 - b. No

Read each statement. Circle the number that matches how strongly you agree, or disagree, with each statement.

STRONGLY AGREE	AGREE			DISAGREE	STRONGLY DISAGREE
1	2	3	4	5	6

Circle One Number for Each Item

9. You have a certain amount of intelligence and you really can't do much to change it.	1	2	3	4	5	6
10. Your intelligence is something that you can't change very much.	1	2	3	4	5	6
11. You can learn new things but you can't really change your basic intelligence.	1	2	3	4	5	6

Student Pre-Intervention Survey (cont.)

Read each statement. Circle the number that matches how strongly you agree, or disagree, with each statement.

STRONGLY DISAGREE	DISAGREE			AGREE	STRONGLY AGREE
1	2	3	4	5	6

Circle One Number for Each Item

12. I am likely to ask others for help.	1	2	3	4	5	6
13. I have to work hard at school, which means I am not smart.	1	2	3	4	5	6
14. I consider a challenge an opportunity to learn.	1	2	3	4	5	6
15. I learn from criticism.	1	2	3	4	5	6
16. I avoid difficult challenges.	1	2	3	4	5	6
17. I am inspired by the success of others.	1	2	3	4	5	6
18. I ignore negative feedback.	1	2	3	4	5	6
19. I use effort to overcome challenges.	1	2	3	4	5	6
20. I use Intelligent Practice, which is “Effort + Good Strategies + Help From Others.”	1	2	3	4	5	6
21. I give up when I struggle.	1	2	3	4	5	6
22. I am motivated to improve in school.	1	2	3	4	5	6
23. I expect to pass this course.	1	2	3	4	5	6

Student Pre-Intervention Survey (cont.)

Read each statement. Circle the number that matches how frequently you sought help from that source in the last two weeks.

IN THE PAST TWO WEEKS, I SOUGHT HELP FROM					
24. An Instructor	0 times	1–2 times	3–4 times	5–6 times	7 or more times
25. Classmates	0 times	1–2 times	3–4 times	5–6 times	7 or more times
26. A Study Group	0 times	1–2 times	3–4 times	5–6 times	7 or more times
27. Family Members	0 times	1–2 times	3–4 times	5–6 times	7 or more times
28. Friends (not in my class)	0 times	1–2 times	3–4 times	5–6 times	7 or more times
29. The Math Lab	0 times	1–2 times	3–4 times	5–6 times	7 or more times
30. The Writing Center	0 times	1–2 times	3–4 times	5–6 times	7 or more times
31. A Tutor	0 times	1–2 times	3–4 times	5–6 times	7 or more times
32. The Library	0 times	1–2 times	3–4 times	5–6 times	7 or more times
33. Online Videos	0 times	1–2 times	3–4 times	5–6 times	7 or more times
34. Other: (Please describe)	0 times	1–2 times	3–4 times	5–6 times	7 or more times

Student Pre-Intervention Survey (cont.)

Circle the number that indicates how useful you found each resource, with 1 being not useful and 6 being extremely useful. Useful means it helped you achieve your academic goal. If you did not use a resource, please circle NA.

I DID NOT USE THIS RESOURCE	NOT USEFUL						EXTREMELY USEFUL
NA	1	2	3	4	5	6	

Circle One Answer for Each Item

35. An Instructor	NA	1	2	3	4	5	6
36. Classmates	NA	1	2	3	4	5	6
37. A Study Group	NA	1	2	3	4	5	6
38. Family Members	NA	1	2	3	4	5	6
39. Friends (not in my class)	NA	1	2	3	4	5	6
40. The Math Lab	NA	1	2	3	4	5	6
41. The Writing Center	NA	1	2	3	4	5	6
42. A Tutor	NA	1	2	3	4	5	6
43. The Library	NA	1	2	3	4	5	6
44. Online Videos	NA	1	2	3	4	5	6
45. Other: (Please describe)	NA	1	2	3	4	5	6

Appendix K

Faculty Interview Protocol

Ask permission to record.

Question Type	Question	Follow up / Probe
Welcome Introduction – topic and norms	Cell phones, comfortable exploring this as faculty collaborators.	
Opening Question (Warm up, ice breaker, sense of community)	Reflecting on the time since we began the project, can you share one specific experience where you personally used a growth mindset?	Did you consciously use a growth mindset, or did you only realize you used a growth mindset after the experience?
Introductory Question (General topic of discussion, open ended, speak about how you see the subject)	How would you describe the growth mindset experience to a colleague?	
Transition (Easy discussion questions—envision the topic in broader scope, logical link from intro to key questions)	As a result of our project, how has your view of growth mindset changed?	Can you tell me about a specific personal example? If not, why not?
Transition	As a result of our growth mindset project, how have you changed your instructional practices?	What, if any, specific changes have you made and why? What specific changes might you make in the future? And why? If not, why not? What are the goals or guidelines for integrating growth mindset in a course?

Faculty Interview Protocol (cont.)

Question Type	Question	Follow up / Probe
Key Questions (Usually 2–5 key, controversial or difficult questions, up to 15 min each, spend most of your time here, be prepared with probes and use pauses, start about 1/3 of the way through the session)	How have you applied growth mindset beyond the intervention class (either in other classes or other settings)?	Can you share an example and explain any influence from our growth mindset project? If not, why not?
Key Questions	In your view, have the growth mindset activities changed student attitudes or behaviors? Can you explain?	Can you tell me about a specific instance? If not, why not?
Key Questions	In your view what were the most effective intervention activities? Why?	
Key Questions	In your view, what were the least effective intervention activities? Why?	What suggestions would you make?
Facilitator Summary: (Facilitator gives a brief oral summary-presenting key points and checking adequacy of summary with the group members (2–3 min.))		
Ending Question: (All things considered, summary, final could be written, bring closure, encourage reflection and critical analysis)	Is there anything we should have discussed that we haven't or anything else you would like to share?	
Wrap-up thank you		

Appendix L
Post-Intervention Faculty Mindset Survey

Name: _____

Read each statement. Circle the number that matches how strongly you agree, or disagree, with each statement.

STRONGLY AGREE	AGREE			DISAGREE	STRONGLY DISAGREE
1	2	3	4	5	6

Circle One Number for Each Item

1. You have a certain amount of intelligence and you really can't do much to change it.	1	2	3	4	5	6
2. Your intelligence is something that you can't change very much.	1	2	3	4	5	6
3. You can learn new things but you can't really change your basic intelligence.	1	2	3	4	5	6

Post-Intervention Faculty Mindset Survey (cont.)

Read each statement. Circle the number that matches how strongly you agree, or disagree, with each statement.

STRONGLY DISAGREE	DISAGREE			AGREE	STRONGLY AGREE
1	2	3	4	5	6

Circle One Number for Each Item

4. I am likely to ask others for help.	1	2	3	4	5	6
5. I have to work hard at school, which means I am not smart.	1	2	3	4	5	6
6. I consider a challenge an opportunity to learn.	1	2	3	4	5	6
7. I learn from criticism.	1	2	3	4	5	6
8. I avoid difficult challenges.	1	2	3	4	5	6
9. I am inspired by the success of others.	1	2	3	4	5	6
10. I ignore negative feedback.	1	2	3	4	5	6
11. I use effort to overcome challenges.	1	2	3	4	5	6
12. I use Intelligent Practice, which is “Effort + Good Strategies + Help From Others.”	1	2	3	4	5	6
13. Based on the growth mindset experience, I have changed my instructional practices.	1	2	3	4	5	6
14. Based on the growth mindset experience I have transferred growth mindset practices to other classes.	1	2	3	4	5	6
15. Based on the growth mindset experience I have transferred growth mindset practices to non-academic activities.	1	2	3	4	5	6
16. As a result of the growth mindset experience, I have observed my students using additional resources.	1	2	3	4	5	6

Appendix M

Post-Intervention Faculty Focus Group Protocol

Focus Group Goals:

- Explore the themes raised in the post-intervention online faculty survey
- Explore what comes next

Waiting Period: Paperwork

Please review the Faculty Interview Preliminary Findings Handout.

Please think about “How would you describe the Growth Mindset experience to a colleague?”

Please complete the Post-Intervention Faculty Mindset Survey (includes the 3-question tool).

Ask permission to record

Question Type	Question	Follow up / Probe
Welcome Introduction – topic and norms	Cell phones, all get a chance to talk – comfortable exploring this as faculty collaborators.	
Opening Question (Warm up-ice breaker-sense of community)	Please start with your name. Please share the best educational advice you ever received. Please remember to <u>start with your name</u> , so you can be identified on the recording.	
Introductory Question (General topic of discussion-open ended—speak about how you see the subject)	How would you describe the growth mindset experience to a colleague?	
Transition (Easy discussion questions—envision the topic in broader scope, logical link from intro to key questions)	Take a minute to review the <u>Faculty Interview Preliminary Findings</u> . What information stands out to you and why?	(Record on the board/poster, look for patterns.)

Post-Intervention Faculty Focus Group Protocol (cont.)

Question Type	Question	Follow-up/Probe
Key Questions (Usually 2–5 key, controversial or difficult questions, up to 15 min each, spend most of your time here, be prepared with probes and use pauses, start about 1/3 of the way through the session)	In number 5 (highlighted) 3 of 9 faculty reported changing their view of students as a result of growth mindset. For example, one faculty member described changing her view of students who were not improving. Before, she would just “write them off,” but now she says <i>“But I think now I’m at least I am trying to be a little more in a place of ‘I don’t know.’ I just really don’t know what is going on and if this isn’t working (laughs) I need to find some other way to get through instead of just assuming that they are tuning me out, or they’re hopeless (laughs). So umm, yeah. But it is definitely a process. It is very much a process.”</i> She talked about changing her mental “script” in how she thinks about and engages her struggling students.	<u>See next page for participant copy.</u> Question: Has our growth mindset experience changed how you think about your students? And if so, in what ways?
Key Questions	Take a minute to focus on #9, the most effective intervention activities.	What made them effective? What suggestions would you make based on your observations? (Record on the board/poster, look for patterns.)
Key Questions	Since, in number 7, all faculty (9/9) discussed plans to integrate growth mindset into their instructional practice in the future, how can we foster an environment of growth mindset? How would you recommend integrating growth mindset in the future?	What are the goals or guidelines for integrating growth mindset into the course?

Post-Intervention Faculty Focus Group Protocol (cont.)

Question Type	Question	Follow-up/Probe
Key Questions	What growth mindset <u>grading and feedback</u> practices support a growth mindset in students?	Review the <u>Reflection Station</u> document from the state community of practice. Look at the 5 most common responses. Which, if any, of the growth mindset strategies identified in the state community of practice would you use in the future? Why?
Key Questions	After reviewing the draft of new the Growth Mindset Plan, what are your thoughts about the new 4 -ession plan?	
	What role can faculty play in developing the growth mindset material?	What types of professional development or training would you like going forward?
Key Questions	How would you balance data collection and instruction?	
Facilitator Summary: (Facilitator gives a brief oral summary-presenting key points and checking adequacy of summary with the group members [2–3 min.])		
Ending Question: (All things considered, summary, final could be written, bring closure, encourage reflection and critical analysis)		
Wrap-up/Thank you		

Appendix N

Post-Intervention Focus Group Interview Preliminary Findings Handout

During individual interviews, faculty participants:		
Action	Subset of Action	Results
1. Identified specific examples of using growth mindset since we began the project		9/9
	Described their use of growth mindset as conscious or deliberate	7/9
2. Transferred growth mindset practices to their personal lives		9/9
	Described transferring growth mindset practices to other classes beyond the intervention class	7/9
	Described applying growth mindset strategies to their own learning	5/9
	Described using growth mindset to seek help from others in their teaching	2/9
3. Said that they enjoyed the growth mindset project experience		8/8
4. Described using growth mindset language with students		9/9
5. Changed (or strengthened) their views of growth mindset		9/9
	Including 3/9 who changed their view of students as a result of the growth mindset project	
6. Changed their instructional practices as a result of the growth mindset project		6/9
7. Described plans to change instructional practices in the future		9/9
8. Reported changes in student attitudes or behaviors		9/9

Post-Intervention Focus Group Interview Preliminary Findings Handout (cont.)

Action	Subset of Action	Results
9. Frequently identified the following as among the most effective intervention activities	Cotton Ball/Cups/Brain Discussion	6
	Mind Mapping	5
	Vote with Your Feet	4
	Number Order Sequencing	4
	Neuron MIT Video	3
	MRI Scan	2
10. Frequently identified the following as among the least effective intervention activities	“You Can Grow Your Brain” article in Session 2	3
	Yellow Memory Partial Outline in Session 4	2

Example of changing views of students as a result of our growth mindset experience:

In number 5 (highlighted) 3 of 9 faculty reported changing their view of students as a result of growth mindset. For example, one faculty member described changing her view of students who were not improving. Before, she would just “write them off,” but now she says

But I think now I’m at least I am trying to be a little more in a place of “I don’t know.” I just really don’t know what is going on and if this isn’t working (laughs), I need to find some other way to get through instead of just assuming that they are tuning me out, or they’re hopeless (laughs). So umm, yeah. But it is definitely a process. It is very much a process.

She talked about changing her mental “script” in how she thinks about and engages her struggling students.

Question:

Has our growth mindset experience changed how you think about your students? And, if so, in what ways?

Appendix O

Post-Intervention Focus Group Grading and Feedback Handout

Reflection Station Growth Mindset Feedback and Grading Practices participant responses during Strengthening Student Success Cultivating a Growth Mindset Post-Conference Session (10.10.2014).

PROMPT:

As many of you have mentioned in previous comments, faculty grading and feedback are crucial in instilling and supporting a growth mindset.

Therefore, please reflect on your own practices, the best practices of others, your research, and even new ideas we might consider to answer the following question:

What grading and feedback practices support a growth mindset in students?

FINDINGS:

Faculty promoted five main strategies. Many faculty members implemented several strategies. From the most to least common strategy, faculty indicated using:

1. a growth mindset grading process (15/29)
2. a growth mindset “failure isn’t permanent” feedback process (16/29)
3. student self-reflection or self-evaluation (12/29)
4. revision for full or partial credit (11/29)
5. growth mindset as a component of the course (10/29)

A Growth Mindset Grading Process

Just over half of the respondents use growth mindset grading practices, such as a grading scale with increasing points towards the later stages of the semester, or portfolio grading. Faculty focus on “low stakes” or even “no stakes” opportunities to help students grow and master concepts before “high stakes” assessment. Furthermore, faculty build towards capstone assignments by embedding smaller skills into a series of smaller assignments. Faculty also emphasize process and student progress as part of the grading process.

- Allowing early success with assignments, assignments get more difficult as semester progresses (and points increase). (24)
- Having lots of low-stakes “check-in” kind of assignments like quizzes is helpful. I think we (teachers) need to collect and give feedback on these. Our feedback can emphasize growth and make suggestions for intelligent practice. (25)
- Consistent feedback to students when using informal classroom assessment techniques (nonthreatening/non-graded). (28)
- Looking at where students start and where they end up as a way to grade. (1)
- This semester I am experimenting with incrementally increasing the values of exams (50–100, 150–200 vs. 3 at 100 + 200). (26)
- Incorporate tasks into larger assignments where tasks are embedded as course goes on (high-stakes). (7)

Post-Intervention Focus Group Grading and Feedback Handout (cont.)

A Growth Mindset “Failure Isn’t Permanent” Feedback Process

Faculty use the feedback process to encourage students to learn from failure and recognize errors as temporary setbacks that create learning opportunities. Linked with the growth mindset grading scale and the self-reflection and revision process, faculty give individual students feedback to identify errors and encourage new strategies for improvement.

- “Failure is not permanent.” (13)
- Try to emphasize that it is a learning opportunity; a “celebration of knowledge.” (15)
- Trying to be sure that feedback indicates that errors are “fixable.” (3)
- Marking guides are a bit more flexible for students grading than rubrics—but giving students feedback really helps them (specific feedback) to see where they can grow. (1)
- We read “Promoting Student Metacognition” article and talk about ways to foster a culture of confusion (i.e., it’s okay to ask questions; I ask “What questions do you have?” instead of “Does anyone have any questions?”). (11)

Student Self-Reflection or Self-Evaluation

Faculty encourage students to learn from their past efforts by requiring and even rewarding self-reflection and self-evaluation. After both assignments and exams, faculty assign and give feedback on self-reflection. Many faculty even award points to students who recognize concept mastery and outline new strategies for future improvement.

- I use discussion forums in my online classes. To make them low-stakes, I give them points just for participation. To encourage metacognition, I have a high-point assignment where I ask each student to pick their best posting to be graded. They submit one at about week five and two more at the end of the semester. I let them submit a replacement for the first one, if they did not do well on it. (6)
- Going over the test in class—Post-exam (10)
 - Doing a post-test survey on specific factors:
 - Time to prep
 - Strategy
 - Time management
- Also, my students make their own quizzes/activity (*Teacher for the Moment*) (14)
- Reflection on exam result (16)
 - What they did to prepare for the test that worked?
 - What did not help at all?
 - Do they think they got what they expected? Less or more?
 - What will they do differently to better prepare for the next test?
 - What topics do you need to review and get better at?
 - What will you do to master these topics?
- I don’t score quizzes, but have students record/reflect using RA techniques, and points are awarded based on journal entries. (17)
- I also like to give students a chance to review and self-correct their mistakes (sometimes I give credit for this, sometimes not). After this review I ask the students to identify the concepts they have mastered and the concepts they need to try a different strategy. (26)

Post-Intervention Focus Group Grading and Feedback Handout (cont.)

Revision for Full or Partial Credit

To encourage learning from mistakes and to create a growth mindset, faculty encourage, or even require, students to revise their work based on feedback and self reflection. Some faculty give full credit revision options, while others give partial credit for improvement.

- I think encouraging (not just allowing) revision on small and large assignments lets students see that failure isn't permanent. It also helps encourage them to look critically and curiously at mistakes and errors to consider "Why is this incorrect? How can I improve?" Mistakes become more interesting. (25)
- I allow students to do revisions on CAD drawing assignments in my Engineering Graphics course. This allows them to "fail" with low risk because they can learn from their mistakes and improve their grade—max revision grade is 90% to incentivize doing it right the first time. (9)
- They are given the chance to revise a project and if they put forth "effort," they are rewarded with 50% of the points lost (from not completing the project correctly the first time). (13)
- Partial re-take of exams, quizzes where students have limited time to research and revise their answers. (23)

Growth Mindset as a Component of the Course

Faculty include growth mindset strategies in the syllabus and course content. Faculty explicitly promote growth mindset strategies, in written documentation and class activities. Some faculty even assign students to teach specific mindset techniques as part of the course.

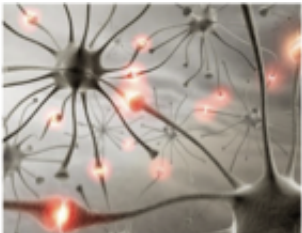
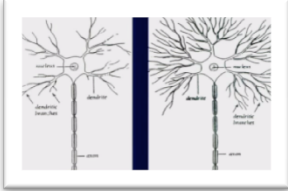
- Modify syllabus to incorporate GM strategies. (22)
- Have groups of students be the teacher for 15 minutes out of one class—highlighting one mindset technique. (28)
- Students keep track of their grades—that's where my bubble points comes in. They have a sheet with bubble on top of the bubbles. They're to write dates and activities, and then get a peer's signature (or the teacher's signature). On a pre-agreed date, instructor and student sit down and decide the final grade. (14)

OVERVIEW

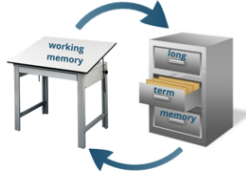
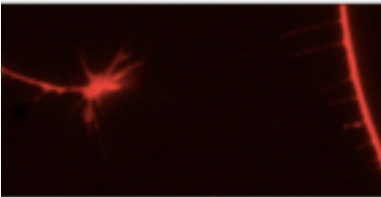
As a group, these faculty implement a variety of growth mindset strategies in their course design and student feedback.

Appendix P

Post-Intervention Focus Group New Model Handout

Growth Mindset Intervention	Key Terms/Concepts	Images	Activities
1: Brain Function (Mostly unchanged)	<u>Neural Plasticity</u> When we learn, our brains create new neural pathways. Our brains literally grow as we learn. This growth is “neural plasticity.” <u>Growth Mindset</u> Basic introduction.	  	• Cotton Ball Game • Neuron MIT Video To learn about “neural plasticity” we played the cotton ball game. In the game, students extend their arms towards their nearest neighbor. They use the spoons to pass the information (cotton ball) from one student to the next. This process creates a new neural pathway. • Growth Mindset Infographic
2: Using Intelligent Practice to Grow Your Brain (Combining elements of 2 and 3)	<u>Intelligent Practice</u> (EFFORT + GOOD STRATEGIES + HELP FROM OTHERS) these are the <u>BEHAVIORS</u> you use to grow your brain. <u>Juggler Experiment</u> The jugglers used Intelligent Practice (effort + good strategies + help from others) to <u>change</u> their permanent brain structure.	I may not be a <i>good</i> math person YET <i>But, I will be because I know a formula for growing my brain</i> <u>EFFORT + GOOD STRATEGIES + HELP FROM OTHERS</u> 	• How I became an expert? (Same student reflection activity) • NEW VIDEO with content from “You Can Grow Your Brain” article • Number Order Sequencing • Juggler Experiment

Post-Intervention Focus Group New Model Handout (cont.)

Growth Mindset Session	Key Terms/Concepts	Images	Activities
3: Using Intelligent Practice to Make Memories (Expanded and improved mind mapping)	<u>Learning is making retrievable memory.</u> We can use Intelligent Practice to improve our memory by learning good memory strategies. To make retrievable memories, you should process information... • <u>actively</u> • <u>deliberately</u> and • with <u>multiple pathways</u>	 	• Memory Outline • Mind Mapping • Mind Mapping APPLICATION • Mind Mapping Creation
4: Applying Growth Mindset (Combining elements of 5 & 6)	Using a Growth Mindset can make you a more successful student. You can respond to challenge as a learning opportunity and use Intelligent Practice to create new neural pathways. You can grow your brain. <u>Having a Growth Mindset means you know that “Everything you learn makes you smarter and being smart is a choice.”</u> With a growth mindset, you know that “everything is hard, before it is easy.” You know that you can learn, and grow your brain. <u>You can respond to challenges as a learning opportunity.</u>	  	• (EGSHFO) Intelligent Practice Mnemonic/Visual Image <u>E</u>very <u>G</u>ood <u>S</u>tudent <u>H</u>as <u>F</u>riends <u>O</u>ver <u>E</u>ffort + <u>G</u>ood <u>S</u>trategies + <u>H</u>elp <u>F</u>rom <u>O</u>thers • Matching Growth Mindset Scenarios • Vote with your Feet • MIT Neural Plasticity Video As a result of our learning discussions, what strategies have you used (or will you use) to improve your learning?

Post-Intervention Focus Group New Model Handout (cont.)

“Growth mindset can be integrated into the course itself, and not just a series of separate workshops” (Faculty 1, Interview)

Key Suggestions from Faculty Interview, Preliminary Findings:

1. Address time issues
 - a. Start earlier in semester, so activities can be planned into syllabus
 - b. Create more time for dialogue and application
2. Decrease the number of sessions
 - a. Avoid over repetition, although some repetition is valuable for learning and application
 - b. For example, when sharing three sessions with other classes, there was more excitement—(fewer, felt newer)
3. Involve more hands-on, engaging group activities, and fewer paper-only or outline completion activities
4. Incorporate dialogue and application after each session
5. Time sessions strategically
 - a. For example, when returning graded essays, have a strategic discussion about growth mindset responses to feedback and help-seeking during improvement/revision
6. Create opportunities for teacher collaboration
7. Remain attentive to “saturation” or repetition from class to class if this becomes a dominant motif on campus

Appendix Q
Post-Intervention Faculty Qualtrix Surveys
(Comparison and Intervention)

Post-Intervention (Comparison Group) Online Qualtrix Survey

- Q1: What is your first name?
- Q2: Briefly describe a typical class session.
- Q3: Do you incorporate any non-cognitive aspects (such as mindset, study skills, or motivation) into your course? If so, please describe.
- Q4: How do you define intelligence?
- Q5: Some people consider intelligence to be fixed (like a person's height) or capable of growth (like a person's bicep). Which view do you take and why?
- Q6: How do you think your students view intelligence – is it fixed or growth? Please explain/describe.
- Q7: Briefly describe what you know about Carol Dweck's growth mindset model.
- Q8: Please discuss any concerns or questions about implementing the growth mindset intervention in your class section.
- Q9: What support would help you to implement the growth mindset intervention in your class? Please explain.

Post-Intervention (Intervention Group) Online Qualtrix Survey

- Q1: Your name:
- Q2: In your opinion, how effective were the growth mindset sessions? How do you evaluate effectiveness?
- Q3: What strengths would you identify in the sessions? What worked well?
- Q4: What weaknesses would you identify in the sessions? What did not work well?
- Q5: What specific improvements would you suggest for future sessions?
- Q6: In what ways, if any, did you observe your students applying concepts from the growth mindset sessions (beyond the sessions themselves) in your class?
- Q7: As we discussed in the focus group, to encourage dialogue and greater student engagement, the new model might have four sessions of approximately 45 minutes each (rather than six sessions of 20 minutes each). What concerns do you have about this model, and what advice would you give to an instructor who was planning to implement it next semester?
- Q8: As a result of the growth mindset sessions, did you already, or do you plan to change your instructional practice or grading policies? If so, please describe.
- Q9: Do you think that your students' beliefs about their own success have changed as a result of the growth mindset sessions? If so, in what ways?
- Q10: Has your own perception about the meaning of student success changed as a result of the growth mindset sessions? If so, please describe.
- Q11: Did you notice any differences in the class that received the growth mindset sessions compared to the other classes that you teach? If so, please describe.
- Q12: Also, is there anything else you would like to share about your experience in this project?

Appendix R

Student Post-Intervention Survey

Class _____

Student Roster # _____

Mindset Survey

Instructions: Please complete the following survey. Please write your class and roster number, as instructed by your faculty member. You will only be identified by this roster number and your name will not be included with your response. Your answers will be confidential, to the extent allowed by law. Your accurate, honest answers are very important for research purposes. Thank you for your participation.

Read each statement. Circle the number that matches how strongly you agree, or disagree, with each statement.

STRONGLY AGREE	AGREE			DISAGREE	STRONGLY DISAGREE
1	2	3	4	5	6

Circle One Number for Each Item

1. You have a certain amount of intelligence and you really can't do much to change it.	1	2	3	4	5	6
2. Your intelligence is something that you can't change very much.	1	2	3	4	5	6
3. You can learn new things but you can't really change your basic intelligence.	1	2	3	4	5	6

Student Post-Intervention Survey (cont.)

Read each statement. Circle the number that matches how strongly you agree, or disagree, with each statement.

STRONGLY DISAGREE	DISAGREE			AGREE	STRONGLY AGREE
1	2	3	4	5	6

Circle One Number for Each Item

4. I am likely to ask others for help.	1	2	3	4	5	6
5. I have to work hard at school, which means I am not smart.	1	2	3	4	5	6
6. I consider a challenge an opportunity to learn.	1	2	3	4	5	6
7. I learn from criticism.	1	2	3	4	5	6
8. I avoid difficult challenges.	1	2	3	4	5	6
9. I am inspired by the success of others.	1	2	3	4	5	6
10. I ignore negative feedback.	1	2	3	4	5	6
11. I use effort to overcome challenges.	1	2	3	4	5	6
12. I use Intelligent Practice, which is “Effort + Good Strategies + Help From Others.”	1	2	3	4	5	6
13. I give up when I struggle.	1	2	3	4	5	6
14. I am motivated to improve in school.	1	2	3	4	5	6
15. I expect to pass this course.	1	2	3	4	5	6
16. After the growth mindset sessions, I use campus resources I <u>had not used before</u> .	1	2	3	4	5	6
17. After the growth mindset sessions, I use campus resources <u>more frequently</u> .	1	2	3	4	5	6
18. After the growth mindset sessions, I use study strategies I <u>had not used before</u> .	1	2	3	4	5	6
19. After the growth mindset sessions, I use study strategies <u>more frequently</u> .	1	2	3	4	5	6

Student Post-Intervention Survey (cont.)

Read each statement. Circle the number that matches how frequently you sought help from that source in the last two weeks.

IN THE PAST TWO WEEKS, I SOUGHT HELP FROM					
20. An Instructor	0 times	1–2 times	3–4 times	5–6 times	7 or more times
21. Classmates	0 times	1–2 times	3–4 times	5–6 times	7 or more times
22. A Study Group	0 times	1–2 times	3–4 times	5–6 times	7 or more times
23. Family Members	0 times	1–2 times	3–4 times	5–6 times	7 or more times
24. Friends (not in my class)	0 times	1–2 times	3–4 times	5–6 times	7 or more times
25. The Math Lab	0 times	1–2 times	3–4 times	5–6 times	7 or more times
26. The Writing Center	0 times	1–2 times	3–4 times	5–6 times	7 or more times
27. A Tutor	0 times	1–2 times	3–4 times	5–6 times	7 or more times
28. The Library	0 times	1–2 times	3–4 times	5–6 times	7 or more times
29. Online Videos	0 times	1–2 times	3–4 times	5–6 times	7 or more times
30. Other: (Please describe)	0 times	1–2 times	3–4 times	5–6 times	7 or more times

Student Post-Intervention Survey (cont.)

Circle the number that indicates how useful you found each resource, with 1 being not useful and 6 being extremely useful. Useful means it helped you achieve your academic goal. If you did not use a resource, please circle NA.

I DID NOT USE THIS RESOURCE	NOT USEFUL						EXTREMELY USEFUL
NA	1	2	3	4	5	6	

Circle One Answer for Each Item

31. An Instructor	NA	1	2	3	4	5	6
32. Classmates	NA	1	2	3	4	5	6
33. A Study Group	NA	1	2	3	4	5	6
34. Family Members	NA	1	2	3	4	5	6
35. Friends (not in my class)	NA	1	2	3	4	5	6
36. The Math Lab	NA	1	2	3	4	5	6
37. The Writing Center	NA	1	2	3	4	5	6
38. A Tutor	NA	1	2	3	4	5	6
39. The Library	NA	1	2	3	4	5	6
40. Online Videos	NA	1	2	3	4	5	6
41. Other: (Please describe)	NA	1	2	3	4	5	6

Read each statement. Circle the number that matches how frequently you used growth mindset in that area in the last two weeks.

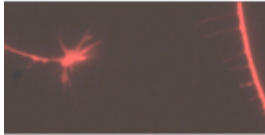
IN THE LAST TWO WEEKS, I USED GROWTH MINDSET					
42. In this course	0 times	1–2 times	3–4 times	5–6 times	7 or more times
43. In another course	0 times	1–2 times	3–4 times	5–6 times	7 or more times
44. At work	0 times	1–2 times	3–4 times	5–6 times	7 or more times
45. In sports	0 times	1–2 times	3–4 times	5–6 times	7 or more times
46. In a hobby	0 times	1–2 times	3–4 times	5–6 times	7 or more times
47. Other: (Please describe)	0 times	1–2 times	3–4 times	5–6 times	7 or more times

Student Post-Intervention Survey (cont.)

Circle the number that indicates how useful you found each resource, with 1 being not useful and 6 being extremely useful. Useful means it helped you achieve your academic goal. If you did not use a resource, please circle NA.

I DID NOT USE THIS RESOURCE NA	NOT USEFUL 1	2	3	4	5	EXTREMELY USEFUL 6
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Circle One Answer for Each Item

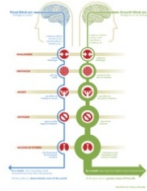
48. Brain Video		NA	1	2	3	4	5	6
49. MIT Neural Plasticity Video		NA	1	2	3	4	5	6
50. Cotton Ball—Neural Plasticity Game		NA	1	2	3	4	5	6
51. Brainology Article		NA	1	2	3	4	5	6
52. Intelligent Practice	I may not be a <i>good</i> math person YET <i>But, I will be because I know a formula for growing my brain</i> <u>EFFORT + GOOD STRATEGIES + HELP FROM OTHERS</u>	NA	1	2	3	4	5	6
53. Number Order Sequencing		NA	1	2	3	4	5	6

Student Post-Intervention Survey (cont.)

Circle the number that indicates how useful you found each resource, with 1 being not useful and 6 being extremely useful. Useful means it helped you achieve your academic goal. If you did not use a resource, please circle NA.

I DID NOT USE THIS RESOURCE	NOT USEFUL						EXTREMELY USEFUL
NA	1	2	3	4	5	6	

Circle One Answer for Each Item

54. Juggling Experiment		NA	1	2	3	4	5	6
55. Mind Mapping		NA	1	2	3	4	5	6
56. Growth Mindset Infographic		NA	1	2	3	4	5	6
57. Growth Mindset Scenarios		NA	1	2	3	4	5	6
58. Vote with Your Feet		NA	1	2	3	4	5	6
59. Growth Mindset Application Reflection	EX: As a result of our learning discussions, what strategies have you used to learn a new concept in school (write a paper, prepare for a test, complete an assignment)?	NA	1	2	3	4	5	6

Appendix S

ANCOVA Results and Intelligent Practice and Fixed Mindset Factor Analysis

ANCOVA Results and Descriptive Statistics For Students' Post-Intervention Intelligent Practice by Intervention Placement and Pre-Intervention Growth Mindset

Post-Intervention Intelligent Practice				
Intervention Placement	Observed Mean	Adjusted Mean	SD	n
Comparison	27.67	27.55	5.54	46
Intervention	29.27	29.38	6.36	62
Source	SS	df	MS	F
Pre-Intervention Intelligent Practice	507.90	1	507.90	15.95
Intervention Placement	88.21	1	88.21	2.77
Error	3342.18	105	31.83	

Note. $R^2 = .147$, $\text{Adj } R^2 = .130$

Note. When controlling for the pre-test, there were no statistically significant findings for gender ($p = .306$), race/ethnicity ($p = .732$) or semesters completed ($p = .816$).

* $p < .05$

ANCOVA Results and Descriptive Statistics For Students' Post Fixed Mindset by Intervention Placement and Pre-Intervention Growth Mindset

Post-Fixed Mindset				
Intervention Placement	Observed Mean	Adjusted Mean	SD	n
Comparison	14.26	14.18	2.69	46
Intervention	14.48	14.55	3.21	62
Source	SS	df	MS	F
Pre-Intervention Fixed Mindset	160.64	1	160.64	21.25
Intervention Placement	3.56	1	3.56	.47
Error	793.72	105	7.56	

Note. $R^2 = .166$, $\text{Adj } R^2 = .154$

Note. When controlling for the pre-test, there were no statistically significant findings for gender ($p = .306$), race/ethnicity ($p = .982$) or semesters completed ($p = .288$).

* $p < .05$

Factor Analysis Intelligent Practice and Fixed Mindset (cont.)

The goal of the exploratory factor analysis (EFA) was to assess the underlying factor structure of the 10 items that were created. EFAs were conducted using a one-factor and two-factor solution. Principal axis factor extraction as well as varimax rotation was used for both solutions. Items that loaded less than .40 were eliminated as well as items with complex factor loadings. The analyses did confirm that items were functioning well in the context of a factor structure. The two-factor solution was deemed the better factor structure as it was the most interpretable solution. First, the factor analysis identified three items measuring a pattern of fixed mindset responses. This fixed mindset factor (Cronbach alpha .708) measured items such as “I have to work hard at school, which means I am not smart” and “I avoid difficult challenges.” Second, the factor analysis identified six items measuring intelligent practices. This intelligent practice factor (Cronbach alpha .774) measured questions such as “I am likely to ask others for help” and “I use intelligent practice which is effort plus good strategies plus help from others.” Tabachnik and Fidell (2007) suggest the cutoff is up to the researcher, while indicating that .45 (20% overlapping variance) is fair and .32 (10% overlapping variance) is poor. The lowest correlation factor loading in the fixed mindset factor was .576 and the lowest correlation factor loading in the intelligent practice factor was .441. Further, Shultz and Whitney (2005) indicate that a Cronbach alpha level of .70 and above is admissible.

Appendix T
ANCOVA Results Expect to Pass

ANCOVA Results and Descriptive Statistics For Students' Post-Expect to Pass by Intervention

Placement and Pre-Expect to Pass

Intervention Placement	Post-Intervention Expect to Pass			
	Observed Mean	Adjusted Mean	SD	n
Comparison	5.24	5.22	1.28	47
Intervention	5.44	5.45	1.11	62
Source	SS	df	MS	F
Pre-Intervention Expect to Pass	3.21	1	3.21	2.30
Intervention Placement	1.41	1	1.41	1.01
Error	146.4	105	1.39	

Note. $R^2 = .028$, $\text{Adj } R^2 = .010$

* $p < .05$

Appendix U

Student Resource Frequency and Resource Usefulness Table

Statistical Significance for ANCOVA Results for Post Resource Frequency and Post Resource Usefulness controlling for the Pre-Resource Frequency and Pre-Resource Usefulness

	Resource $p =$	
	Frequency	Usefulness
Instructor	.366	.638
Classmates	.693	.817
Study Group	.391	.169
Family Member	.117	.308
Friends	.937	.201
Math Lab	.559	.667
Writing Center	.315	.703
Tutor	.303	.572
Library	.358	.557
Online Video	.665	.323
Other	.366	.174