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Interteaching and mindset

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Interteaching and Mindset

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An Honors Program Project Presented to

the Faculty of the Undergraduate

College of Health and Behavioral Studies

James Madison University

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by Caroline Dorothy Hall

May 2016

Accepted by the faculty of the Department of Psychology, James Madison University, in partial fulfillment of the requirements for the Honors Program.

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PUBLIC PRESENTATION

This work is accepted for presentation, in part or in full, at [venue]   on [date]   .

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Acknowledgements

Abstract

The researcher investigated the relationships between growth mindset and performance and statistics self-efficacy and performance in interteaching courses. The study included college students enrolled in one section of a Psychological Statistics and Measurements class. Participants completed a mindset survey indicating their level of growth mindset. Participants then completed a Statistics Self-Efficacy Survey. Finally, participants completed a demographics survey. Participants completed the mindset survey again in the middle of the semester as well as at the end of the semester. The researchers also collected behavioral data including the number of emails participants sent throughout the course and the number of preparation guides missed. Students completed four tests during the semester. There was a significant negative relationship between growth mindset of intelligence and grades. Growth mindset did not increase across time during the interteaching course. There was not a significant relationship between growth mindset of intelligence and number of preparation guides missed. There was not a significant relationship between growth mindset of intelligence and number of emails. The findings of this study suggest that aspects of interteaching courses might create an environment that supports students with lower levels of growth mindset and growth mindset may be related to long-term academic performance.

Introduction

Interteaching and Mindset

According to Dweck (2006), beliefs strongly influence the goals people set and whether they are successful in achieving their goals. Specifically, our mindset and beliefs about ourselves influence how we live our lives and changing mindset beliefs can have effects on success (Dweck 2006). Growth mindset refers to the belief that people can develop their abilities through effort and learning. On the other hand, fixed mindset is the idea that people only have a certain personality, a certain amount of intelligence, and a certain set of morals (Dweck 2006). Teachers can encourage a growth or fixed mindset in their students through different types of praise (Dweck 2007). In addition to praise from teachers, the type of classroom instruction might influence mindset of students. Previous research has suggested that one type of classroom instruction, interteaching, might be more effective than traditional styles of teaching because it capitalizes on behaviors that are typical of students with growth mindset such as revisiting course material (Saville, Zinn, & Elliot 2005). In addition to mindset, self-efficacy beliefs have been found to influence performance and academic achievement (Zimmerman 200). The current study investigated the relationship between growth mindset and performance and statistics self-efficacy and performance in an interteaching course.

Mindset

Although qualities of people are different, individuals with a growth mindset believe that people can change their basic qualities through application and experience (Dweck 2006). Rather than believing that anyone can accomplish anything, people with a growth mindset believe that people do not know their true potential until they try to accomplish their goals (Dweck 2006). The goal of people with a growth mindset is to learn (Dweck 2007).

According to Dweck (2007), people with a growth mindset have a passion for challenging themselves and persevering to reach their goals even when they are struggling. Specifically, having a growth mindset allows people to shine during some of the most difficult times of their lives. Individuals with a growth mindset are interested in making their failures become successes in the future. When people with a growth mindset fail, they decide to make a greater effort. For example, individuals classified as having a growth mindset suggest that they need to study harder (Dweck 2006). Dweck (2007) also found the people with a growth mindset follow three rules: taking on challenges, working hard, and confronting and correcting their weaknesses. Rather than choosing simple tasks that display that they are smart, individuals with a growth mindset are willing to complete tasks that challenge them. Additionally, people with a growth mindset believe that effort leads to ability and that they will improve their ability to complete tasks if they work harder in order to master them (Deck 2007).

On the other hand, fixed mindset is the idea that people only have a certain personality, a certain amount of intelligence, and a certain set of morals (Dweck 2006). Those with a fixed mindset have a sense of urgency to prove themselves again and again and subsequently are not willing to risk failure through challenging themselves or accepting feedback. When people with a fixed mindset are not coping with challenges, they seem as smart and attractive as people with a growth mindset. However, at times people with a fixed mindset feel like a failure or a reject (Dweck 2006). Examples of behaviors associated with fixed mindset include exhibiting a helpless response to challenges and reporting decreases in self-esteem during college (Murphy and Thomas 2008).

Mindset and learning environments

According to Dweck, people with a growth mindset are more accurate in estimating their abilities than those with a fixed mindset because those with a growth mindset are willing to accept both positive and negative feedback in order to learn (Dweck 2006). Based on the principles of behavior analysis, learning is viewed as something a person does, rather than something that happens to people (Skinner 1968). Moreover, no matter what the student has experienced to result in learning, learning becomes evident when a student can do something that they could not do before learning. According to Boyce and Hineline (2002), teachers facilitate learning; they do not just present information.

According to Dweck (2006), changing mindset beliefs can have effects on success. Teachers can encourage a fixed mindset in their students if they emphasize the importance of looking smart and avoiding looking dumb or focus on success coming easily to students. When instructors teach people about growth mindset, these people develop positive ideas regarding challenges and effort. On the other hand, when instructors teach people about fixed mindset and put emphasis on traits, people no longer value effort and begin to fear being challenged (Dweck 2006). Students with a fixed mindset show poor motivation, less resilience, and lower grades as compared to those with a growth mindset (Dweck 2007). According to Dweck (2007), the goal of students with a fixed mindset is to look smart and these individuals follow three rules including avoiding making and fixing mistakes and avoiding working hard. Specifically, students with a fixed mindset think mistakes are setbacks and working hard displays low intelligence (Dweck 2007). Not only do people with a fixed mindset believe mistakes are setbacks, but they believe that setbacks display a permanent lack of ability (Dweck 2007). Many brilliant students stop studying when school becomes more difficult (Dweck 2007).

One way that instructors can influence students' mindset is through praise. According to Dweck (2007), the most motivated students are those who believe they can develop their abilities through effort and learning. At times during students' education, teachers make the work more challenging and they create an environment that is less personalized. According to Dweck (2007), instructors should not tell students how great they are when they do something quickly or easily because the idea that working means people lack ability is a detrimental belief that students can have. In other words, students should not believe that making little effort shows they have a high level of intelligence. Praise for intelligence conveys to students that performance can be used to judge intelligence and that teachers value intelligence over everything (Dweck 2007). Students even lied about test scores when they were praised for intelligence, displaying that they were embarrassed for putting forth effort and performing poorly. On the other hand, praise for effort leads to a growth mindset in students. Students became confident and willing to take on challenges (Dweck 2007).

When educators believe in and teach fixed mindset, often students who earn high grades at the beginning of the course are the only students who earn high grades at the end of the course. However, when educators believe in and teach growth mindset, students who perform poorly in the beginning of the course improve and catch up to the other students by the end of the course (Dweck 2007). Furthermore, Aronson, Fried, and Good (2002) taught students that their brains form new connections and that people can become smarter over time. Additionally, the researchers taught the students that they could apply this lesson to their school work. Teaching students a growth mindset resulted in increased motivation, better grades, and higher test scores. Specifically, students who learned about growth mindset received higher grades than those who

did not, even when those in the control group received study skills training (Aronson et al., 2002).

Moreover, Skipper and Douglas (2002) investigated the effects of person and process praise compared to objective outcome feedback. Person praise includes phrases such as "you are clever", whereas process praise includes phrases such as "you worked hard". Skipper and Douglas (2002) conducted an experiment during which university students read three scenarios and imagined themselves as the main characters. The characters successfully completed tasks and received person, process, or no praise. Participants then read two scenarios in which the characters failed the task. Participants evaluated the performance, affect, and persistence of the characters. Participants who received person praise reacted most negatively after failing once. Participants who received process praise did not differ significantly from those who received objective outcome feedback. These findings suggest person praise is detrimental compared to process feedback, supporting the evidence that Dweck (2007) provided that instructors can influence student mindset.

Duckworth, Peterson, Matthews, and Kelly (2007) also provided evidence that mindset influences learning. In order to accomplish difficult goals, people do not only need to have talent and intelligence, but they also need to focus on applying their talent over time (Duckworth et al., 2007). Specifically, grit refers to passion and perseverance for long-term goals (Duckworth et al., 2007).

Mangels, Butterfield, Lamb, Good, and Dweck (2006) also provided evidence that mindset can be related to performance. Columbia University undergraduate students were selected based on their average scores across four Theory of Intelligence questions framed from an entity perspective, or a fixed mindset perspective. Results from an achievement goals

questionnaire modified from Grant and Dweck (2003) displayed that incremental theorists, or students characterized as having a growth mindset, endorsed learning goals, whereas entity theorists or students characterized as having a fixed mindset, more strongly endorsed performance goals. Participants then received performance feedback and correct answers to the questions, regardless of whether or not the answer was correct. Later, the students completed a surprise retest including all of the questions they answered incorrectly. The researchers found that incremental theorists demonstrated significantly greater improvement on the retest than the entity theorists. Both groups were able to correct the majority of errors at retest; however incremental theorists corrected significantly more errors than entity theorists. Moreover, errors were more likely to be corrected when they were initially made with higher confidence as compared to errors made with lower confidence.

Self-Efficacy and learning

In addition to mindset, self-efficacy has predicted students' levels of motivation and learning. Self-efficacy beliefs have been found to influence performance and academic achievement. According to Bandura (1986), self-efficacy refers to different perceived capabilities and personal judgements of capabilities to achieve goals. According to Zimmerman (2000), self-efficacy measures are sensitive to context. Self-efficacy questionnaires have been completed before completing activities and as a result self-efficacy beliefs can play a causal role in academic success. According to Zimmerman (2000), self-efficacy beliefs have been predictive of rate of performance and expenditure of energy. Thus, self-efficacy influences methods of learning as well as motivational processes. Additionally, self-efficacy beliefs provide students with the motivation to self-regulate. For example, when students believe they are capable, they are more willing to set challenging goals.

Types of Classroom Instruction

In addition to praise from teachers, the type of classroom instruction might influence mindset of students. Traditional styles of teaching including lecture rely on long-term contingencies such as midterm and final exams; therefore, most students only spend time studying a few days before tests. Despite this, many educators continue to use traditional lecture (Saville et al., 2005).

One alternative to traditional styles of teaching includes Keller's Personalized System of Instruction (PSI) (Karp 1983). According to Karp (1983), PSI is based on operant conditioning (Skinner 1953) and includes self-pacing, unit mastery, infrequent motivational lectures, writing as the main form of communication between the instructor and students, and student proctors who provide tutoring and administer assessments. PSI emphasizes active learning of the student and focuses less on the instructor (Karp 1983). Specifically, the instructor clearly states what material the students should learn and then writes the material in a written form so the students may review the information as many times as they need (Karp 1983). Students must reach a higher criterion of mastery in each unit before proceeding to the next unit (Karp 1983). According to Keller, (1968), the teacher manages reinforcement contingencies, and student proctors who have already mastered the material provide individualized assistance to the students who need it (Karp 1983). Students who seem inferior at the beginning of the course might perform better on exams than those who seemed superior when they were taught using traditional teaching methods (Keller 1968). Generally, students are learning more and enjoying classes taught using PSI more than traditional lecture courses (Karp 1983). However, PSI is often time consuming and results in failing grades due to the fact that content mastery is required (Saville et al., 2005).

Interteaching

Interteaching is a type of classroom instruction based on the principles of behavior analysis that combines aspects of Keller's (1968) Personalized System of Instruction, reciprocal peer tutoring (Griffin & Griffin, 1998), cooperative learning (Halpern, 2004), and problem-based learning (Duch, Groh, & Allen, 2001). According to Boyce and Hineline (2003), a typical class period with interteaching requires the instructor to create a preparation guide including questions to guide students through learning. Students complete the prep guide in preparation for the next class during which they form small groups, dyads or triads, and earn credit for discussing the questions. The instructor and teaching assistants assist groups in answering difficult questions as well as facilitating discussion. The students fill out a pair discussion record at the end of the class, which the instructor utilizes to create a brief lecture for the beginning of the next class period. There should be a clear relation connection between prep guide questions and test questions (Boyce & Hineline, 2002).

Saville, Zinn, and Elliot (2005) randomly assigned eighty-four undergraduate students to one of three experimental conditions including interteaching, lecture, reading, or a control condition. Participants in the interteaching group received a set of questions designed to guide them through an article and the researchers provided them with fifteen minutes to read the article and answer the questions. Next, participants in the interteaching group discussed the questions with a partner for 15 minutes. The researcher answered participants' questions during their discussions and then the researcher spent 15 minutes reviewing those questions. On the other hand, participants in the other experimental groups simply listened to a lecture or read the article, while the control group did not see the article. Participants in the interteaching group performed better on a multiple-choice quiz than participants in other groups, and students enjoyed and

learned more through interteaching than lecture, displaying the effectiveness of interteaching relative to traditional methods of teaching. According to Saville, Zinn, and Elliot (2005), the results suggest that interteaching might be a more effective way of teaching than traditional lecture because it utilizes active learning and immediate social reinforcement from peers and the instructor. According to Saville and Zinn (2011), a conversation requires two people to participate and thus students are disappointed when their partners have nothing to add to the conversation. Teachers can also listen to the conversations and identify those students who are unprepared (Saville & Zinn, 2011). Boyce and Hineline (2002) suggested that instructors spend less time preparing lectures but still do lecture and as a result, students and staff believe they have an active role in teaching. Allowing students to choose the topics the instructor covers in the lectures serves as a motivational function because students are more likely to listen to a lecture about information they have requested.

One reason why interteaching might be a more effective style of classroom instruction is because interteaching attempts to produce behaviors that are typical of students with a growth mindset. Typical behaviors of students with a growth mindset include welcoming challenges and displaying mastery-oriented responses (Murphy & Thomas, 2008). Interteaching allows instructors to focus lectures on topics of interest or difficulty (Saville, Zinn, Neef, Van Norman, & Ferreri, 2006). Interteaching also encourages students to master the course material through requiring students to complete preparation guides that contain questions that are factual, conceptual or applied (Saville & Zinn, 2011). Moreover, the purpose of preparation guides is to lead students through the course material they will discuss during the next class period with questions that assess factual knowledge (Boyce & Hineline 2002) as well as questions that encourage students to connect material from different parts of the course or with material from

other courses (Saville & Zinn, 2011). Discussing preparation guides with a classmate and then participating in lecture also requires students to revisit and master the material, emphasizing the importance of effort in learning, a behavior typical of students characterized as having a growth mindset.

Current Study

The current study investigated the relationship between growth mindset and course performance in an interteaching course. Based on the literature, I predicted that growth mindset would be positively correlated with final grades. Due to the evidence that self-efficacy has predicted students' levels of motivation and learning and self-efficacy beliefs have been found to influence performance and academic achievement, I predicted there would be a positive correlation between self-efficacy and grades.

In addition to grades, I collected performance data including number of preparation guides missed and number of emails. I predicted that level of growth mindset would be negatively correlated with the number of preparation guides missed because students with a growth mindset believe that effort can influence level of intelligence and thus students characterized as having a growth mindset would make the effort to complete preparation guides in order to learn. I also predicted that level of growth mindset would be positively correlated with the number of emails students sent because in addition to be putting forth effort to learn, students with a growth mindset should be willing to challenge themselves and accept feedback. Thus, students with a growth mindset would be more willing to communicate with their professor and teaching assistants through email in addition to in person in order to learn.

Finally, I predicted that growth mindset would increase overtime in interteaching courses because interteaching courses focus on multiple exposures to material (e.g., preparation guides,

pair discussion, clarifying lecture), and mastery of content because professors encourage students

to revisit their mistakes and focus on topics of difficulty in order to foster learning. I

hypothesized that growth mindset would increase throughout the term.

Method

Participants

Thirty-seven college students enrolled in one section of a Psychological Statistics and

Measurements course participated. The course provides an introduction to statistical techniques

used by psychologists in measuring behavior. Fundamental measures and theory of descriptive

and inferential statistics are discussed (See Appendix F for Psychological Measurements and

Statistics Course Syllabus). Ages of the participants ranged from 19 to 22 (M=19.75, SD=.840).

GPA ranged from 2 to 4 (M=3.09, SD=.347).

Materials

Participants took an online Qualtrics survey which included a consent form as well as

questions regarding demographics, mindset, and self-efficacy.

Mindset Survey

The mindset survey was eight total questions to measure two constructs, intelligence and

personality mindset (Dweck 2007). Example items for intelligence mindset included "Your

intelligence is something very basic about you that you can't change very much" and "No matter

how much intelligence you have, you can change it quite a bit". Two items were reverse coded.

Example items for personality mindset included, "You are a certain kind of person, and there is

not much that can be done to really change" and "You can always change basic things about the

kind of person you are". Again, two items were reverse coded (Dweck 2006). Participants

answered on a five-point Likert scale, from strongly disagree ("1") to strongly agree ("5").

Higher scores were associated with growth mindset. A total score was calculated for mindset in

terms of intelligence and personality. Cronbach's alpha for intelligence mindset was .87 (See

Appendix D for Mindset Survey).

<u>Statistics Self-Efficacy Scale</u>

Participants indicated how confident they were about 14 tasks on a 6-point scale ranging from no confidence at all (1) to complete confidence (6). For example, students indicated how confident they were to "identify the scale of measurement for a variable" and "explain the difference between a sampling distribution and a population distribution". According to previous research conducted by Finney and Shraw (2003), Cronbach's alpha for this measure was .54, which they expected due to different levels of difficulty of each item. Cronbach's alpha is maximized when items have similar probabilities of being answered correctly (Finney & Shaw 2003). (See Appendix E for Statistics Self-Efficacy Survey).

<u>Demographics</u>

Participants responded to the demographic items that included- major, minor, age, gender, grade point average, years at James Madison University (JMU), race/ethnicity, transfer status, and whether they had taken a course using interteaching or team-based learning previously. Participants indicated their student ID numbers in order to match the responses to course performance (See Appendix C for Demographics Survey).

Procedure

At the end of week one of the fall semester, participants read and signed the consent form. Next, participants completed a mindset survey, statistics self-efficacy survey, and the demographics survey. Participants completed the mindset survey again in the middle of the semester as well as at the end of the semester during week nine, as well as at the end of the semester during week 16. The researcher also collected behavioral data including the number of emails participants sent throughout the course to the professor and the number of student absences.

Students completed four check points, or tests, during the semester, each of which included (a) short answer questions drawn from the preparation guides, (b) several problem-solving questions, and (c) multiple-choice and/or fill-in-the-blank questions (See Appendix F for Psychological Measurements and Statistics Course Syllabus).

Results

Intelligence mindset scores from the beginning of the semester ranged from 7 to 18 (*M*=14.03, *SD*=2.95). Personality mindset scores from the beginning of the semester ranged from 6 to 20 (*M*=14.24, *SD*=2.93). Statistics self-efficacy scores ranged from 40 to 71 (*M*=57.22, *SD*=7.89). The number of emails sent to the professor ranged from 0 to 17 (*M*=5, *SD*=3.87). The number of preparation guides missed ranged from 0 to 6 (*M*=1.41, *SD*=1.35). Intelligence mindset scores from the middle of the semester ranged from 8 to 18 (*M*=13.54, *SD*=3.13). Intelligence mindset scores from the end of the semester ranged from 8 to 20 (*M*=14.64, *SD*=3.22). Final grade percentage ranged from 26.94 to 97.09 (*M*=83.25, *SD*=13.73).

The first hypothesis was that students' growth mindset would predict final grades in an interteaching course. A simple regression model was significant $F(1,35) = 4.299$, $p = .046$ with intelligence mindset negatively related to grades $\beta= -.331$, $t (35) = -2.074$, $p = 0.46$, $R^2 = .109$. Because GPA was related to final grade, the researcher ran a hierarchical regression again controlling for GPA and although the beta weight dropped, the relationship between growth mindset and final grade remained marginally significant at the .01 level, $\beta= -.228$, $t (35) = -1.845$, $p = 0.074$, $R^2 = .493$. I used the alpha of .01 because of the low power which was due to a small sample size (See Appendix A for Table I).

A multiple regression revealed that growth mindset was not a significant predictor of number of emails, $F(2,35) = 1.376$, $p = .266$, $\beta= .108$, $t (35) = .494$, $p = .624$, $R^2 = .073$, or number of preparation guides missed, $F(2,31) = 1.080$, $p = .352$, $\beta= -.023$, $t (31) = -.128$, $p = .899$, $R^2 = .065$. However, gender and GPA were marginally significant predictors of number of preparation guides missed $F(2,31) = 4.726$, $p = .016$, $\beta = -.307$, $t(31) = -1.897$, $R^2 = .234$ (See Appendix A for Table I).

Finally, a dependent samples t-test did not reveal a significant change in intelligence mindset from the beginning of the interteaching course ($M = 14.18$, $SD = 2.612$) to the end of the

interteaching course (M = 14.62, SD = 3.215), t(21) = .852, p = .404. Because the second administration of the survey had a low response rate, I only analyzed the change from beginning to the end of the semester. Although there was not a statistically significant change in intelligence mindset, intelligence mindset of some students did change from the beginning to the end of the semester (See Appendix B for Table II).

Discussion

I predicted the level of growth mindset would be positively correlated with grades in an interteaching course because one of the behaviors associated with growth mindset is the willingness to correct mistakes and master material, behaviors likely encouraged by the Interteaching method. The results did not support this hypothesis. In fact, there was a negative correlation between growth mindset and final grades, suggesting that students with a more fixed minset performed better in the course. These data are inconsistent with numerous studies including one study conducted by Dweck (2007) which concluded that students with a fixed mindset show poor motivation, less resilience, and lower grades as compared to those with a growth mindset. Rather than level of growth mindset being positively correlated with grades, the results of the current study showed a significant negative relationship between level of growth mindset and grades.

According to Dweck (2006), those with a fixed mindset have a sense of urgency to prove themselves repeatedly and subsequently are not willing to risk failure through challenging themselves or accepting feedback. The goal of students with a fixed mindset is to look smart (Dweck 2007). Grant and Dweck (2003) also displayed that incremental theorists, or students characterized as having a growth mindset, endorsed learning goals, whereas entity theorists or students characterized as having a fixed mindset, more strongly endorsed performance goals. These findings suggest that students with lower levels of growth mindset might be successful because they are performance oriented and focused on receiving high grades (Dweck 2006).

Additionally, the results of this study were obtained during a short time frame of one semester. This might be related to the results because students with high levels of growth mindset might perform better in courses over time, however students with lower levels of a

growth mindset might perform better after shorter periods of time. For example, students with high levels of growth mindset might have higher GPAs at the end of college because they are more willing to challenge themselves and accept feedback (Dweck 2006). Opportunities for future research include examining how growth mindset is related to performance throughout college rather than just one semester.

The results also did not support the hypothesis that mindset would increase across time. The researcher hypothesized mindset would increase during interteaching courses because instructors and teaching assistants assist students in answering difficult questions as well as facilitate discussion, repeat difficult material, and focus on mastery of content, behaviors typical of students with a growth mindset. Specifically, people with a growth mindset have a passion for challenging themselves and persevering to reach their goals, even when they are struggling to succeed (Dweck 2007). One reason why growth mindset may not have increased across time is because students with lower levels of growth mindset are not willing to risk failure through challenging themselves or accepting feedback and thus would be less likely to display a change in mindset at the end of the semester.

Interteaching has also been shown to be a more effective way of teaching than traditional lecture courses, which may be because interteaching utilizes immediate social reinforcement from peers and instructors (Saville et al., 2005). Although Dweck (2006) provided evidence that growth mindset can improve goal setting and academic performance, these studies were conducted using traditional styles of teaching. While interteaching might create an environment that changes how growth mindset and performance are related, we do not know this because we did not compare the relationship between grades and level of growth mindset of students in interteaching courses to the relationship between grades and level of growth mindset to students

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taught using traditional styles of teaching. Moreover, although data were not collected on this, anecdotally the professor and teaching assistants expressed that this particular class was unusual compared to previous classes in terms of personalities and group cohesiveness. Thus, it is more likely that the current study contains a spurious relationship because the results go against all previous research regarding growth mindset and interteaching. Because of the small sample size, if there were a few outliers, the results would be skewed. Future opportunities for research include comparing mindset of students of interteaching courses to mindset of students enrolled in courses using traditional styles of teaching.

Moreover, the results do not support the hypothesis that there would be a relationship between level of growth mindset and number of emails. Specifically, the results displayed a floor effect in terms of numbers of emails displaying that although students with growth mindset sent emails, the results were not significantly greater than those students with lower levels of growth mindset. This could also be because those with fixed mindset sent a lot of emails asking about their grades, while students with growth mindset sent emails asking about learning content. Future research could examine the content of emails as well as conversations between the students and the professor to determine if there is a difference in the types of questions that students with a growth mindset ask compared to the types of questions that students with a fixed mindset ask.

The results also refute the hypothesis that growth mindset would be related to number of preparation guides missed. One explanation for these results include the idea that the contingencies for attending class override student mindset. For example, students with a lower levels of growth mindset might not have the desire to work hard in order to learn, but losing points for absences might outweigh their lack of a willingness to put forth effort. Furthermore,

according to Dweck (2006), those with a lower level of growth mindset have a sense of urgency to prove themselves again and again and the goal of students with a lower level of growth mindset is to look smart. Consequently, although students with a growth mindset would be likely to complete preparation guides in order to learn, the results may not have been significant because students with lower levels of growth mindset also complete preparation guides in order to prove themselves and seem smart (Dweck 2007).

One limitation and threat to internal validity of the current study includes experimental mortality, or loss of subjects. Specifically, 38 students completed the Qaultrics survey at the beginning of the semester. However, only 22 students completed the survey at the end of the semester that assessed whether intelligence mindset changed throughout the course. Thus, the results from the survey may not accurately reflect that intelligence mindset of the entire class. Another limitation of the current study includes the fact that all of the participants were psychology students and thus we cannot generalize our findings to classes beyond psychology. Additionally, it is likely that many of these students have learned about the positive effects of growth mindset and the results which displayed that there is a negative relationship between level of growth mindset and grades could be due to social desirability bias. Specifically, students with low grades might not truly display a growth mindset in their studying habits, but rather they may have wanted to provide answers to the survey that the professor would view favorably.

Another limitation of the study includes the fact that students completed the mindset survey online during their own time. As a result, students may have taken the survey quickly for completion and they may have selected answers that are not the best representation of their beliefs. Additionally, students were not required to complete the surveys and thus the data may not accurately reflect the beliefs of the majority of the class. One way to improve these

limitations is to require students to complete the survey as a class activity. Completing the survey during class might increase the likelihood that all students would complete the survey and the students might spend more time on the survey, providing more accurate representations of students' beliefs regarding mindset. At the same time, if students completed the survey in class, the results would only represent the students who attend class on that day.

The relationship between mindset and academic performance in interteaching courses is an important concern because our mindset and beliefs about ourselves strongly influence the goals we set and whether or not we are successful in achieving our goals (Dweck 2006). Additionally, college courses are often taught using traditional styles of teaching despite the research showing that interteaching has been a more effective style of teaching (Saville et al., 2005). While previous research has indicated some reasons why interteaching has been more effective than traditional lecture such as allowing students to choose topics for instruction, data has not been provided on topics such as mindset in terms of interteaching specifically. While previous studies have displayed the influence of growth mindset on academic performance with traditional styles of teaching, it is important to determine whether growth mindset influences academic performance during alternative styles of learning such as interteaching.

Appendix A

Table I

	Outcome					
	Final Grade		Number of Prep Guides Missed		Emails	
	R^2	β	R^2	β	R^2	β
Step 1 Intelligence Mindset	.109	-.331	.065	-.023	.073	.108
	F = 4.299		F = 1.08		F = 1.376	
	p = .046*		*p* > .05		*p* > .05	

Appendix B

Table II

Intelligence Mindset Week 1	Intelligence Mindset Week 2
9	12
16	16
16	16
15	12
14	16
15	
14	8
9	19
14	16
14	13
12	9
7	14
11	12
12	
18	
15	16
16	
16	16
16	13
16	20
17	
16	
8	
16	
14	15
16	
15	
18	
7	18
13	16
17	
12	19
16	10
14	16
16	
16	
11	
16	

Demographics Survey

Please indicate your major(s).

_____

Please indicate your minor(s).

_____

Please Indicate your age.

_____

Please indicate your gender.

- Male

- Female

- Transgender

- Other

- Prefer not to respond

Please indicate your year at JMU.

- Freshman

- Sophomore

- Junior

- Senior

- Post-baccalaureate

Please indicate your race/ethnicity (Check all that apply).

- African American

- Asian American

- Caucasian/White

- Latino/a

- Native American

- Pacific Islander

- Prefer not to respond

Have you previously taken a course that used interteaching?

- Yes

- No

- I am not sure

Have you previously taken a course in which team-based learning was used?

- Yes

- No

- I am not sure

Are you a transfer student?

- Yes

- No

Please report your cumulative GPA. If you do not have a cumulative GPA from JMU, you may use your GPA from your previous institution.

_____

Do you give permission for verification of your cumulative GPA?

- Yes

- No

Please indicate your student ID number.

_____

We will not be looking at these data until grades are submitted at the end of the term.

Thank you for your participation. Email Dr. Zinn (zinnte@jmu.edu) if you have questions.

<div align="center">

Appendix D

Mindset Survey

</div>

Please read the following statements and rate your level of agreement for each item.

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

      Strongly Disagree   Disagree Neither Agree nor Disagree   Agree   Strongly Agree

You can learn new things, but you can't really change how intelligent you are.

      Strongly Disgree   Disagree Neither Agree nor Disagree   Agree   Strongly Agree

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

      Strongly Disagree   Disagree Neither Agree nor Disagree   Agree   Strongly Agree

You can always substantially change how intelligent you are.

      Strongly Disagree   Disagree Neither Agree nor Disagree   Agree   Strongly Agree

Please read the following statements and rate your level of agreement for each item.

You can do things differently, but the important parts of who you are can't really be changed.

      Strongly Disagree   Disagree Neither Agree nor Disagree   Agree   Strongly Agree

You are a certain kind of person, and there is not much that can be done to really change that.

      Strongly Disagree   Disagree Neither Agree nor Disagree   Agree   Strongly Agree

No matter what kind of person you are, you can always change substantially.

      Strongly Disagree   Disagree Neither Agree nor Disagree   Agree   Strongly Agree

You can always change basic things about the kind of person you are.

      Strongly Disagree   Disagree Neither Agree nor Disagree   Agree   Strongly Agree

Appendix E
Statistics Self-Efficacy Survey
Indicate how confident you are about the following tasks.

	No confidence at all (1)	2	3	4	5	Complete confidence (6)
Identify the scale of measurement for a variable	O	O	O	O	O	O
Interpret the probability value (p-value) from a statistical procedure	O	O	O	O	O	O
Identify if a distribution is skewed when given the values of three measures of central tendency	O	O	O	O	O	O
Select the correct statistical procedure to be used to answer a research question	O	O	O	O	O	O
Interpret the results of a statistical procedure in terms of the research question	O	O	O	O	O	O
Identify the factors that influence power	O	O	O	O	O	O
Explain what the value of the standard deviation means in terms of the variable being measured	O	O	O	O	O	O
Distinguish between a Type I error and a Type II error in hypothesis testing	O	O	O	O	O	O
Explain what the numeric value of the standard error is measuring	O	O	O	O	O	O
Distinguish between the objectives of descriptive versus inferential statistical procedures	O	O	O	O	O	O
Distinguish between the information given by the three measures of central tendency	O	O	O	O	O	O
Distinguish between a population parameter and a sample statistic	O	O	O	O	O	O
Identify when the mean, median, and mode should be used as a measure of central tendency	O	O	O	O	O	O
Explain the differences between a sampling distribution and a population distribution	O	O	O	O	O	O

Appendix F

Psychological Measurement and Statistics (Psyc 210—4 credit hours) Spring, 2015

Instructor: Dr. Tracy Zinn (You can call me "Dr. Zinn" or "Tracy", whichever you are more comfortable with)

Office: Miller 1167

Office Hours: After class from 9:10-9:50 (in the classroom) 11-12 MW (in my office)

Gchat/Hangouts: justtzinn   **Phone:** 568-6309   **E-mail:** zinnte@jmu.edu

Class Meetings: MW 9:50-11:00 Miller 1107

F: 9:15-10:25   Miller 1111

**Undergraduate TAs: Miller 1209 (In research suite)   Graduate Assistant (SPSS & lab):
Miller 1170**

Nikole Gregg (greggnl@dukes.jmu.edu)   Elizabeth (Liz) Smith
        (smith3el@dukes.jmu.edu)

Julia Ricotta (ricottjm@dukes.jmu.edu)

Mack Cowan (cowanncm@dukes.jmu.edu)

Required Text: ISBN: 9781464113062

Nolan, S.A., & Heinzen, T.E. (2013) (2nd ed). *Essentials of statistics for the behavioral sciences.* New York, NY: Worth Publishers

Other readings on Canvas

I am here to help you with anything you need in order to do the best you can possibly do in this class. Please feel comfortable coming to me with any questions or concerns. Remember, I cannot help you if I do not know there is a problem.

Course Description: This course provides an introduction to statistical techniques used by psychologists in measuring behavior. Fundamental measures and theory of descriptive and inferential statistics will be discussed. The use of computers for data analysis will be introduced. **Prerequisites:** GPSYC 101 and MATH 205, 220, 231, or 235 with a grade of C- or better

COURSE OBJECTIVES

Department objectives: The Department of Psychology has common learning objectives recommended by the American Psychological Association (http://www.psyc.jmu.edu/undergraduate/curriculumobjectives.html). This course will *focus on*:

➢ **Research Methods in Psychology.** Students will understand and apply basic research methods in psychology, including research design, data analysis, and interpretation.

➢ **Critical Thinking Skills in Psychology.** Students will respect and use critical and creative thinking, skeptical inquiry, and, when possible, the scientific approach to solve problems related to behavior and mental processes.
➢ **Application of Psychology.** Students will understand and apply psychological principles to personal, social, and organizational issues.
➢ **Values in Psychology.** Students will be able to weigh evidence, tolerate ambiguity, act ethically, and reflect other values that are the underpinnings of psychology as a discipline.
➢ **Information and Technological Literacy.** Students will demonstrate information competence and the ability to use computers and other technology for many purposes.
➢ **Communication Skills.** Students will be able to communicate effectively in a variety of formats.

General method course (Psyc 210 & 211) objectives: Students of psychology must take methods courses before moving on to most content courses. At the end of these courses, students will be able to:

➢ demonstrate basic research skills including: data analysis and interpretation
➢ use critical thinking, skeptical inquiry, and when possible a scientific approach to solve problems.
➢ demonstrate information competence and the ability to use technology (e.g. SPSS) for research purposes.
➢ report effectively empirical research in written form using APA-style

Course Specific Objectives: Many students are either not looking forward to taking a statistics course or are down-right dreading it. My primary objective in this class is to familiarize you with the importance and utility of statistics while reducing fear and apathy students may have toward the subject. At the conclusion of this class, you will be able to:

➢ Describe how statistics are used in the social sciences
➢ Identify circumstances when you will need to understand statistics in your daily life
➢ Describe the purpose of different statistical procedures
➢ Convey the importance and utility of statistics in your future career or a hobby
➢ Identify what statistic should be used under different circumstances
➢ Explain some limitations of statistics
➢ Use SPSS for basic statistical procedures
➢ Report analyzed data in written form
➢ Tolerate probability (i.e., uncertainty)

COURSE STRUCTURE: The structure for this course is going to be slightly different from the traditional course structure with which you are most familiar. We will be using a method of classroom instruction known as interteaching.

Interteaching: Interteaching is a different way of arranging classroom instruction. The central component of interteaching is pair discussion, although it also consists of several other components (see below). One of the best ways to learn a particular piece of information is to discuss it; an even better way to learn something is to teach it to someone else. Therefore, you will spend about half of your in-class time discussing the main points in a specified reading assignment, clarifying any topics that are confusing, and practicing concepts related to your reading.

Preparation ("Prep") Guides (PG): Prior to most classes, I will post a prep guide that contains the topics we will discuss in class. Your job is to take the PG, prepare for class, and show up ready to discuss the topics contained on it and/or complete activities related to the material. The PGs may be used as guides for later studying and will provide the structure for any supplementary notes that you might take during lectures.

Pair discussions: You will earn points for participating in the pair discussion and completing supplementary work. Each day, we will randomly select students to show us their completed PG. If you don't have a completed PG you will not earn the participation points for that day. During pair discussions, you should emphasize discussion of the PG items (i.e., do not simply read the answers you wrote down). In addition, class time will not be used for reading or work that was not completed beforehand. As you discuss the prep guides, be sure to define clearly any of the concepts that are included in the questions, even if the questions do not ask for definitions. If you do this, you will be less likely to misinterpret of the questions. If you are unsure about an answer, check with me or one of the TAs. My job during discussions is to provide help for those who request it. If you never have difficulty, or if you consistently finish early, you probably are not discussing adequately.

Record Sheet: After you complete the pair discussions, you will complete a record sheet that will be distributed in class. On it, you will enter (a) your names, (b) difficult topics/questions, (c) any problems you want to notify me of, (d) what concepts you believe you know well, and (e) the "gem" of the day (I'll explain).

Clarifying Lectures: I will lecture the following class day on any topics or activities that gave you difficulty or need clarification. By your responses on the record sheet, I will spend time reviewing only those topics you specifically request. As a result, we won't waste valuable class time discussing topics you already understand.

COURSE REQUIREMENTS

Pair Discussion Participation (20 @ 5 pts): In order to earn points for your participation in the pair discussions you will have to (a) show your completed prep guide (if asked) and (b) respond to a record sheet online. You do not have to have all correct answers so don't worry about that! Just do the work and come prepared. On the days we will be reviewing for the check point, you will post comments/questions to a discussion board for credit. You are able to miss 2 during the semester.

Mastery Quizzes (5 @ 20 pts): In order to encourage fluency with material, you will be able to take mastery quizzes (MQs) to prepare for the CPs. You will be able to take each quiz up to 3 times before the CP to practice the material (due by time of CP). The highest grade will be used to calculate your points. **However, you must get an 80% (a B) in order to earn any credit.** Also, please remember that you should use these as a chance to study and learn the material. Space your practice accordingly.

CheckPoints (CP)(4 for a total of 325 pts): There will be 4 CP during the semester. The value of the CP increases as we go through the material, as material gets more difficult. CP will typically include (a) short answer questions drawn from the preparation guides, (b) several problem-solving questions, and (c) multiple-choice and/or fill-in-the-blank questions. Explanation of concepts is very important. Each CP will cover information from the assigned prep guides, lectures, activities, and SPSS homework. In other words, the prep guides, lectures, pair discussions, and other assignments are practice for the CP. You will not be surprised by what you see on the CP.

Corrections (not required): For the CPs, you will also have the opportunity to turn in corrections. After the CP, you will turn in the answer sheet, but take home the test. For a portion of the questions, you will be able to change your answers. During the class period following the CP, you can turn in your corrections, **along with an explanation about why you missed the question/why the new answer is correct**, and earn half of the possible points back.

SPSS in-class activities (10 @ 10 pts): During most lab meetings, you will have a brief activity to complete for credit. You will be able to drop your lowest two scores (including a 0 for a missed assignment). Activities are to be completed during lab time, unless otherwise specified.

SPSS Homework (4 @ 50 pts): In your Friday labs, you will be learning how to use and interpret output from SPSS. This will include how to manage data, select statistics, interpret output, and write about those results. You will see SPSS output on some of your prep guides and CPs. You will have 4 SPSS assignments throughout the semester, for which you will use SPSS to analyze data and answer questions. A portion of your final exam will also be SPSS. I will upload SPSS homework assignments to Canvas for you to complete. The material from the homework assignments and other material covered in lab are fair game for the CP. **SPSS assignments are due at 7:00pm on the due date.**

Pair project (150 pts): Over the course of the semester, you will complete a statistics project with a partner. This will include answering survey questions, developing hypotheses to test, selecting appropriate statistics, running and interpreting statistics, and writing a short paper to describe your results. More guidelines will be posted on Canvas and discussed in lab.

Cumulative Final (250 pts): The dreaded cumulative final! Don't worry, you'll be well prepared if you attend class and complete the assignments. You won't have anything on the cumulative portion of the final that you haven't seen in class. Part of the exam will be take-home (the SPSS portion—80 pts), and part will be in class. The in-class portion will include new material (80 pts) and review material (90 pts). Keep all your materials throughout the class!

OTHER INFORMATION

Evidence-based teaching: In all of my classes, I research the literature on evidence-based teaching and design my classes based on methods that are likely to be effective in a particular context (e.g., seminar class, introductory class). I also collect data on how my students and I are doing every semester. At the end of every semester, I use those data to determine how I will teach in the future. In some cases, data are presentable or publishable; therefore, I will give you the opportunity to consent to me using your data in non-identifiable form. I will not look at the consent forms until after grades are submitted at the end of the term. This means that I will not know whether you consented to me using your data until after class is completely over. In addition, your name or any identifying information will not be included in presentations or other use of the data.

From the Provost: Students are responsible for registering for classes and for verifying their class schedules on e-campus. The deadline for adding a spring 2015 semester class through MyMadison without academic unit permission is January 20, 2015. Between January 21, 2015 and January 29, 2015, academic unit permission is required to add a class for spring semester 2013. The deadline to drop a class without "W" grade is January 20. After March 20, students will not be permitted to withdraw from a class via MyMadison. No exceptions will be made to these deadlines.

INTERTEACHING AND MINDSET

For more information on block courses, refer to the Registrar's website at
http://www.jmu.edu/registrar/RegistrationDatesDead.shtml.

Email & Canvas: Make sure you check your email and Canvas regularly (i.e., at least every other day). Email is the easiest way to get in touch with me. I will also be available often on Gchat during office hours. All SPSS assignments and survey project assignments will be done on Canvas. *Unless otherwise stated on the syllabus or in class*, all Canvas assignments are due by 7:00pm on the due date. All documents must either be in Microsoft Word or in rich text. Please let me or one of the TAs know if you are confused about how to upload your assignments.

Attendance & Make-up Policy: Attendance is not "required", but there is a strong correlation between attendance and learning (and, subsequently, grades). Moreover, some of your grade will be based on your participation in the pair discussions. Although I do hope to see you every day, it is ultimately your decision as to whether or not you attend class. **There will be no make-ups for pair discussions, regardless of the reason for absence**. You are able to miss two across the semester without penalty, so save them for when you need them. I will allow you to make up one CP over the course of the semester without documentation; however, **corrections will not be available**. Regardless of the nature of the excuse, if you are interested in making up any CP you must notify me as soon as possible if you have missed class or if you plan to miss class.

Disability Services: If you have a documented need for accommodations due to a disability, please see me as soon as possible. If you suspect that you might have a disability or if you have questions about disability services, visit www.jmu.edu/ods or email disability-svcs@jmu.edu.

Religious Observation Accommodations: I am happy to provide reasonable accommodations due to religious observation. Please see me if you believe the course policies will conflict with any religious holidays.

Academic Honesty: First of all, I assume honest behavior from my students, unless I am given reason to think otherwise. I know that you are under pressure from other classes, work, etc., and that honest work requires honest effort. I try to structure my classes such that students who perform honestly are rewarded. I don't try to "catch" you cheating. But, it is a problem on every campus. If there is a problem with dishonest behavior, it will be dealt with according to University Policies and Procedures. See the Honor Council's website http://www.jmu.edu/honor/code.shtml for details. I expect that your course papers will include appropriate citations (see me if you are unsure about what would qualify as plagiarism). Attempts to manipulate the policies set forth in the syllabus, lies (by omission or commission), and sharing information with students in an unauthorized manner are considered violations of the Honor Code.

Inclement Weather Policy: In case of delay or cancellation, check Canvas and e-mail for makeup information (see http://www.jmu.edu/JMUpolicy/1309.shtml, for more information). I will try to make up time by assigning online activities; however, this will depend on the timing of the cancellation.

Pet Peeves: Some of our non-school pet peeves: 1) any movie that has a scene of a woman having a baby, 2) people who say "irregardless," 3) unbalanced egg cartons, and 4) badly presented data in the media. I also have class pet peeves. Please do not do any of the following: 1) show up for class unprepared or rush through discussion; 2) grade grub; 3) don't use the syllabus; or 4) text in class.

Pet Prides: First, non-school related pet prides: 1) people who will talk to me about sports; 2) people who've adopted shelter pets; and 3) people frequent the farmer's market/Food Co-Op. And some school related pet

prides: 1) students who say they are excited about something they are learning; 2) students who smile and have fun in class; 3) students who are prepared for class and use their time wisely; and 4) students who come to my office to ask questions or just say, "Hi."

Grading: Course letter grades will be based on the percentage of total points earned. I know that everyone has concerns about grades—graduating, graduate school, parents, etc. However, I hope that over the course of the term you come to enjoy coming to class and completing activities because of the learning you get from it, and not just the grade you get out of it. **Focus on your learning the material and completing the assignments and your grade will follow.** By having many smaller assignments, it is more likely that you will remember the information and do well. This also means that most days there is some type of graded assignment. *Please keep track of your grades and keep your papers—the information is cumulative.*

L-Earning Your Grade

Pair Discussion Participation	20 @	5 pts (drop 2)	**100 pts.**
Mastery quizzes	5 @	20 pts	**100 pts.**
CPs			**325 pts.**
CP #1		50 pts	
CP #2		75 pts	
CP #3		90 pts	
CP #4		110 pts	
SPSS in-class activities	10 @	10 pts (drop 2)	**100 pts.**
SPSS Homework	4 @	50 pts	**200 pts.**
Statistics project			**150 pts.**
Answering survey	10 pts		
Articles for paper	10 pts		
First draft	50 pts		
Final draft	75 pts		
Evaluations	5 pts		
Cumulative Final Exam			**250 pts.**
New Material	80 pts.		
In class final (MC)	90 pts.		
Take home SPSS	80 pts.		

1225 pts.

IF YOU ARE ON THE BORDER BETWEEN TWO GRADES AT THE END OF THE SEMESTER, I WILL CONSIDER GIVING YOU THE HIGHER GRADE IF, AND ONLY IF, YOU ATTENDED CLASSES REGULARLY AND YOU EARNED THE HIGHER GRADE ON YOUR FINAL. IF YOU ARE BETWEEN AN "A" AND A "B", BUT YOU EARNED A "B" ON THE FINAL, I WON'T RAISE YOUR GRADE. HOWEVER, IF YOU ARE BETWEEN AN "A" AND A "B" AND YOU EARNED AN "A" ON THE FINAL AND ATTENDED CLASS REGULARLY, I WILL RAISE YOUR GRADE.

Grading Scale

A	92% +	A-	90 – 91.9%	B +	88 – 89.9%	B	82 – 87.9%
B-	80 – 81.9%	C +	78 – 79.9%	C	75 – 77.9%	C-	70- 74.9%
D	65 – 69.9%	F	Below 65%				

I reserve the right to make changes to the schedule as needed. Changes will be posted on Canvas and announced in class.

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