An Analysis of Mindset Strategies in Economics Courses

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This paper examines the fixed and growth mindset theories using students from a U.S. university's economics courses. We utilized two groups for this study: one group served as the control and received no growth mindset interventions. In contrast, the other group was subjected to growth mindset interventions. We did not find a significant difference in success rates between the two groups. This finding is inconsistent with previous studies that primarily involved K-12 students as participants. Our results suggest that as individuals gradually enter adulthood, they are more likely to hold fixed mindsets rather than growth mindsets.

Keywords: fixed mindset theory, growth mindset theory

INTRODUCTION

The concept of the growth mindset was introduced to the field of education several decades ago, originating from the work of psychologist Carol Dweck, who began investigating students' belief systems concerning achievement and intelligence. She became interested in understanding attitudes about failure in K-12 students. She sought to show that there is a relationship between what we believe about how we learn and our actual achievement. Her research on motivation and personality and the impact of mindsets has widely changed the landscape of education in the K-12 setting (Diener & Dweck, 1978; Diener & Dweck, 1980; Dweck & Leggett, 1988).

Dweck's mindset theory is that most people hold one of two beliefs about their intelligence: it can change or it is fixed. Growth mindset students believe that intelligence can change and that they can continue to learn and grow as they put in effort. With a fixed mindset, students believe that their intelligence is a fixed trait that cannot be changed much. She also mentioned that with some interventions, students who realize the significance of a growth mindset can change from a fixed to a growth mindset (Dweck, 2006).

In her book on mindset, Dweck mentioned that mindsets can be formed early in life, and a child's education plays a crucial role in shaping either a growth or a fixed mindset. Teachers can influence and promote either mindset. Students who adopt a fixed mindset are less likely to put in effort. Conversely, when taught a growth mindset, students value criticism and assessment. Teaching students a growth mindset is Dweck's mission.

Following Dweck's work, many educators and researchers began to study how a growth mindset affects academic performance, such as the studies by Yeager et al. (2019) and Porter et al. (2022). Yeager and his coauthors conducted a national study on learning mindsets. They found that a brief online growth mindset intervention, which lasts less than an hour and teaches that intellectual abilities can be developed, improved grades for lower-achieving students, and increased enrollment in advanced mathematics courses among a nationally representative sample of secondary education students in the United States. Porter et al. (2022) evaluated a teacher-delivered growth mindset intervention for grades 6 and 7. Their results showed that struggling students in the target class saw an improvement in their grades, suggesting that growth mindset interventions can be effective when implemented by teachers.

Prior studies on mindsets generally indicate that the more students have a growth mindset, the better they perform academically because their goal is learning and understanding, and they recognize that effort is directly associated with development. However, most of these studies focuse on K-12 education.

This paper examines whether growth mindset interventions in a macroeconomics college classroom can improve student outcomes. Specifically, we analyzed students' course performance in two different settings for Principles of Macroeconomics. We named the two groups 'mindset' and 'non-mindset'. Both groups used the same instructional materials and textbook and were taught using the same methods such as class preparation assignments, graded assessments for homework and quizzes, and tests.

The difference in the 'mindset' group is that they were provided with a post-assessment analysis and goal setting after each test. Additionally, the group was given a mindset lesson before each class meeting. The students read information on fixed and growth mindsets and answered questions to assess their understanding and analyze their behaviors. The six growth mindset lessons taught were: Introduction to Growth Mindset, Growth Mindset Assessment, The Truth About Your Brain, Mistakes Are Opportunities, Growth Mindset: Keep Going, Keep Growing, and Growth Mindset: Check-In.

Based on the growth mindset theory, we hypothesized that the 'mindset' group could have significantly higher success rates (students earning a C or better in the course) than the 'non-mindset' group. We used t-tests to assess our hypotheses. Our results didn't show a significant difference between the two groups' success rates. In addition, we didn't find consistent academic improvement in the performance of the 'mindset' group after they received growth mindset interventions.

This study makes the following contributions to the existing literature:

First, this study contributes to the growth mindset literature by focusing on college students, a demographic that has been less examined than middle and high school students.

Second, our research pioneers the application of growth mindset theory within the context of economics courses at the higher education level. This is the first study to explore the growth mindset theory in this academic setting.

Third, our paper highlights a general lack of evidence supporting growth mindset interventions integrated into classroom instruction. Most existing interventions have been laboratory-based rather than embedded in regular teaching practices.

Finally, our findings present different results from previous research predominantly focused on K-12 students, revealing a tendency towards fixed mindsets among college students. This contrasts with the more optimistic outcomes often reported for younger age groups and suggests the need for further investigation into mindset theories across different educational stages.

LITERATURE REVIEW

Research on the fixed and growth mindset can be traced back to the early studies by Dweck and her co-authors. (Dweck & Reppucci, 1973; Dweck, 1975; Diener & Dweck, 1978). Initially, they discussed two

major patterns of cognition-affect-behavior: the maladaptive 'helpless' response and the more adaptive 'mastery-oriented' response. The helpless response is defined as avoiding challenges and experiencing a decline in performance when encountering obstacles. Conversely, the mastery-oriented pattern involves actively seeking challenges and generating effective strategies in the face of obstacles (Dweck& Leggett, 1988).

In these early studies, late grade-school-age children participated in some concept formation tasks in laboratory settings. The helpless children viewed their difficulties as failures and insurmountable challenges, leading to negative self-cognitions, emotions, and impaired performance. In contrast, mastery-oriented children saw unsolved problems as challenges to overcome through effort and strategy. They engaged in constructive self-instruction and self-monitoring, maintaining a positive attitude and effectively solving problems. Even though they had received identical tasks, the two groups of children responded to the situation in entirely different ways.

In summary, Dweck and her coauthors' early research suggests that helpless children tend to focus on their ability and its adequacy, perceiving challenges as threats to their self-esteem. On the other hand, mastery-oriented children focus on mastering challenges through effort and strategy, viewing difficult problems as opportunities for growth and learning.

Later, in her 2006 book Mindset: *The New Psychology of Success*, Dweck began using the terms fixed and growth mindsets to describe how the two types of beliefs about intelligence affect behavior. She also mentioned in the book that, with appropriate interventions, individuals can change between fixed and growth mindsets. Teachers play a crucial role in facilitating this dynamic process.

After Dweck introduced the mindset theory, many researchers began studying how mindset affects the field of education. David Yeager is one of the most productive researchers in this area, having published numerous papers.

Yeager and Dweck (2012) researched how students' mindsets influence their resilience in dealing with academic and social challenges. They demonstrate that students who hold (or are taught) a growth mindset rather than a fixed mindset tend to achieve higher academic success during challenging transitions and exhibit better completion rates in demanding math courses. A growth mindset can also reduce adolescents' aggression and stress related to peer victimization or exclusion, leading to improved school performance.

Previous mindset interventions used in laboratory experimental research were not very effective. Yeager et al. (2016) tested a new intervention method on a group of students during their transition to high school. Qualitative inquiry and rapid, iterative randomized 'A/B' experiments were conducted with approximately 3,000 participants. Subsequent experimental evaluations demonstrated that the revised growth mindset intervention outperformed previous versions. Additionally, it improved 9th-grade core-course GPAs and reduced the number of Ds and Fs among lower-achieving students when delivered online under routine conditions.

Later, Yeager et al. (2022) found teachers' mindset influence was very important to the effectiveness of mindset interventions. They asked whether students can apply a growth mindset on their own or if they need their teacher to also have a growth mindset. Their results supported the idea that teachers' mindsets do play a crucial role.

Other research that has significantly contributed to the literature on mindsets includes Broda et al. (2018), Destin et al. (2019), Hecht et al. (2021), etc.

To investigate the effects of mindset interventions on racial and ethnic minority students, as well as first-generation students, Broda et al. (2018) randomly assigned 7,686 students to an online growth mindset intervention, a social belonging intervention, or a comparison group, their results indicated that the growth mindset intervention significantly improved GPA for Latino/a students by approximately 0.40 points, representing a 72% reduction in the GPA gap between White and Latino/a students.

Destin et al. (2019) found that data from a nationally representative sample of ninth-grade students in U.S. public schools revealed that higher socioeconomic status was linked to a less fixed mindset about academic ability. Additionally, having a fixed mindset was negatively related to academic performance, suggesting that mindsets are linked to socioeconomic factors and academic achievement.

Hecht et al. (2021) introduce the Mindset × Context framework and apply it to the analysis of growth mindset interventions. They found that teaching students a growth mindset is most effective in educational settings that actively support and encourage it. This framework highlighted the need for a more comprehensive approach: in addition to interventions that change students' beliefs, we must also implement strategies that guide teachers in adopting classroom policies and practices that support and reinforce students' growth mindset beliefs.

HYPOTHESES DEVELOPMENT

Research has documented that a growth mindset is associated with better academic performance. For example, in a year-long study, Park et al. (2016) found that as early as 1st and 2nd grade, children who endorsed a growth mindset performed better on a nationally normed standardized math test compared to those who held a fixed mindset. Bostwick et al. (2017) involved secondary school students in grades 7–9 from 19 schools in Australia. After accounting for five student background factors (e.g., sex, socioeconomic status), students' growth mindset positively predicted mathematics engagement and achievement. Another study by the same group of researchers, using a different sample of Australian middle and high school students, found that students' growth orientation in mathematics was a significant positive predictor of increases in both mathematics engagement and achievement, surpassing the influence of other factors (Bostwick et al.,2019).

Given that a growth mindset is associated with better academic outcomes and students' mindsets can be changed (Dweck, 2006), educators have begun to explore interventions to shift students with a fixed mindset to a growth mindset to improve their academic results.

Blackwell et al. (2007) conducted a middle school study involving 48 U.S. seventh graders in the intervention group and 43 in the control group. The intervention was administered by highly trained facilitators who were not the students' regular teachers. The students engaged in readings complemented by activities and discussions. The results indicated that teaching students about growth mindset theory led to positive changes in classroom motivation compared to the control group. While the control group continued to show a decline in grades, the intervention group experienced a reversal of this downward trend.

Yeager and Walton (2011) reviewed the theoretical basis of several mindset interventions. They attributed their lasting impact to their focus on students' subjective experiences in school, their use of persuasive methods for conveying psychological concepts, and their ability to engage recursive processes within educational settings. These psychological interventions are powerful tools.

The studies mentioned above have found that growth mindset interventions can improve students' academic performance. However, most of them focus on middle and high school students. Here, we used a college business class to test whether the growth mindset intervention could improve college students' academic outcomes. Specifically, we propose the following hypotheses:

H1: *Students' grades are higher in the semester when growth mindset interventions are provided compared to the semester when such interventions are not given.*

H2: *Students' grades are higher after they receive mindset interventions compared to before receiving these interventions within the same semester.*

Prior studies also found that not all students respond to mindset interventions in the same way. High-risk, low-achieving students seem to benefit more from mindset interventions (Sriram, 2014; Paunesku et al., 2015; Yeager et al., 2019).

Sriram (2014) examined the mindset's role in promoting success for academically high-risk students. He found that students taught to view intelligence as malleable reported significantly higher levels of academic effort and study skills than those who were directly taught study skills.

Paunesku et al. (2015) designed mindset interventions to help students facing academic challenges, expecting that these interventions would be particularly beneficial for those struggling academically. The interventions increased semester GPAs in core academic courses among students at risk of dropping out.

In addition, Yeager et al. (2019) discovered that a brief online growth mindset intervention led to improved grades for lower-achieving students.

Based on these findings, we conducted a sub-sample analysis focusing on whether low-achieving students benefit from mindset interventions. Therefore, we hypothesize that:

H3: *Low-achieving students' grades are higher after they receive mindset lessons compared to before receiving these lessons within the same semester.*

METHODOLOGY

Participants

This study took place at a U.S. university. The instructor collected the data from her Principles of Macroeconomics classes. In Fall 2019, she taught one class without providing students with growth mindset lessons. This class is our 'non-mindset' group, which consists of 46 students. In Fall 2020, The same course was taught by the same instructor, who provided students with several growth mindset interventions. The Fall 2020 'mindset' group had two sections, with a total of 74 students included in the study across both sections.

Procedure

Different intervention methods are used in prior studies, such as remote online training or those implemented in a laboratory setting (Yeager et al., 2016; Broda et al., 2018; Covarrubias et al.,2019). However, Haimovitz & Dweck (2017) suggest that mindset interventions are more effective if they are integrated with the daily instruction students receive from teachers. Schmidt et al. (2017) also emphasized the crucial role of teachers in shaping students' mindset orientations to achieve the best possible outcomes. Therefore, we integrated the mindset interventions into classroom instruction.

To demonstrate the growth mindset ideas to the Macroeconomics students, the following lessons were taught to the Fall 2020 'mindset' groups at the beginning of each class meeting:

1. Introduction to Growth Mindset: This lesson gave a brief introduction to the difference between fixed and growth mindsets. The purpose was to provide a background to Dr. Dweck's research and the relationship between students' beliefs regarding intelligence and achievement.
2. Growth Mindset Assessment: After further explanation of fixed and growth mindsets, this lesson had students assess their mindset to determine which category they fit into. The self-assessment was designed to help students understand where they are on their growth mindset journey. They also had the opportunity to share and reflect on their results.
3. The Truth About Your Brain: This lesson explained to students that your brain can change and grow when faced with new challenges. It introduced the science of neuroplasticity and how your brain can change with new practices and habits. It also explained to students that effort is directly associated with learning and that their beliefs about their intelligence have a direct impact on their approach to learning, overcoming challenges, and trying new things.
4. Mistakes Are Opportunities: This lesson helped students to understand that mistakes are a key part of the learning process. It taught students the difference between good mistakes and bad ones and helped them identify how to turn mistakes into opportunities for growth.
5. Growth Mindset: Keep Going, Keep Growing: This lesson helped students identify healthy learning strategies and understand how working through frustration will help them grow. It taught students how to recognize frustrations, remind themselves that difficulty and struggles can be an important part of the learning process and when they are feeling overwhelmed they can reset by taking a short break.

6. Growth Mindset: Check-In: This lesson was both a reflection and a look ahead in applying the strategies. It also served as a goal-setting session at the end of the semester.

Three tests were conducted throughout the semester. Test 1 was done after the first four growth mindset lessons: Introduction to Growth Mindset, Growth Mindset Assessment, The Truth About Your Brain, and Mistakes are Opportunities lessons. Test 2 was given after two additional growth mindset lessons were taught: Growth Mindset: Keep Going, Keep Growing, and Growth Mindset Check-In, and test 3 was conducted after the final growth mindset review. After each test, the students were also provided with a post-assessment analysis and goal-setting.

To assess our H1, we compared the grades from the first three tests between the ‘mindset’ and 'non-mindset' groups. Both groups took the same tests. We didn't include the final exam in this study because students might elect to "opt out" of the final exam. We also excluded students who missed any of the three tests. Our final sample consists of 46 students for the 'non-mindset' group (Fall 2019) and 74 for the ‘mindset’ group (Fall 2020).

The statistical technique of the t-test was used to analyze our hypotheses. Because the ‘mindset’ and 'non-mindset' groups have different sample sizes, we also applied the Satterthwaite method of the t-test as a robustness check to address the concern of unequal variances.

The growth mindset lessons were taught in the Fall 2020 semester. To evaluate H2, we compared the grades before and after growth mindset interventions for the ‘mindset’ group to see how students' performance was affected. To control for differences in difficulty levels across tests, we divided each test score from 2020 by the average score for the same test in 2019, using the 2019 scores as the baseline.

To test H3, we further divided the ‘mindset’ group into two sub-groups: low-achieving and high-achieving groups. The classification is based on the first test’s grades. If a student's grade is higher than the group's median grade, they are classified into the high-achieving group. Otherwise, they are classified into the low-achieving group. We repeated the same comparison tests before and after the mindset interventions for the low-achieving sub-group.

RESULTS

Table 1 illustrates the results of H1. The ‘mindset’ group only has a higher average grade for test #2. However, this difference is not statistically significant at any level (P-value=0.1383 for the pooled method and P-value=0.1254 for the Satterthwaite method). For tests #1 and #3, the ‘mindset’ group has even lower mean grades. However, both differences are not statistically significant. Due to the outbreak of the pandemic in 2020, the unexpected results may be driven by this cause.

Table 2 presents the ‘mindset’ group t-test results. Since the three tests were administered to the same students, their performance across the tests should be related or show some pattern after they received mindset interventions.

When testing H2, each test score is scaled by the average score of the same test in 2019 to control for the difficulty levels of different tests. As we can see, students did much better in test #2 than in test #1. However, their performance dropped for test #3. Recall that students took test 2 after two additional growth mindset lessons, Growth Mindset: Keep Going, Keep Growing, and Growth Mindset: Check-in. They took test 3 after the growth mindset review. It appears that the two lessons, Growth Mindset: Keep Going, Keep Growing, and Growth Mindset: Check-in, had a more positive effect on students' intelligence. However, the growth mindset review did not improve performance. Overall, the difference between test #3 and test #1 is not positive or statistically significant, indicating that the growth mindset interventions given during the semester were not useful in helping students get better grades. Our H2 is not supported.

TABLE 1
T-TEST: DIFFERENCES IN EXAM GRADES BETWEEN 'MINDSET' (2020) GROUP AND 'NON-MINDSET' (2019) GROUP

Panel A: Test_1 difference				
Year	**N**	**Mean**	**Std Dev**	**Std Err**
2019	46	78.7174	11.8475	1.7468
2020	74	76.8784	11.1022	1.2906
Diff (2020-2019)		-1.839	11.3922	2.139
Method	**Variances**	**DF**	**t Value**	**Pr > |t|**
Pooled	Equal	118	-0.86	0.3917
Satterthwaite	Unequal	90.85	-0.85	0.3994
Panel B: Test_2 difference				
Year	**N**	**Mean**	**Std Dev**	**Std Err**
2019	46	73.2717	9.5416	1.4068
2020	74	76.2162	11.063	1.2861
Diff (2020-2019)		2.9445	10.5088	1.9731
Method	**Variances**	**DF**	**t Value**	**Pr > |t|**
Pooled	Equal	118	1.49	0.1383
Satterthwaite	Unequal	106	1.54	0.1254
Panel C: Test_3 difference				
Year	**N**	**Mean**	**Std Dev**	**Std Err**
2019	46	77.2609	11.0095	1.6233
2020	74	74.2838	12.7929	1.4871
Diff (2020-2019)		-2.9771	12.1437	2.2801
Method	**Variances**	**DF**	**t Value**	**Pr > |t|**
Pooled	Equal	118	-1.31	0.1942
Satterthwaite	Unequal	106.15	-1.35	0.1792

TABLE 2
T-TEST: DIFFERENCES IN EXAM GRADES BEFORE AND AFTER GROWTH MINDSET LESSONS FOR THE 'MINDSET' GROUP

Difference	N	Mean	Std Dev	t Value	Pr > |t|
Test_2- Test_1	74	0.0635	0.1474	3.71	0.0004***
Test_3- Test_2	74	-0.0787	0.1299	-5.21	<.0001***
Test_3- Test_1	74	-0.0152	0.1419	-0.92	0.3606

Notes: *** denotes significance at the 1% level.

Table 3 illustrates the results of low-achieving students. Prior studies show that a growth mindset may help low-achieving students improve their self-confidence and academic performance (Sriram, 2014; Yeager et al.,2019). The subsample test results are consistent with our findings for H2. Students did better in test #2 but not in test #3. Although the low-achieving students did better in test #3 than in test #1, the difference of 0.0341 is not statistically significant (P-value=0.146). Our H3 also does not hold.

TABLE 3
T-TEST: DIFFERENCES IN EXAM GRADES BEFORE AND AFTER GROWTH MINDSET LESSONS FOR THE LOW-ACHIEVING SUBGROUP

Difference	N	Mean	Std Dev	t Value	Pr > |t|
Test_2- Test_1	37	0.1221	0.137	5.42	<.0001***
Test_3- Test_2	37	-0.0879	0.1181	-4.53	<.0001***
Test_3- Test_1	37	0.0341	0.1396	1.49	0.146

Because the students were required to answer questions to assess their understanding after each mindset lesson, we also tested the correlation between the change in grades and the mindset assessment grades (Growth Mindsets 1-6). The results are reported in Table 4.

For Table 4, a positive correlation implies that the growth mindset assessment grade is positively related to an increase in the exam grades. Although we see some positive correlation coefficients, none are significant. The correlation coefficients between growth mindset assessment results and change in exam grades also fail to support our hypotheses.

TABLE 4
CORRELATION BETWEEN CHANGE IN EXAM GRADES AND GROWTH MINDSET QUIZZES' GRADES

	Test_2 - Test_1	Test_3 - Test_2	Test_3 - Test_1
Growth Mindset 1	-0.11736	-0.01592	-0.14977
	0.3193	0.8929	0.2028
Growth Mindset 2	0.03373	-0.08446	-0.05426
	0.7754	0.4743	0.6461
Growth Mindset 3	-0.20595	0.13124	-0.08886
	0.0783	0.265	0.4515
Growth Mindset 4	-0.02483	0.1296	0.11364
	0.8337	0.2711	0.335
Growth Mindset 5	-0.09126	-0.02559	-0.13091
	0.4393	0.8286	0.2662
Growth Mindset 6	0.12397	-0.04562	0.08996
	0.2927	0.6995	0.4459

Notes:
1. The probability that each correlation coefficient is different from zero (p-value) is reported under the correlation.
2. Growth mindsets (1-6) refer to the grades of the six growth mindset assessments, respectively

CONCLUSION

The study of mindset has received significant attention in recent decades, particularly within education and research. Boaler (2013) summarized its impact as reshaping education. Rattan et al. (2015) even stated that fostering growth and belonging to academic mindsets should become a national education priority.

Therefore, we believe that researching the application of growth mindset in higher education is both timely and relevant, given the growing interest from the public, policymakers, and educators in using growth mindset research to enhance educational outcomes. While mindset interventions have been

increasingly implemented and shown effectiveness in K-12 education, this study aims to explore their potential in higher education. This area has not yet received as much attention.

We studied growth mindset in university-level macroeconomics courses, as such courses are typically challenging for college students. Our results show that the growth mindset interventions for college students are less effective than prior studies that mainly used middle and high school students as research subjects. This may suggest that their mindset becomes increasingly difficult to change once people enter adulthood. Therefore, if the growth mindset is beneficial for educational outcomes, it is essential to implement such interventions at the early stages of education to optimize their impact.

There are some limitations of this study. First, it was conducted during the COVID-19 pandemic, which may have impacted students' mindsets in the 'mindset' groups, potentially affecting their performance relative to the 'non-mindset' groups. Additionally, the current duration of the study may be insufficient to bring about noticeable changes in students' mindsets. Dweck (2006) noted that the success of growth mindset interventions can only be truly measured in the long term. In the future, we could track the academic performance of the same individuals from their freshman to senior years, continuously applying growth mindset interventions.

This study provides a preliminary exploration of the role of growth mindset interventions in higher education, suggesting that the academic community is still investigating the potential effectiveness of growth mindset interventions at the higher education level.

It is vital to consider how to help all students succeed, and the growth mindset remains important. Since research has shown that growth mindset education is effective among K-12 students, we still believe it may benefit higher education. However, finding a better method to implement growth mindset strategies in higher education is a topic that warrants thorough exploration in the future.

The study of mindset carries significant implications for educators, researchers, and society. Future research should consider incorporating a broader range of college courses to determine whether the growth mindset impacts certain disciplines. Additionally, follow-up studies may be necessary to further validate the findings.

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