IES Institute of Education Sciences

Growth Mindset Interventions

Intervention Report | Supporting Postsecondary Success Topic Area

WHAT WORKS CLEARINGHOUSE™
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Large numbers of students who enroll in college do not complete a degree. Yet, earning a college degree is one of the primary pathways for economic success and is increasingly required for good jobs and high wages.[1] The way students interpret early academic struggles in college may affect whether or not they remain enrolled. If students attribute their academic challenges to a perceived lack of intelligence or inability to succeed in college, they may be less likely to persist.[2] *Growth Mindset* interventions aim to improve college persistence and academic achievement by encouraging students to view intelligence as a "malleable" characteristic that grows with effort, and to view academic challenges as temporary setbacks that they can overcome.[3]

This What Works Clearinghouse (WWC) report, part of the WWC's Supporting Postsecondary Success topic area, explores the effects of *Growth Mindset* interventions on postsecondary students' academic achievement, college enrollment, and progressing in college. The WWC identified 15 studies of *Growth Mindset* interventions. Six of these studies meet WWC standards. The evidence presented in this report is from studies of the impact of *Growth Mindset* interventions on postsecondary students—including Black, White, Hispanic, first-generation, and Pell grant-eligible students—in both public and private postsecondary settings.

What Happens When Students Participate in *Growth Mindset* Interventions?[4]

The evidence indicates that implementing *Growth Mindset* interventions:

- **may increase academic achievement**
- **may result in little or no change in college enrollment**
- **may result in little or no change in progressing in college**

Findings on *Growth Mindset* interventions from six studies that meet WWC standards are shown in Table 1. The table reports an effectiveness rating, the improvement index, and the number of studies and students that contributed to the findings. The improvement index is a measure of the intervention's effect on an outcome. It can be interpreted as the expected change in percentile rank for an average comparison group student if that student had received the intervention.

Table 1. Summary of findings on *Growth Mindset* interventions from studies that meet WWC standards

		Study findings	Evidence meeting WWC standards (version 4.0)	
Outcome domain	Effectiveness rating[a]	Improvement index (percentile points)	Number of studies	Number of students
Academic achievement	Potentially positive effects	+13	5	5,301
College enrollment	No discernible effects	+1	2	8,194
Progressing in college	No discernible effects	-2	3	8,351

Note: The improvement index can be interpreted as the expected change in percentile rank for an average comparison group student if that student had received the intervention. For example, an improvement index of +13 means that the expected percentile rank of the average comparison group student would increase by 13 points if the student received a *Growth Mindset* intervention. The improvement index values are generated by averaging findings from the outcome analyses that meet WWC standards, as reported by Aronson et al. (2002), Bostwick & Becker-Blease (2018), Broda et al. (2018), Fink et al. (2018), Suh et al. (2019), and Yeager et al. (2016). A positive or negative improvement index does not necessarily mean the estimated effect is statistically significant. Academic achievement outcomes reported in these studies include semester or quarter grade point average (GPA), final exam score, and course passing rate. College enrollment outcomes reported in these studies include full-time enrollment rate, which is the percentage of students enrolled full-time. Progressing in college outcomes reported in these studies include the percentage of students completing 12 or more college credits in a semester and the rate of retention to the following semester. The effects of *Growth Mindset* interventions are not known for other outcomes within the Supporting Postsecondary Success topic area, including college attendance, postsecondary degree attainment, credential attainment, employment, or earnings.

[a] Effectiveness ratings were determined according to version 4.0 of the WWC Procedures Handbook. Version 4.1 of the WWC Procedures Handbook introduces fixed-effects meta-analysis and a revised approach to determining effectiveness ratings. Effectiveness ratings may differ depending on whether an intervention is assessed using the version 4.0 or version 4.1 WWC Procedures.

BOX 1. HOW THE WWC REVIEWS AND DESCRIBES EVIDENCE

The WWC evaluates evidence based on the quality and results of reviewed studies. The criteria the WWC uses for evaluating evidence are defined in the Procedures and Standards Handbooks and the Review Protocols. The studies summarized in this report were reviewed under WWC Standards (version 4.0) and the Supporting Postsecondary Success topic area protocol (version 4.0).

To determine the effectiveness rating, the WWC considers what methods each study used, the direction of the effects, and the number of studies that tested the intervention. The higher the effectiveness rating, the more certain the WWC is about the reported results and about what will happen if the same intervention is implemented again. The following key explains the relationship between effectiveness ratings and the statements used in this report:

Effectiveness rating	Rating interpretation	Description of the evidence
Positive (or negative) effects	The intervention ***likely*** to change an outcome	Strong evidence of a positive (or negative) effect, with no overriding contrary evidence
Potentially positive (or negative) effects	The intervention ***may*** change an outcome	Evidence of a positive (or negative) effect with no overriding contrary evidence
No discernible effects	The intervention ***may result in little to no change*** in an outcome	No affirmative evidence of effects
Mixed effects	The intervention ***has inconsistent effects*** on an outcome	Evidence includes studies in at least two of these categories: studies with positive effects, studies with negative effects, or more studies with indeterminate effects than with positive or negative effects

How are *Growth Mindset* Interventions Implemented?

The following section provides details of how postsecondary institutions implemented *Growth Mindset* interventions. This information can help educators identify the requirements for implementing *Growth Mindset* interventions and determine whether implementing these types of interventions would be feasible in their institutions. Information on *Growth Mindset* interventions presented in this section comes from the studies that meet WWC standards (Aronson et al., 2002; Bostwick & Becker-Blease, 2018; Broda et al., 2018; Fink et al., 2018; Suh et al., 2019; and Yeager et al., 2016) and from correspondence with a researcher in the field.

- **Goal:** *Growth Mindset* interventions aim to improve students' academic achievement and college persistence by helping students view intellectual ability as something that can grow over time with effort and practice rather than as an innate, fixed quantity. These interventions also aim to change students' mindsets to regard academic challenges as learning opportunities rather than permanent impediments.
- **Target population:** *Growth Mindset* interventions implemented in postsecondary settings tend to target students who are entering or are in their first semester of college, particularly those who may interpret early academic difficulties as an indication that they do not have–and cannot develop–the ability to succeed academically in college.
- **Method of delivery:** *Growth Mindset* interventions in postsecondary settings are delivered to students individually or in groups, through online modules or in classroom settings.

Comparison group: In the six studies that contribute to this intervention report, students in the comparison group were typically exposed to alternative, non-growth-mindset information and then asked to describe, in their own words, how they would apply this information to their own learning or use it to advise another student. Some studies encouraged students in the comparison group to remember that individuals have different intellectual strengths and weaknesses (Aronson et al., 2002; Bostwick & Becker-Blease, 2018); other studies offered students advice on adjusting to the physical environment of the campus and surrounding area (Yeager et al., 2016) or tips for academic success in college, such as getting sufficient sleep or engaging in stress reduction or time management activities (Broda et al., 2018; Fink et al., 2018; and Suh et al., 2019).

- **Frequency and duration of service:** *Growth Mindset* interventions in postsecondary settings typically occur once, either at the start of a student's first year of college enrollment or around the time that students complete their first or midterm course exams, and are administered in one or more sessions, each lasting about 30 minutes.
- **Intervention components:** *Growth Mindset* interventions for postsecondary students typically include an exposure component, in which students are exposed to messages that intelligence is malleable and can grow with effort, and an application component, in which students describe in their own words how to apply these growth mindset messages. Refer to Table 2 for additional details.

Table 2. Components of *Growth Mindset* interventions

Key component	Description
Exposure to growth mindset concepts	Students are exposed to information that intellectual abilities grow when an individual exerts effort toward new or challenging problems. This information may include summaries of research on brain plasticity, the benefits of working hard to solve difficult problems, or testimonials from other students who overcame academic challenges through exerting effort, using effective strategies for learning, or asking for help.
Application of growth mindset concepts	Students are prompted to describe how they would apply growth mindset concepts to support their own or another student's persistence in the face of academic challenges. For example, students might explain how they will use these concepts to prepare for their next exam or write a letter encouraging future first-year students that they can improve their academic abilities.

What Do *Growth Mindset* Interventions Cost?

This preliminary list of costs is not designed to be exhaustive; rather, it provides educators an overview of the major resources needed to implement *Growth Mindset* interventions. The program costs described in Table 3 are based on the information available as of November 2020.

Table 3. Cost ingredients for *Growth Mindset* interventions

Cost ingredients	Description	Source of funding
Personnel	College personnel oversee the preparation and delivery of materials to students.	College
Facilities	*Growth Mindset* interventions can be administered in an existing classroom, laboratory, or other campus facility, or delivered online via computer in a location of each student's choosing.	College
Equipment and materials	Postsecondary institutions can access existing intervention materials for free online at sites such as https://www.perts.net/orientation/cg and https://www.mindsetkit.org. Alternatively, college personnel can adapt intervention materials described or provided in the studies reviewed here. Other costs may include the information technology infrastructure and software needed to deliver the intervention online.	College

For More Information:

About *Growth Mindset* interventions

Web:

Project for Education Research that Scales (PERTS), *Growth Mindset* for College Students: https://www.perts.net/orientation/cg

Growth Mindset toolkit and resources: https://www.mindsetkit.org/

Research on *Growth Mindset* interventions: https://mindsetscholarsnetwork.org/learning-mindsets/growth-mindset/

Research Summary

The WWC identified 15 studies that investigated the effectiveness of *Growth Mindset* interventions with postsecondary students (Figure 1):

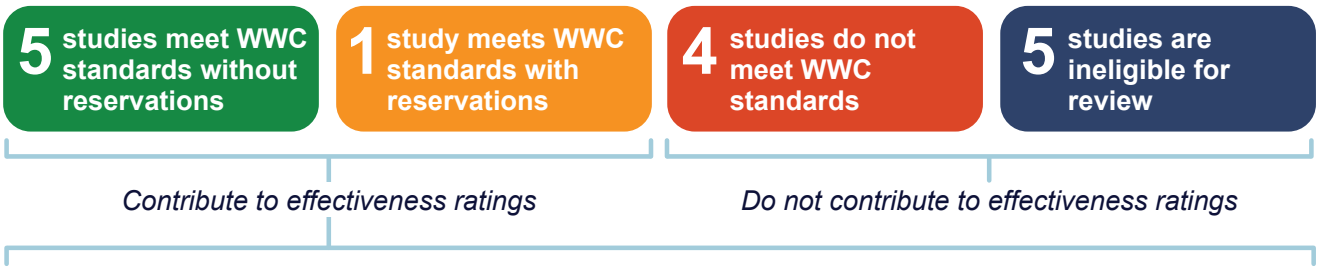
- Five studies meet WWC group design standards without reservations
- One study meets WWC group design standards with reservations
- Four studies do not meet WWC group design standards
- Five studies are ineligible for review

The WWC reviews findings on the interventions' effects on eligible outcome domains from studies that meet standards, either with or without reservations. Based on this review, the WWC generates an effectiveness rating, which summarizes how the intervention impacts, or changes, a particular outcome domain. The WWC reports additional supplemental findings, such as those the study authors reported for long-term retention in college, on the WWC website (https://whatworks.ed.gov).

These supplemental findings and findings from studies that either do not meet WWC standards or are ineligible for review do not contribute to the effectiveness ratings.

The six studies of *Growth Mindset* interventions that meet WWC group design standards reported findings on academic achievement, college enrollment, and progressing in college. No other findings in the studies meet WWC group design standards within any outcome domain included in the Supporting Postsecondary Success topic area.[6] Citations for the 10 studies reviewed for this report are listed in the References section, which begins on page 14. Citations for the five studies that are ineligible for review and the reasons the WWC determined they were ineligible are also listed in the References section.

Figure 1. Effectiveness ratings for *Growth Mindset* interventions



Growth Mindset interventions have **potentially positive effects** on academic achievement

The WWC determined that one study that meets WWC group design standards without reservations (Aronson et al., 2002) showed evidence of a positive and statistically significant effect of a *Growth Mindset* intervention on academic achievement. Two other studies that meet WWC group design standards without reservations (Bostwick & Becker-Blease, 2018 and Suh et al., 2019) showed effect sizes greater than 0.25 of *Growth Mindset* interventions on academic achievement but these findings were not statistically significant. Two studies, one that meets WWC group design standards without reservations (Broda et al., 2018) and one that meets WWC group design standards with reservations (Fink et al., 2018), showed evidence of indeterminate effects of *Growth Mindset* interventions on academic achievement.

Growth Mindset interventions have **no discernible effects** on college enrollment

The WWC determined that two studies that meet WWC group design standards without reservations (Broda et al., 2018; and Yeager et al., 2016) showed evidence of an indeterminate effect of a *Growth Mindset* intervention on college enrollment.

Growth Mindset interventions have **no discernible effects** on progressing in college

The WWC determined that three studies that meet WWC group design standards without reservations (Broda et al., 2018; Suh et al., 2019; and Yeager et al., 2016) showed evidence of indeterminate effects of *Growth Mindset* interventions on progressing in college.

Main Findings

Table 4 shows the findings from the six *Growth Mindset* intervention studies that meet WWC standards. The table includes WWC calculations of the mean difference, effect size, and performance of the intervention group relative to the comparison group. Based on findings from the six studies that meet WWC standards, the effectiveness rating for academic achievement is *potentially positive effects*, indicating evidence of positive effect with no overriding contrary evidence. These findings are based on 5,301 students. The effectiveness ratings for college enrollment and progressing in college is *no discernible effects*, indicating no affirmative evidence of effects. These findings are based on 8,194 and 8,351 students, respectively.

Table 4. Findings by outcome domain from studies of *Growth Mindset* interventions that meet WWC standards

Measure (study)	Study sample	Sample size	Mean (standard deviation)		WWC calculations			*p*-value
			Intervention group	Comparison group	Mean difference	Effect size	Improvement index	
Quarter grade point average (GPA; Aronson et al. 2002)[a]	*Growth Mindset* vs. control pen-pal	51	3.46 (0.30)	3.19 (0.33)	0.27	0.85	+30	<.01
Final exam score (Bostwick & Becker-Blease 2018)[b]	*Growth Mindset* vs. fixed mindset	173	80.00 (10.0)	77.00 (12.0)	3.00	0.27	+11	.08
Semester grade point average (GPA; Broda et al. 2018)[c]	*Growth Mindset* vs. comparison	4,357	3.18 (0.75)	3.14 (0.78)	0.04	0.05	+2	.09
Final exam score (Fink et al. 2018)[d]	*Growth Mindset* vs. comparison	565	64.90 (27.30)	63.60 (27.20)	1.30	0.05	+2	.57
Course passing rate (%) (Suh et al. 2019)[e]	*Growth Mindset* vs. laughter/stress	155	64.8	32.8	32.0	0.80	+29	.17
Final exam score (Suh et al. 2019)[e]	*Growth Mindset* vs. laughter/stress	74	73.68 (12.58)	74.24 (15.08)	-0.56	-0.04	-2	.94
Outcome average for academic achievement across all studies						**0.32**	**+13**	
Full time enrollment rate (%) (Broda et al. 2018)[c]	*Growth Mindset* vs. comparison	4,357	96.0	96.0	0.00	0.00	0	>.99
Full time enrollment rate (%) (Yeager et al. 2016)[f]	*Growth Mindset* vs. comparison	3,837	90.0	89.0	1.00	0.06	+3	.32
Outcome average for college enrollment across all studies						**0.03**	**+1**	
College credits completed (Broda et al. 2018)[c]	Growth Mindset vs. comparison	4,357	13.18 (2.32)	13.12 (2.46)	0.06	0.03	+1	0.41
Retention to the following semester (%) (Suh et al. 2019)[e]	Growth Mindset vs. laughter/stress	157	74.2	80.9	-6.70	-0.23	-9	0.63
Completed 12 or more college credits (%) (Yeager et al. 2016)[f]	*Growth Mindset* vs. comparison	3,837	88.0	87.0	1.00	0.06	+2	0.35
Outcome average for progressing in college across all studies						**-0.05**	**-2**	

Notes: For mean difference and effect size values reported in the table, a positive number favors the intervention group and a negative number favors the comparison group. The effect size is a standardized measure of the effect of an intervention on outcomes, representing the average change expected for all individuals who are given the intervention (measured in standard deviations of the outcome measure). An indicator of the effect of the intervention, the improvement index can be interpreted as the expected change in percentile rank for an average comparison group student if that student had received the intervention. For example, an improvement index of +13 means that the expected percentile rank of the average comparison group student would increase by 13 points if the student received a *Growth Mindset* intervention. A positive or negative improvement index does not necessarily mean the estimated effect is statistically significant. Some statistics may not sum as expected due to rounding.

[a] Aronson et al. (2002) did not require corrections for clustering or multiple comparisons nor difference-in-differences adjustments. The intervention and comparison group means and standard deviations presented here were calculated by the WWC using data reported in the study and data provided in response to an author query. In the study, the authors reported means, but not standard deviations, for the intervention and "control pen-pal" comparison groups separately for Black and White subgroups. In response to an author query, the authors provided unadjusted standard deviations for students in the control pen-pal and "no pen-pal" comparison groups combined, both overall and for Black and White subgroups. The WWC aggregated the Black and White subgroup means from Table 1 of the study using the unadjusted standard deviations for the combined comparison groups to calculate the mean and standard deviation for all students in the control pen-pal comparison group only. The effect size and p-value reported here were calculated by the WWC because the authors did not report these values separately for the difference between the intervention and control pen-pal comparison group. This study is characterized as having a statistically significant positive effect on academic achievement because the mean effect reported is positive and statistically significant.

[b] Bostwick & Becker-Blease (2018) did not require corrections for clustering or multiple comparisons nor difference-in-differences adjustments. The effect size and p-value presented here were calculated by the WWC using the unadjusted means and standard deviations reported for the intervention and "fixed mindset" comparison groups because the authors did not report these values separately for the difference between the intervention and fixed mindset comparison group. This study is characterized as having a potentially positive effect on academic achievement because the effect size is ≥ 0.25 but not statistically significant

[c] Broda et al. (2018) did not require corrections for clustering or multiple comparisons nor difference-in-differences adjustments. The effect sizes presented here were calculated by the WWC using the unadjusted means and standard deviations for academic achievement and progressing in college and the dichotomous method for college enrollment. The *p*-values presented here were calculated by the WWC. This study is characterized as having indeterminate effects on academic achievement, college enrollment, and progressing in college because the mean effects are not statistically significant.

[d] Fink et al. (2018) did not require corrections for clustering or multiple comparisons nor difference-in-differences adjustments. The effect size presented here was calculated by the WWC. To calculate the effect size, the WWC converted standard errors to standard deviations and calculated the unadjusted and adjusted means for the full sample by

Table 4. Findings by outcome domain from studies of *Growth Mindset* interventions that meet WWC standards (continued)

aggregating across findings by race and sex categories reported in Appendix 3, Table 4 of the study. The study is characterized as having an indeterminate effect on academic achievement because the mean effect is not statistically significant.

[e] Suh et al. (2019) required corrections for clustering because the reported analyses did not take into account the clustering of students within course sections. The WWC also applied a correction for multiple comparisons in the academic achievement domain.The effect sizes and p-values presented here were calculated by the WWC because the authors did not report these values separately for the difference between the intervention and "laughter/stress" comparison group. This study is characterized as having a potentially positive effect on academic achievement because the mean effect size is ≥ 0.25 but not statistically significant and an indeterminate effect on progressing in college because the effect size is < 0.25 and not statistically significant.

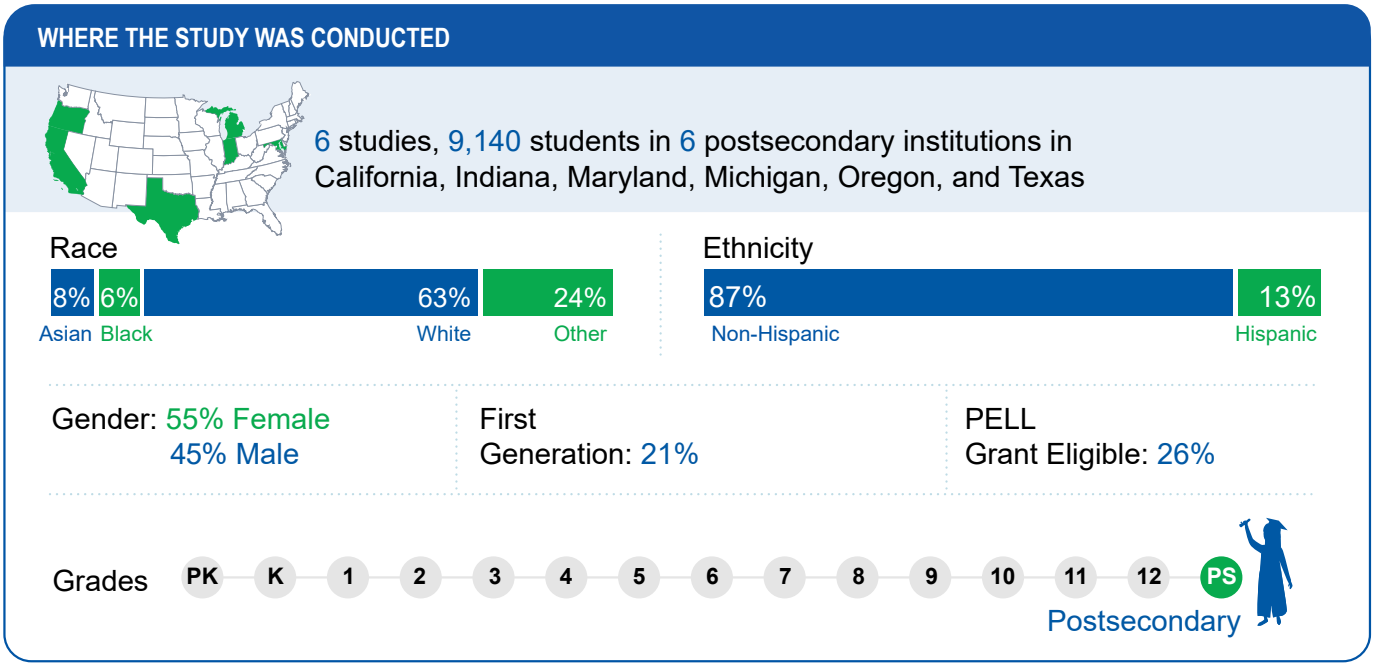
[f] Yeager et al. (2016) did not require corrections for clustering or multiple comparisons nor difference-in-differences adjustments. The effect sizes presented here were calculated by the WWC using the dichotomous method for college enrollment and progressing in college. The *p*-values presented here were calculated by the WWC. This study is characterized as having indeterminate effects on college enrollment and progressing in college because the mean effects are not statistically significant.

For more information, please refer to the WWC Procedures Handbook, version 4.0, page 22.

In What Context Was *Growth Mindset* Studied?

The following section provides information on the setting of the six studies of *Growth Mindset* interventions that meet WWC standards, and a description of the participants in the research.

This information can help educators understand the context in which the studies of *Growth Mindset* interventions were conducted, and determine whether the program might be suitable for their setting.



Details of Each Study that Meets WWC Standards

This section presents details for the studies of *Growth Mindset* interventions that meet WWC standards. These details include the full study reference, findings description, findings summary, and description of study characteristics. A summary of domain findings for each study is presented below, followed by a description of the study characteristics. These study-level details include contextual information about the study setting, methods, sample, intervention group, comparison group, outcomes, and implementation details. For additional information, readers should refer to the original studies.

Research details

Aronson, J., Fried, C. B., & Good, C. (2002). Reducing the effects of stereotype threat on African American college students by shaping theories of intelligence. *Journal of Experimental Social Psychology, 38*(2), 113-125. https://doi.org/10.1006/jesp.2001.1491

Findings from Aronson et al. (2002) show evidence of a statistically significant positive effect of a *Growth Mindset* intervention in the academic achievement domain (Table 5). This finding is based on an outcome analysis that includes 51 students.[7]

Table 5. Summary of findings from Aronson et al. (2002)

		Meets WWC Group Design Standards Without Reservations		
		Study findings		
Outcome domain	Sample size	Average effect size	Improvement index	Statistically significant
Academic achievement	51 students	0.85	+30	Yes

Table 6. Description of study characteristics for Aronson et al. (2002)

WWC evidence rating	**Meets WWC Group Design Standards Without Reservations.** This is a randomized controlled trial (RCT) with low attrition. For more information on how the WWC assigns study ratings, please see the WWC Procedures and Standards Handbooks (version 4.0) and WWC Standards Briefs, available on the WWC website.
Setting	The study took place at a private four-year university in California. Groups of two to five undergraduate students participated in the study together in a laboratory setting on campus.
Methods	The study authors randomly assigned 109 students blocked by race (White or Black) to one of three groups, a "malleable pen-pal" *Growth Mindset* intervention group (37 students), a "control pen-pal" comparison group (34 students), or a "no pen-pal" comparison group (38 students). This review prioritized findings for the intervention group versus the control pen-pal group to be consistent with other studies reviewed for this report and because this condition better isolates the effect of the growth mindset intervention.[8] The analytic sample included 28 students in the intervention and 23 in the control pen-pal comparison group. This sample loss after random assignment (attrition) was within the acceptable threshold for the review. The overall attrition rate was 28%, and the differential attrition rate was 8 percentage points.
Study sample	For students in the main analytic sample comparing outcomes for the intervention and control pen-pal comparison groups, 55% were Black and 45% were White. The authors did not provide other demographic information for the study sample.
Intervention group	Students in the intervention group attended three one-hour sessions, spaced 10 days apart starting in mid-January and continuing through February. In groups of two to five, students were asked to write a reassuring letter to a middle school student experiencing academic difficulties. Students read letters ostensibly written by seventh-grade students, but actually prepared by the study authors. Next, researchers told students that intelligence could grow with hard work, and showed a short video describing research showing that the human brain developed new connections in response to intellectual challenges. Before replying to their assigned middle school "pen-pal," students were encouraged to include information about the malleability of intelligence, as well as illustrative examples from their own life in their response. In the second session, students received a thank you note, ostensibly from their pen-pal and pen-pal's teacher; students then wrote a similar letter to a new pen-pal. In the third session, students converted their letters into a speech, recorded their speech, and then listened twice to their own audiotaped speech.
Comparison group	In the control pen-pal comparison group, students attended three one-hour sessions spaced 10 days apart starting in mid-January and continuing through February. In groups of two to five, students were asked to write a reassuring letter to a middle school student experiencing academic difficulties. Students read letters ostensibly written by seventh-grade students, but actually prepared by the study authors. Next, researchers told students that intelligence was not a single attribute but that individuals had multiple intellectual strengths and weaknesses, and showed a short video describing how psychologists were starting to view intelligence as multiple abilities rather than a single entity. Before replying to their assigned middle school pen-pal, students were encouraged to include information about the multiple types of intelligence in their response. In the second session, students received a thank you note, ostensibly from their pen-pal and pen-pal's teacher; students then wrote a similar letter to a new pen-pal. In the third session, students converted their letters into a speech, recorded their speech, and then listened twice to their own audiotaped speech. In the no pen-pal comparison group, students attended one laboratory session near the end of February to complete survey measures and sign study-related forms.

Outcomes and measurement	Using data from university transcripts, study authors reported students' grade point averages (GPA) at the end of the spring academic term (approximately nine weeks after the end of the intervention). Although the authors presented findings separately for each of the three study groups, only the difference in GPA between the intervention and control pen-pal comparison groups is classified as a main finding. Supplemental findings for the intervention group relative to the no pen-pal comparison group and relative to the two comparison groups combined are available on the WWC website (https://whatworks.ed.gov). The supplemental findings do not factor into the intervention's rating of effectiveness. Study authors also collected data on measures that are ineligible for review under the Supporting Postsecondary Success topic area including students' self-reported beliefs about the malleability of intelligence, experiences of stereotype threat, enjoyment of the educational process, and belief that academic achievement was important to their identity. Subgroup findings for Black and White students reported by the authors are not included because they did not meet WWC group design standards; the study authors did not provide information on attrition separately for each group, nor was information available on the equivalence of the analytic intervention and comparison groups at baseline for either subgroup.
Additional implementation details	No additional information provided.

Research details for Bostwick & Becker-Blease (2018)

Bostwick, K. C. P., & Becker-Blease, K. A. (2018). Quick, easy mindset intervention can boost academic achievement in large introductory psychology classes. *Psychology Learning and Teaching, 17*(2), 177–193. https://eric.ed.gov/?q=EJ1182886&id=EJ1182886

Findings from Bostwick & Becker-Blease (2018) show evidence of an indeterminate effect of a *Growth Mindset* intervention in the academic achievement domain (Table 7). This finding is based on an outcome analysis that includes 173 students.

Table 7. Summary of findings from Bostwick & Becker-Blease (2018)

		Meets WWC Group Design Standards Without Reservations		
		Study findings		
Outcome domain	Sample size	Average effect size	Improvement index	Statistically significant
Academic achievement	173 students	0.27	+11	No

Table 8. Description of study characteristics for Bostwick & Becker-Blease (2018)

WWC evidence rating	**Meets WWC Group Design Standards Without Reservations.** This is a randomized controlled trial (RCT) with low attrition.
Setting	The study took place on the campus of a mid-sized public university in Oregon. Students who enrolled in a large, lecture-based introductory psychology course participated in the study. Students received materials for the intervention or one of two comparison conditions immediately after the first course exam was administered in class.
Methods	The study authors randomly assigned 278 students enrolled in an introductory psychology course to one of three groups, 93 students to a *Growth Mindset* intervention group, 94 students to a "fixed mindset" comparison group, and 91 students to a "class attendance matters" comparison group. This review prioritized findings for the *Growth Mindset* intervention group versus the fixed mindset comparison group to be consistent with other studies reviewed for this report and because the study authors argued this condition better approximates the "business as usual" experiences of college students.[9] Of the 187 students assigned to the intervention or fixed mindset group, 173 students were included in the analytic sample, with 86 students in the intervention group and 87 students in the fixed mindset group. The sample loss after random assignment (attrition) was within the acceptable threshold for the review. The overall attrition rate was 7%, and the differential attrition rate was less than 1 percentage point.
Study sample	Study authors did not report demographic characteristics of the analytic sample. Of the 278 students randomly assigned, gender was not specified for 14 students. Among the remaining 264 students, 66% were female. The authors noted that, historically, 50% of students who enrolled in the introductory psychology course were first-year or transfer students.

Intervention group	After submitting their first course exam, students in the intervention group received a letter from the instructor stating that recent research showed that the human brain is adaptable and that people can overcome new challenges with persistence and hard work and strengthen areas of weakness over time.
Comparison group	After submitting their first course exam, students in the fixed mindset and class attendance matters groups each received a letter from the instructor. The letter for students in the fixed mindset group stated that people have different strengths and weaknesses, that the key to success was to use one's strengths, and that everyone has to approach obstacles differently. The letter for students in the class attendance matters group stated the importance of class attendance for academic performance and thanked the student for coming to class.
Outcomes and measurement	Study authors reported findings on students' final exam score, administered approximately nine weeks after the delivery of the intervention. The review team leadership determined that the final exam was equivalent to a department-wide examination, making it eligible for review under the Supporting Postsecondary Success topic area. The exam was cumulative across content covered throughout the course and was administered to the class. Review team leadership also determined that this exam was equivalent to a final course grade, and therefore, as a standard educational measure, its reliability and validity are assumed to meet WWC outcome criteria. Study authors also reported supplemental findings for the class attendance matters comparison group. These findings, and findings that compare outcomes for the intervention group to the two comparison groups combined are available on WWC website (https://whatworks.ed.gov). The supplemental findings do not factor into the intervention's rating of effectiveness. Findings for a subgroup of students who passed a "manipulation check" demonstrating that they recalled the contents of the letter they had received did not meet WWC group design standards because of high attrition and because the analytic intervention and comparison groups did not satisfy the baseline equivalence requirement. Findings for student scores on the second, third, and fourth course exams were ineligible for review under the Supporting Postsecondary Success topic area.
Additional implementation details	No additional information provided.

Research details for Broda et al. (2018)

Broda, M., Yun, J., Schneider, B., Yeager, D. S., Walton, G. M., & Diemer, M. (2018). Reducing inequality in academic success for incoming college students: A randomized trial of growth mindset and belonging interventions. *Journal of Research on Educational Effectiveness, 11*(3), 317-338. https://eric.ed.gov/?id=EJ1181580

Findings from Broda et al. (2018) show evidence of indeterminate effects of a *Growth Mindset* intervention in the academic achievement, college enrollment, and progressing in college domains (Table 9). Each finding is based on an outcome analysis that includes 4,357 students.

Table 9. Summary of findings from Broda et al. (2018)

		Meets WWC Group Design Standards Without Reservations		
		Study findings		
Outcome domain	**Sample size**	**Average effect size**	**Improvement index**	**Statistically significant**
Academic achievement	4,357 students	0.05	+2	No
College enrollment	4,357 students	0.00	0	No
Progressing in college	4,357 students	0.03	+1	No

Table 10. Description of study characteristics for Broda et al. (2018)

WWC evidence rating	**Meets WWC Group Design Standards Without Reservations.** This is a randomized controlled trial (RCT) with low attrition.
Setting	The study took place at a public university in Michigan. Several weeks before arriving on campus for a two-day orientation program, incoming first-year students received a survey link from the university and completed the survey either prior to, or after arriving, on campus for orientation.

Methods	After blocking students on race and ethnicity, study authors randomly assigned incoming first-year students who responded to a survey invitation into one of three groups: 2,189 students to a *Growth Mindset* intervention group, 2,210 students to a *Social Belonging* intervention group, and 2,269 students to a comparison group.[10] The analytic sample for outcomes at the end of the fall (2014) semester included 2,135 students in the *Growth Mindset* intervention group and 2,222 students in the comparison group. This sample loss after random assignment (attrition) was within the acceptable threshold for the review. The overall attrition rate was 2%, and the differential attrition rate was less than 1 percentage point.
Study sample	Among students included in analyses for main findings, 54% were female, 78% were White, 7% were Black, and race was not specified for 15% of the sample. Four percent were Hispanic. Approximately 24% were first-generation college students and 26% were eligible for a Pell grant.
Intervention group	Students in the intervention group read an article summarizing research showing that the brain is malleable and that intelligence can grow if students exert effort when facing a challenge. Next, students wrote short essay responses to questions about how they may or may not have applied a growth mindset to a challenge. Finally, students wrote a letter, incorporating elements of the "brain is malleable" article, offering advice for a future first-year student. On average, students spent 20 to 25 minutes on the intervention activities.
Comparison group	Students in the comparison group read stories about adapting to the physical aspects of college life, including the weather in Michigan, navigating around the university campus, adjusting to a new class schedule, and finding places to eat. Next, students wrote short essay responses to questions about how the stories they had read related to the start of their own college-going experience. On average, students spent 10 to 15 minutes on the comparison group activities.
Outcomes and measurement	Using administrative data for the end of the fall semester, study authors reported students' grade point average (GPA; academic achievement domain), number of course credits completed (progressing in college domain), and full-time enrollment rate (percentage of students enrolled full-time; college enrollment domain). Supplemental findings include fall semester outcomes reported separately for Black, White, and Hispanic subgroups, as well as spring (2015) semester GPA, course credits completed, and cumulative year-end (2014-2015) GPA for the full sample and each subgroup. These supplemental findings are available on the WWC website (https://whatworks.ed.gov). The supplemental findings do not factor into the intervention's rating of effectiveness. Ineligible outcomes included the number of course credits attempted in each of the two first-year semesters. Findings that compared outcomes for the *Social Belonging* intervention group to the comparison group were not relevant to this report but are included in a separate WWC intervention report on *Social Belonging* interventions for postsecondary students.
Additional implementation details	No additional information provided.

Research details for Suh et al. (2019)

Suh, E. K., Dahlgren, D. J., Hughes, M. E., Keefe, T. J., & Allman, R. J. (2019). Conditions for success: Fostering first-year students' growth mindset in developmental mathematics. *Journal of The First-Year Experience & Students in Transition, 31*(2), 63-78. https://www.ingentaconnect.com/contentone/fyesit/fyesit/2019/00000031/00000002/art00004

Findings from Suh et al. (2019) show evidence of an indeterminate effect of a *Growth Mindset* intervention in the academic achievement and progressing in college domains (Table 11). These finding are based on outcome analyses that include 155 and 157 students respectively.

Table 11. Summary of findings from Suh et al. (2019)

		Meets WWC Group Design Standards Without Reservations		
		Study findings		
Outcome domain	Sample size	Average effect size	Improvement index	Statistically significant
Academic achievement	155 students	0.38	+15	No
Progressing in college	157 students	-0.23	-9	No

Table 12. Description of study characteristics for Suh et al. (2019)

WWC evidence rating	**Meets WWC Group Design Standards Without Reservations.** This is a cluster randomized controlled trial (RCT) with low cluster-level attrition and individual-level non-response.
Setting	The study took place at a public four-year university in Indiana within seven sections of a developmental mathematics course required for graduation.[11]
Methods	Study authors randomly assigned seven sections of a developmental mathematics course required for graduation to a *Growth Mindset* intervention group (3 sections, 89 students), a "laughter/stress" comparison group (2 sections, 68 students), or an "advice-only" comparison group (2 sections, 70 students). The analytic sample for the course passing rate included 88 students in the intervention group and 67 students in the laughter/stress comparison group. After random assignment, there was no cluster-level attrition and individual-level non-response was within the acceptable threshold for the review. The overall attrition rate was 1%, and the differential attrition rate was less than 1 percentage point. The analytic sample for students' final exam score included 54 students in the intervention group and 20 students in the laughter/stress comparison group. Although this sample loss exceeded the acceptable threshold for the review, the authors demonstrated equivalence of the analytic sample at baseline. The analytic sample for retention to the following semester included all 157 students randomly assigned to the intervention or laughter/stress comparison group.
Study sample	Among the 227 students in the seven course sections randomly assigned, 8% were Black, 78% were White, and race was not specified for 13% of the sample. Sixty-nine percent of these students were female, and 51% were first-generation college students.[12] Information about the characteristics of the analytic samples for main findings was unavailable.
Intervention group	During the second and third weeks of the fall semester, students in the *Growth Mindset* intervention group read a short article describing research showing that the brain is malleable and that intelligence can grow if students exert effort when facing a challenge. Next, students wrote three short essay responses to prompts in which they (1) summarized the article, (2) described a personal experience about learning something new, and (3) gave advice to a hypothetical student who was feeling "dumb."
Comparison group	Within the second and third weeks of the fall semester, students in the laughter/stress comparison group read a short article describing the role of laughter in health and stress management. Next, students wrote short replies to essay prompts in which they (1) summarized the article and (2) described a personal situation in which they used laughter to relax and improve their health. Students in the advice-only comparison group did not read an article before writing short replies to two essay prompts in which they (1) described a personal situation in which they succeeded in a class and explained the reasons for their success, and (2) wrote a letter to a friend who was feeling "dumb" and offered advice for how to learn and become smarter.
Outcomes and measurement	Study authors reported the course passing rate and students' final exam score (academic achievement domain), and the rate of retention to the following semester (percent of students who re-enrolled; progressing in college domain). Supplemental findings include the rate of retention to the fall semester of the next academic year, as well as the course passing rate and rate of retention to the following semester for students in the intervention group compared to those in the advice-only comparison group. These supplemental findings are available on the WWC website (https://whatworks.ed.gov). The supplemental findings do not factor into the intervention's rating of effectiveness. One study-reported finding, comparing the final exam score for students in the intervention group to those in the advice-only comparison group, did not meet WWC group design standards due to high individual-level non-response and because the analytic intervention and comparison groups did not satisfy the baseline equivalence requirement. The study authors also reported findings for students' persistence to the final course exam, an ineligible outcome under the review protocol.
Additional implementation details	No additional information provided.

Research details for Yeager et al. (2016)

Yeager, D. S., Walton, G. M., Brady, S. T., Akcinar, E. N., Paunesku, D., Keane, L., Kamentz, D., Ritter, G., Duckworth, A. L., Urstein, R., Gomez, E. M., Markus, H. R., Cohen, G. L., & Dweck, C. S. (2016). Teaching a lay theory before college narrows achievement gaps at scale. *Proceedings of the National Academy of Sciences of the United States of America, 113*(24), E3341-E3348. https://doi.org/10.1073/pnas.1524360113

Findings from Yeager et al. (2016) show evidence of indeterminate effects of a *Growth Mindset* intervention in the college enrollment and progressing in college domains (Table 13). Each finding is based on an outcome analysis that includes 3,837 students.

Table 13. Summary of findings from Yeager et al. (2016)

		Meets WWC Group Design Standards Without Reservations		
		Study findings		
Outcome domain	Sample size	Average effect size	Improvement index	Statistically significant
College enrollment	3,837 students	0.06	+3	No
Progressing in college	3,837 students	0.06	+2	No

Table 14. Description of study characteristics for Yeager et al. (2016)

WWC evidence rating	**Meets WWC Group Design Standards With Reservations.** This is a randomized controlled trial (RCT) with low attrition.
Setting	The study took place at a public university in Texas. Incoming students reviewed pre-orientation materials online—including text that served as the intervention—one week before arriving on campus for the full orientation.
Methods	After blocking students on SAT score, race and ethnicity, and gender, study authors randomly assigned incoming first-year students who completed a brief survey into one of four groups: 1,775 students to a *Growth Mindset* intervention group, 1,746 students to a *Social Belonging* intervention group, 2,062 students to a comparison group and an unknown number to an intervention that combined elements of the *Growth Mindset* and *Social Belonging* interventions.[13] The analytic sample for outcomes at the end of the fall (2012) semester included 1,775 students in the *Growth Mindset* intervention group and 2,062 students in the comparison group. There was no sample loss after random assignment (attrition).
Study sample	Across the 7,343 students in the analytic sample that included all four study conditions, 46% were White, 18% were Asian, 5% were Black, and race was not specified for 31% of the sample. Twenty-four percent were Hispanic. Approximately 17% were first-generation college students and 83% were continuing-generation.[14]
Intervention group	In an online session lasting approximately 30 minutes, students in the *Growth Mindset* intervention group read an article summarizing research showing that the brain is malleable and that intelligence can grow if students exert effort when facing a challenge. Next, students read stories from upper-class students that described how they had overcome early struggles in college. These stories conveyed messages that initial struggles in college, such as receiving low grades, getting critical feedback from a professor, or having difficulty with the college bureaucracy, do not imply that a student is "dumb" or unprepared for college; rather, these challenges suggest that students may learn more effective study strategies by asking for help and that the "knowing how" part of their brain was still developing. Finally, students wrote an essay, to be shared with other first-year students facing struggles, that described how these messages applied to their own experience adjusting to college.
Comparison group	In an online session lasting approximately 30 minutes, students in the comparison group read stories from upper-class students that described how they had adapted to the physical environment on campus and in the surrounding city. Next, students wrote an essay, to be shared with other first-year students facing struggles, about how students adjust to college.
Outcomes and measurement	Using administrative data, study authors reported the percentage of students enrolled full-time (that is, enrolled for 12 or more credit hours) during the fall 2012 semester, an outcome in the college enrollment domain, and the percentage of students who completed 12 or more credits by the end of the semester, an outcome in the progressing in college domain. Supplemental findings include fall semester full-time enrollment and credit completion rates reported separately for disadvantaged (all first-generation to college and all Black or Hispanic students) and advantaged (all continuing generation Asian or European-American students) subgroups, as well the percentage of students enrolled full-time continuously for the entire year (2012-2013) and the percentage who completed 24 or more credits by the end of the year. The authors reported these end-of-year findings for the full sample and each subgroup. These supplemental findings are available on the WWC website (https://whatworks.ed.gov). The supplemental findings do not factor into the intervention's rating of effectiveness. Findings that compared outcomes for the *Social Belonging* intervention group to the comparison group were not relevant to this report but are included in a separate WWC intervention report on *Social Belonging* interventions for postsecondary students.
Additional implementation details	The university embedded the study materials within a set of online, pre-orientation tasks required of incoming students, such as reviewing the university honor code, health care requirements, and course registration procedures. To help ensure that students read the materials carefully, each web page had a timer that prevented students from advancing to the next page until a minimum amount of time had elapsed. The study materials were framed as information about the "university mindset," and an opportunity to learn from older students' experience with the transition to college. Study materials informed students that their essays could be shared, anonymously, to help future students cope with the transition to college.

Research details for Fink et al. (2018)

Fink, A., Cahill, M. J., McDaniel, M. A., Hoffman, A., & Frey, R. F. (2018). Improving general chemistry performance through a growth mindset intervention: Selective effects on underrepresented minorities. *Chemistry Education Research and Practice, 19*(3), 783-806. https://doi.org/10.1039/C7RP00244K

Findings from Fink et al. (2018) show evidence of an indeterminate effect of a *Growth Mindset* intervention in the academic achievement domain (Table 15). This finding is based on an outcome analysis that includes 565 students.

Table 15. Summary of findings from Fink et al. (2018)

		Meets WWC Group Design Standards With Reservations		
		Study findings		
Outcome domain	Sample size	Average effect size	Improvement index	Statistically significant
Academic achievement	565 students	0.05	+2	No

Table 16. Description of study characteristics for Fink et al. (2018)

WWC evidence rating	**Meets WWC Group Design Standards With Reservations.** This is a compromised randomized controlled trial (RCT) with analytic intervention and comparison groups that satisfy the baseline equivalence requirement.
Setting	The study took place as part of a General Chemistry course at a private university. Students participated in the study by completing activities that were incorporated into three online homework assignments.
Methods	Study authors randomly assigned two cohorts of first-year students who enrolled in General Chemistry 1 in the fall of 2015 or fall of 2016 to a *Growth Mindset* intervention group or a "transition tips" comparison group. After random assignment, the authors excluded from analysis students who (1) did not consent, (2) were inadvertently exposed to a "self-affirmation" intervention designed to improve their academic performance in the course, or (3) did not participate in the intervention or comparison group study activities. Excluding students who did not participate in the study activities compromised the integrity of random assignment.[15]
Study sample	The analytic sample consisted of 565 first-year students enrolled in General Chemistry 1 in the fall of 2015 or fall of 2016 who consented to participate in the study and completed three online study activities. The *Growth Mindset* intervention group included 275 students and the "transition tips" comparison group included 290 students. Among the 565 students in the analytic sample, 57% were female, 76% were White, and 24% were members of a racial or ethnic group historically underrepresented among students earning a bachelor's degree in chemistry or another STEM field, including Black, American Indian/Alaska Native, Native Hawaiian or Pacific Islander, and Hispanic students. Asian students were excluded from the sample.
Intervention group	Students received three online study activities during the semester. In the first, administered two weeks before the first course exam, students read a short article summarizing research showing that the brain is malleable and that intelligence can grow with effortful practice on challenging tasks, and by developing new learning strategies with support from others. For the second activity, administered one week before the second course exam, students received a summary of the article's key points and were prompted to write about how the article would affect their preparation for the upcoming exam. For the third activity, one week prior to the course final exam, students were prompted to write about how the article would influence their studying strategies for the exam.
Comparison group	Students received three online study activities during the semester, administered at the same points in time as the intervention group received their assignments. In the first activity, students in the comparison group received a set of "transition tips" for college success that emphasized organization and time management, maintaining their health and balancing academic work with social and extracurricular activities, being an active participant in class, and using available resources to support learning the course material. The second and third activities prompted students to reflect on how the transition tips article would affect their approach to preparing for the second and final course exams.
Outcomes and measurement	Study authors reported final exam scores (academic achievement domain) for students in the intervention and comparison groups. To correct any potential differences between the fall 2015 and fall 2016 final exams and student cohorts, the authors converted raw test scores to standardized scores (z-scores) prior to analysis. For the following outcomes, the authors reported findings that did not meet WWC group design standards because the analytic intervention and comparison groups did not satisfy the baseline equivalence requirement: final exam scores for the subgroup of students historically underrepresented in STEM, and average of exam scores in General Chemistry 2 during the spring semester, both for the full sample and the subgroup of students historically underrepresented in STEM.

Additional implementation details	No additional information provided.

References

Studies that meet WWC group design standards

Aronson, J., Fried, C. B., & Good, C. (2002). Reducing the effects of stereotype threat on African American college students by shaping theories of intelligence. *Journal of Experimental Social Psychology, 38*(2), 113-125. https://doi.org/10.1006/jesp.2001.1491

Bostwick, K. C. P., & Becker-Blease, K. A. (2018). Quick, easy mindset intervention can boost academic achievement in large introductory psychology classes. *Psychology Learning and Teaching, 17*(2), 177-193. https://eric.ed.gov/?id=EJ1182886

Broda, M., Yun, J., Schneider, B., Yeager, D. S., Walton, G. M., & Diemer, M. (2018). Reducing inequality in academic success for incoming college students: A randomized trial of growth mindset and belonging interventions. *Journal of Research on Educational Effectiveness, 11*(3), 317-338. https://eric.ed.gov/?id=EJ1181580

Suh, E. K., Dahlgren, D. J., Hughes, M. E., Keefe, T. J., & Allman, R. J. (2019). Conditions for success: Fostering first-year students' growth mindset in developmental mathematics. *Journal of The First-Year Experience & Students in Transition, 31*(2), 63-78. https://www.ingentaconnect.com/contentone/fyesit/fyesit/2019/00000031/00000002/art00004

Yeager, D. S., Walton, G. M., Brady, S. T., Akcinar, E. N., Paunesku, D., Keane, L., Kamentz, D., Ritter, G., Duckworth, A. L., Urstein, R., Gomez, E. M., Markus, H. R., Cohen, G. L., & Dweck, C. S. (2016). Teaching a lay theory before college narrows achievement gaps at scale. *Proceedings of the National Academy of Sciences of the United States of America, 113*(24), E3341-E3348. https://doi.org/10.1073/pnas.1524360113

Study that meets WWC group design standards with reservations

Fink, A., Cahill, M. J., McDaniel, M. A., Hoffman, A., & Frey, R. F. (2018). Improving general chemistry performance through a growth mindset intervention: Selective effects on underrepresented minorities. *Chemistry Education Research and Practice, 19*(3), 783-806. https://doi.org/10.1039/C7RP00244K

Studies that do not meet WWC group design standards

McCabe, J. A., Kane-Gerard, S., & Friedman-Wheeler, D. G. (2020). Examining the utility of growth-mindset interventions in undergraduates: A longitudinal study of retention and academic success in a first-year cohort. *Translational Issues in Psychological Science, 6*(2), 132. https://doi.org/10.1037/tps0000228 The study does not meet WWC group design standards because the equivalence of clusters in the analytic intervention and comparison groups is necessary but the requirement was not satisfied.

Powers, M. D. (2014). *Growth mindset intervention at the community college level: A multiple methods examination of the effects on faculty and students*. [Doctoral dissertation, UCLA]. https://escholarship.org/uc/item/48575763 The study does not meet WWC group design standards because the equivalence of clusters in the analytic intervention and comparison groups is necessary but the requirement was not satisfied.

Sriram, R. (2014). Rethinking intelligence: The role of mindset in promoting success for academically high-risk students. *Journal of College Student Retention: Research, Theory & Practice, 15*(4), 515-536. https://eric.ed.gov/?id=EJ1076282 The study does not meet WWC group design standards because it is a randomized controlled trial with high attrition, and the analytic intervention and comparison groups do not satisfy the baseline equivalence requirement.

Wright, J. C. (2018). *The challenge of community college student academic motivation: The "Go for Growth!" intervention* (Publication No. 10751685) [Doctoral dissertation, The University of North Carolina at Chapel Hill]. ProQuest LLC. https://eric.ed.gov/?id=ED585680 The study does not meet WWC group design standards because the equivalence of the clusters in the analytic intervention and comparison groups is necessary but the requirement was not satisfied.

Studies that are ineligible for review using the Supporting Postsecondary Success Protocol

Burnette, J. L., Pollack, J. M., Forsyth, R. B., Hoyt, C. L., Babij, A. D., Thomas, F. N., & Coy, A. E. (2020). A growth mindset intervention: Enhancing students' entrepreneurial self-efficacy and career development. *Entrepreneurship Theory and Practice, 44*(5), 878-908. https://doi.org/10.1177%2F1042258719864293 The study is ineligible for review because it does not address at least one outcome in a domain specified by the review protocol.

Delpeche, H. E. (2018). *The implicit and the explicit: the impact of teaching academic mindsets and reading strategies on beginning college learners' reading comprehension* (Publication No. 10846277) [Doctoral dissertation, University of Delaware]. ProQuest LLC. https://eric.ed.gov/?id=ED591213 The study is ineligible for review because it does not address at least one outcome in a domain specified by the review protocol.

Fleurizard, T. A., & Young, P. R. (2018). Finding the right equation for success: An exploratory study on the effects of a growth mindset intervention on college students in remedial math. *Journal of Counseling and Psychology, 2*(1), 3. https://digitalcommons.gardner-webb.edu/jcp/vol2/iss1/3 The study is ineligible for review because it does not address at least one outcome in a domain specified by the review protocol.

Lewis, L. S., Williams, C. A., & Dawson, S. D. (2020). Growth mindset training and effective learning strategies in community college registered nursing students. *Teaching and Learning in Nursing, 15*(2), 123-127. The study is ineligible for review because it does not use an eligible design.

Moore, J. E. (2018). *Mindset, self-efficacy, and first year college students: Perceptions of performance accomplishments* (Publication No. 10840187) [Doctoral dissertation, Western Connecticut State University]. ProQuest LLC. https://eric.ed.gov/?id=ED587949 The study is ineligible for review because it does not address at least one outcome in a domain specified by the review protocol.

Endnotes

[1] McFarland, J., Hussar, B., Zhang, J., Wang, X., Wang, K., Hein, S., Diliberti, M., Forrest Cataldi, E., Bullock Mann, F., and Barmer, A. (2019). *The Condition of Education 2019* (NCES 2019-144). U.S. Department of Education. Washington, DC: National Center for Education Statistics. https://nces.ed.gov/pubsearch/pubsinfo.asp?pubid=2019144.

[2] Stinebrickner, R., & Stinebrickner, T. (2014). Academic performance and college dropout: Using longitudinal expectations data to estimate a learning model. *Journal of Labor Economics, 32*, 601-644.

[3] The WWC provided a description of this category of interventions to researchers familiar with *Growth Mindset* and *Social Belonging* interventions in July 2021 and the WWC incorporated feedback from these researchers. Further verification of the accuracy of the descriptive information for this type of intervention is beyond the scope of this review.

[4] The literature search reflects documents publicly available as of November 2020. Reviews of the studies in this report used the standards from the WWC Procedures and Standards Handbook (version 4.0) and the Supporting Postsecondary Success review protocol (version 4.0). The evidence presented in this report is based on available research. Findings and conclusions could change as new research becomes available.

[5] Yeager et al. (2016) reports findings from a related study of the effects of a *Growth Mindset* intervention on college enrollment of high school seniors (Experiment 1). The study was not eligible for review under the Supporting Postsecondary Students review protocol, because students in the study were enrolled in high school when the intervention was delivered. An individual study review of Experiment 1 is forthcoming under the WWC's Study Review Protocol, version 1.0.

[6] The effects of *Growth Mindset* interventions are not known for other outcome domains within the Supporting Postsecondary Success topic area, including college attendance, postsecondary degree attainment, credential attainment, employment, and earnings.

[7] In a previous review of Aronson et al. (2002), the WWC based its study rating on the full sample of 79 students that compared the average GPA for students in the intervention group to the combined sample of students in either the control pen-pal or no pen-pal comparison group. Although the current study rating does not differ from that of the prior review, the WWC has prioritized the finding that compares the average GPA for students in the intervention group to those in the control pen-pal comparison group to align with other studies included in this report.

[8] Each study reviewed for this intervention report included a comparison group in which students participated in an activity that was similar in structure but not content to what students in the growth mindset intervention group experienced. This type of comparison group served to rule out alternative explanations for any observed effect of the growth mindset messaging on college outcomes. For example, in Aronson et al. (2002), both the *Growth Mindset* intervention and the control pen-pal comparison groups wrote letters to fictional students in which they summarized information they had learned as part of participating in the study, but the no pen-pal group did not summarize new information or write a letter. Any differences in outcomes between students in the intervention and no pen-pal comparison groups could have resulted from the fact that one group summarized information in a written letter and the other group did not, rather than from differences in the content of that information. In contrast, differences in outcomes between the intervention and control pen-pal groups isolates the effect of growth mindset content relative to other content about learning or adjusting to college life.

[9] See Bostwick and Becker-Blease's (2018) argument that "fixed mindset" messages may be a "normal and typical experience for many university students" (p. 181).

[10] The study authors blocked 7,686 incoming first-year students who responded to the survey invitation by race, ethnicity (White, Black, Asian, multiracial, or Hispanic) and status as an international student, but after random assignment, excluded Asian, multiracial, and international students from analyses. Following WWC standards, v. 4.0 (pp. 8; 11-13), these exclusions are not counted as attrition because they were based on characteristics that existed prior to the introduction of the intervention and applied consistently across the intervention and comparison groups.

[11] Although the Supporting Postsecondary Success protocol indicates that studies focused exclusively on students in need of developmental coursework should be reviewed under the Review Protocol for Studies of Interventions for Developmental Students in Postsecondary Education, the review team leadership determined that this study should be included in this intervention report because it used a *Growth Mindset* intervention.

[12] In Suh et al. (2019), Table 1 shows that the initial sample of 227 students at the time of random assignment included 156 female and 71 male students. Because the percentages shown in the table do not match the number of female (or male) students divided by the total, the WWC independently calculated these percentages to be 69% female (156 of 227) and 31% male (71 of 227). Similarly, the percentage of Black students in the initial sample shown in Table 1 does not match the number of Black students (n=19) divided by the total (n=227). The WWC independently calculated this percentage to be 8.4%.

[13] A separate WWC intervention report on *Social Belonging* interventions under the Supporting Postsecondary Students review protocol (version 4.0) includes findings that contrast the *Social Belonging* intervention group with the comparison group. The intervention that combined elements of the *Growth Mindset* and *Social Belonging* interventions was ineligible for inclusion in either this report or the report on *Social Belonging* interventions because outcomes could not be attributed to the unique effects of either of the two types of interventions.

[14] These percentages reflect the WWC's calculations using the sample sizes by race, ethnicity, and first- or continuing generation status reported in Table S11 of Appendix 3 (Yeager et al., 2016, pp. 42-43). These percentages differ from those reported elsewhere in Appendix 3 (p. 30) for Asian students (19%), first-generation students (19%), and continuing-generation students (81%).

[15] Although Asian students were also excluded from analyses, this exclusion would not, alone, have compromised random assignment under WWC 4.0 standards because this characteristic existed prior to the start of the intervention and the exclusion was applied to both the intervention and comparison groups in an equivalent manner.

Recommended Citation

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