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Relationship Between Entrepreneurship Education, Entrepreneurial Mindset, and Career Readiness in Secondary Students

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Abstract

Background: Career-focused education programs in the United States increasingly emphasize 21st century workplace readiness. These programs use project-based learning to develop a holistic, noncognitive skillset linked to an entrepreneurial mindset. **Purpose:** This study assesses the relationship between entrepreneurial mindset development and students in entrepreneurship education programs compared with other career-focused academies. **Methodology/Approach:** Using a quasi-experimental design, entrepreneurial mindset was measured in two matched groups of students from underserved communities at the beginning and end of the school year. Additional analyses were conducted to assess the impact of career-focused education on student outlook of career readiness. **Findings/Conclusions:** Students in entrepreneurship education showed an overall statistically significant increase in entrepreneurial mindset, specifically in communication and collaboration, opportunity recognition, and critical thinking and problem-solving. Moreover, there was a positive association between entrepreneurial mindset gains and perceptions of future career success. **Implications:** This study paves the way for more rigorous research on linkages between career-focused education and noncognitive skills and suggests that entrepreneurship education may be effective in developing noncognitive skills linked to career success.

Keywords

experiential education, noncognitive measurement, entrepreneurial mindset, entrepreneurship education, career readiness

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With a growing demand for students to graduate from high school with skills that enable them to succeed in the 21st century, education in the United States and many parts of the world has expanded from a singular focus on the development of cognitive skills, measured by high-stakes assessments, to a more noncognitive, holistic approach that also promotes career readiness (The Aspen Institute, 2018; Bridgeland et al., 2013). This does not mean that noncognitive skill development is altogether distinct from cognitive learning. As other researchers have established, noncognitive factors are often intertwined and informed by cognitive processes (Borghans et al., 2008; Farrington et al., 2012). In fact, some of the noncognitive skills discussed in this study, such as critical thinking and problem-solving, are heavily based on cognitive understanding. Although cognitive and noncognitive skills are intrinsically connected and have been shown to predict meaningful life outcomes, the latter are not prevalent in traditional classroom pedagogy (Kautz et al., 2014). In this article, we use the phrases noncognitive skills and entrepreneurial mindset to encompass the transferable skills related to experiential education that are increasingly being emphasized by teachers and administrators, particularly in low-income schools. These range from communication and collaboration to comfort with risk and opportunity recognition. Research suggests that developing these noncognitive skills early can facilitate at-risk students to enroll in postsecondary education, gain workforce readiness, and engage in entrepreneurial activity (McBride et al., 2016).

In particular, we focus on entrepreneurship education, also referred to as enterprise education or entrepreneurial education, which leverages experiential learning to develop noncognitive skills and promote career readiness through the study of entrepreneurship (Lackéus, 2015; Plasman et al., 2017; Quality Assurance Agency, 2018). In the United States, entrepreneurship education has become increasingly prevalent in K-12 education through the emphasis on career and technical education (Junior Achievement USA, 2015; Plasman et al., 2017). The European Union has also been a significant promoter of entrepreneurship education and noncognitive skill development. It has established entrepreneurship as one of the eight key competencies essential to a knowledge-based society and has disseminated measurement tools around entrepreneurship education across Europe (Bacigalupo et al., 2016; Moberg et al., 2014). Yet, research examining the linkages between entrepreneurship education and noncognitive learning in secondary education remains sparse. The program in the current study (hereafter referred to as "Program X") introduces entrepreneurship in high schools in underresourced communities throughout the United States and parts of the world. Specifically, Program X seeks to introduce students to the concept of the "entrepreneurial mindset" to improve students' confidence in the domains that encompass the entrepreneurial mindset. The entrepreneurial mindset is defined by Program X as a constellation of noncognitive skills that empower students to recognize opportunities, overcome and learn from setbacks, and apply these skills to future careers, which may include starting one's own business.

Program X has recently updated its curriculum to bolster student-centric learning using project-based learning (PBL) pedagogy. PBL is distinctive in that it is problem oriented, that is, the problem or questions drives the learning activities (Helle et al.,

2006). These updates are based on literature that suggests the importance of PBL in fostering engaged students and developing noncognitive, social-emotional learning (McBride et al., 2016). Program X has further infused experiential learning through incorporating the latest findings from entrepreneurship and business research. A growing theme in entrepreneurship theory suggests that startups often evolve their business models through constant experimentation, learning, and revising (Fisher, 2012; Sarasvathy, 2001). This has resulted in the lean start-up movement, which Ries (2011) describes as a methodology designed to help organizations experiment and iterate when developing a sustainable business model; it is cyclical and ever-evolving. While the program focus is not on business creation, a combination of PBL and lean start-up theories drives the experiential learning model in Program X's curriculum as a means to instill transferable skills focused on self-efficacy (Dhliwayo, 2008; Jones & Iredale, 2010; Moberg, 2014).

As a result, the study seeks to understand the impact of entrepreneurship education grounded in experiential learning by assessing the noncognitive outcomes associated with the entrepreneurial mindset. This article contributes to understanding the extent to which entrepreneurship education programs relate to the development of noncognitive skills as compared with programs in other career-focused academies. While career educators maintain that noncognitive skill development is essential to our changing workplace (Kang, 2019), we do not know whether noncognitive skills can be improved via exposure to an entrepreneurial mindset intervention over the course of one academic year. The study also assesses whether exposure to this entrepreneurial mindset intervention improves other outcomes that are more broadly concerned with career readiness. Ultimately, this article underscores the need to understand and evaluate noncognitive skills, especially in career-focused education, given the increasing emphasis on fostering holistic, social-emotional learning that is relevant to the 21st century workplace.

Literature Review

Classroom Practices in Entrepreneurship Education

Although the Every Student Succeeds Act in the United States has encouraged the attainment of 21st century skills and defined accountability as more than the assessment of achievement test scores, without students' depth of learning, motivation, and engagement, such acts cannot achieve their desired goals (Darling-Hammond et al., 2016). Entrepreneurship education, at all levels of education, teaches students how to handle real-world problems; specifically in the United Kingdom, enterprise and entrepreneurship education focuses on mindset, personal development, and preparing students for adapting to changes in environments (Quality Assurance Agency, 2018). Greene et al. (2004) note that students as young as high school aged become more motivated and engaged when they perceive that their classroom environment supports autonomy and achieving mastery, as opposed to competitive evaluation, a hallmark of high-stakes achievement tests.

In a similar vein, Blumenfield et al. (1991) found that PBL serves as a motivating factor for students. Blumenfield et al. state that PBL is "a comprehensive perspective focused on teaching by engaging students in investigation" (p. 371). As with noncognitive skills, PBL benefits lower performing students because it allows them to discover skills necessary to complete a project, like a business venture, and allows them to progress at their own pace (Wurdinger & Rudolph, 2009), both of which are difficult to accomplish with a traditional curriculum. The PBL approach is highly student centered and provides opportunities for students to practice skills related to the workforce, such as time management and problem-solving. In this way, students are learning about academic content while strengthening noncognitive skills. These characteristics, integral to entrepreneurship education, make it a potentially effective approach to learning.

The focus of noncognitive skills in entrepreneurship education offers a new perspective on the desired outcomes of enrolling in such a program; students are often taught either how to act entrepreneurially or how to become entrepreneurs and start their own businesses (Jones & Iredale, 2010). Moberg (2014) found that it is important for entrepreneurship education programs to be designed in a way that highlights both the cognitive and noncognitive aspects of starting a business. PBL lessons focusing on the entrepreneurial mindset allow for the fusion of the two often disjointed pedagogical practices. Unlike most research on entrepreneurship education, the current study examined high school students who are taught the foundations of entrepreneurship and the skills required to start a business. However, the focus is largely on developing noncognitive skills and entrepreneurial self-efficacy *through* entrepreneurship education.

Noncognitive Skills

The National Research Council (NRC, 2013) recognized a demand for "noncognitive" or "21st century skills" in the workplace. Garcia (2014) outlines the noncognitive skills emphasized in classrooms today, including "critical thinking skills, problem solving skills, social skills, persistence, creativity, and self-control" (p. 32). According to West et al. (2016), the umbrella term "noncognitive" refers to skills traditionally not captured by assessments of cognitive ability and knowledge, including self-control and grit. It is also sometimes associated with social and emotional learning, which includes traits like empathy and social awareness.

Because noncognitive skills have been shown to predict academic success (MacCann et al., 2012), researchers and others agree that they have an obvious place in the classroom as an addition to cognitive skills. Although the inclusion of noncognitive skills in the classroom is a recent development (Vadeboncoeur & Collie, 2013), it is now recognized that optimal learning takes place by having both cognitive and noncognitive activations of the mind (Farrington et al., 2012).

Measuring Noncognitive Skills

Because of the relative newness of teaching noncognitive skills in the classroom, there is a paucity of psychometric research on the development of noncognitive tests.

Noncognitive assessments further face unique challenges in measurement. Duckworth and Yeager (2015) write about the various approaches, including self-report questionnaires, surveys administered to teachers about their students, and performance tasks, to measure noncognitive skills. The first two are the most frequent tools used, but noncognitive experts have reservations regarding misinterpretation of questions, lack of insight, reference bias, and social desirability bias. Because all measures have both limitations and advantages, Duckworth and Yeager (2015) advise practitioners and researchers to seek out the most valid measure for their intended purpose with caution.

Yet, results from studies that have undertaken the challenge of measuring noncognitive skills are unclear, and results are presented with many caveats (West et al., 2016), especially considering the many unanswered questions regarding noncognitive measurement. A report from the Educational Testing Service notes that a full array of noncognitive assessments are not offered because "policy makers and scientists are skeptical that noncognitive qualities can be measured reliably and in a valid way" (Kyllonen, 2005, p. 2). Despite this, the report suggests that these skills matter and, therefore, should not be ignored in measurement. The current study seeks to measure the noncognitive skills most related to the intervention, which are encapsulated by the entrepreneurial mindset.

Few researchers have examined the idea of entrepreneurial mindset, as it combines many broader terms that are more established in noncognitive research. Borchers and Park (2010) created an entrepreneurial mindset battery that measures entrepreneurial self-efficacy, locus of control, and intention to start a business. Given Program X's focus on entrepreneurial mindset as a standalone concept, this study examines a constellation of noncognitive skills most closely aligned with an entrepreneurial mindset. In addition, we analyze career outlook independently from entrepreneurial mindset, though some literature combines these constructs (Kriewall & Mekemson, 2010).

Overview of Study

Program X offers multiple entrepreneurship courses grounded in PBL and innovative lean start-up principles housed in an interactive, digital platform. New and existing teachers are required to attend in-person trainings to learn the updated pedagogy, curriculum, and digital components before they begin teaching the revised offerings. A successful intervention entails an engaged classroom where students are actively developing and experimenting with their business idea. Teachers facilitate student learning without imposing their own ideas and judgments. The desired immediate outcome of the intervention is the development of students' entrepreneurial mindset. Program X views developing an entrepreneurial mindset as essential to students possessing the transferable skills needed to succeed in the 21st century economy.

In this study, we focus on teachers who were trained and implementing Program X's new pedagogy and curriculum to assess the intervention with full fidelity. We adopted a quasi-experimental approach to evaluate whether an in-school entrepreneurship education intervention, grounded in PBL and lean start-up principles, is associated with increases in entrepreneurial mindset and career outlook. While others have

studied the efficacy of PBL and the merits of social-emotional learning individually, this is the first more rigorous attempt to quantitatively assess the relationship between an experiential entrepreneurship education program and increases in noncognitive factors like an entrepreneurial mindset. In particular, the study answered the following primary research question:

- What is the effect of the entrepreneurship education program on students' entrepreneurial mindset, compared with a similar group of students who did not participate in the program?

We hypothesized that exposure to an entrepreneurship program (compared to nonexposure) is related to students' development of an entrepreneurial mindset. Given entrepreneurship education's emphasis on labor market success, we also sought to answer the following questions:

- What is the relationship between exposure to entrepreneurship education and students' outlook on college and careers?
- What is the association between entrepreneurial mindset gains and students' outlook on college and careers, irrespective of exposure to the entrepreneurship education program?

While Program X's emphasis on entrepreneurial mindset development stems from a clear theory of change, there is less differentiation between the intervention and other career-focused programs as it relates to career readiness. Accordingly, we expected the relationship between exposure (or not) to entrepreneurship education and students' outlook on college and careers to be positive, albeit weak.

Method

Setting and Sample

The study took place in two large, public high schools across 10th, 11th, and 12th grades in Miami, Florida, in 2018 to 2019. The study was approved by a national institutional review board (Solutions IRB, No. 2017/06/31) and the Miami-Dade County Public Schools research review board (No. 2251). Approved protocols were followed, and parental consent was received by the majority of the students in each participating class. The schools in Miami-Dade County were selected to ensure comparable school admission policies and composition. The final study sample included 171 participants in 10th grade (38 who received treatment), 72 participants in 11th grade (27 who received treatment), and 26 participants in 12th grade (12 who received treatment). In sum, there were 269 student participants with 77 students in the treatment sample.

Before the school year began, we collaborated with the two teachers in the treatment sample to identify classes and recruit teachers that would make an appropriate comparison to their entrepreneurship classes. We received student district identifiers

Table 1. Sample Overview by School and Career Academies.

	Treatment group	Comparison group
School 1 ($n = 217$)	International Business and Finance. Classes include the following: • Accounting Applications 1 • Business Management and Law • Principles of Entrepreneurship	Information Technology. Classes include the following: • Introduction to Microcomputers • Digital Design • Digital Information Technology • Foundations of Robotics • Game and Simulation Foundations • Robotic Design Essentials • Technical Design
School 2 ($n = 52$)	Digital Media Design and Entrepreneurship. Classes include the following: • Gaming and Simulation (Start-up Tech App Development) • Entrepreneurship and Business	Digital Media Design and Entrepreneurship and Legal. Classes include the following: • TV Production • Law Studies/Legal Systems and Concepts

from each participating school, which were then used to authenticate the presurveys and postsurveys as well as obtain district records for the final analysis. One-page information sheets were distributed to all participating teachers with details on how to administer the presurveys and postsurveys toward the beginning and end of the school year. Due to school schedules and logistical constraints, the survey periods varied from school to school and ranged a few months. School 1 administered the presurveys from late September to late October, while School 2 administered the presurveys from late October to late November; postsurveys were administered from early April to early June for School 1 and mid-March to early May for School 2.

All students were part of a career academy in their school, with the treatment class in International and Finance or Digital Media Design and Entrepreneurship and comparison students in Information Technology, Digital Media Design and Entrepreneurship, and Legal Studies (see Table 1). Although data collection occurred in a wider range of academies, the final selection was narrowed after gathering teacher input and conducting site visits to assess similarities in pedagogy, curriculum content, and teaching style. Admission to each of these career academies includes a grade point average (GPA) requirement, ensuring comparability between students in the treatment and comparison groups. Students elect to participate in each academy and follow a course sequence throughout their high school trajectory. Students who received the treatment largely did not have a choice in selecting the class as it was part of their academy sequence. Students who did not receive the treatment were taking a combination of required and elective classes, all of which were housed in their respective career academy.

Program X works with a diverse population of students in schools with >50% free or reduced lunch rates. Therefore, it was important to ensure that the treatment ($n = 77$) and

Table 2. Sample Individual Characteristics.

	Treatment sample	Comparison sample	Difference
Female	0.32	0.51	−0.19**
Born in the United States	0.69	0.7	−0.01
Black	0.03	0.09	−0.06*
Hispanic and Other	0.93	0.87	0.06
2017–2018 Unweighted GPA (of 4.0)	2.96	2.89	0.07
English language learner	0.07	0.01	0.06**
Gifted exceptionality	0.2	0.16	0.04
Exceptional student education (not gifted)	0.09	0.05	0.04
Free reduced lunch status	0.64	0.69	−0.05
Currently working (yes)	0.1	0.14	−0.04
Had summer job/internship (yes)	0.2	0.25	−0.05
Entrepreneurial exposure through family member (yes)	0.56	0.58	−0.02
Observations	76	192	

Note. GPA = grade point average.
*$p < .1$. **$p < .05$.

comparison ($n = 192$) groups were similar in composition on individual characteristics. The data for individual characteristics were obtained through district records except for characteristics related to students' employment status and exposure to entrepreneurship through an immediate family member, which are self-reported by student participants. As seen in Table 2, the majority of students in both the treatment and comparison classes were born in the United States, Hispanic or another race/ethnicity that was not Black or White, and receiving free or reduced lunch. They had similar levels of academic achievement, as measured by the average unweighted GPA of the previous school year. Students in both treatment and comparison classes also reported similar rates of employment and entrepreneurial exposure through an immediate family member. Results of a t test between groups suggested that the two groups were, on average, similar on all characteristics except female, Black, and English language learner.

The two teachers from the treatment sample were experienced educators with more than 20 years of teaching experience and had been teaching the entrepreneurship class for more than 10 years. They were both also trained in Program X's new curriculum, pedagogy, and digital platform in the past two years. While we did not survey all teachers participating in the comparison sample, teachers in both schools had many years of experience and taught project-based classes with associated career certifications.

Dependent Measures

The Entrepreneurial Mindset Index (EMI), a self-assessment tool developed in partnership with Educational Testing Service to measure youth entrepreneurial mindset,

was used to assess differences between the treatment and comparison classes. The EMI consists of 30 items rated on a 5-point Likert-type scale, six situational judgment tests rated using distance scoring, a battery of self-report career and college outlook questions, and a handful of optional demographic and informational questions. For the scope of this study, we focused on the six EMI domains to assess entrepreneurial mindset, given that prior research has established this scale's reliability and validity (Gold & Rodriguez, 2018). We also selected questions from the battery of self-report career and college outlook questions, described below.

Pre/Post-EMI Likert-type Domain Scores

Based on a factor analysis, the 30 Likert-type agreement items load onto six distinct entrepreneurial mindset domains: communication and collaboration, comfort with risk, creativity and innovation, opportunity recognition, critical thinking and problem-solving, and future orientation (see Supplemental Appendix A). The six domains are also averaged to assess an overall EMI score. The domain and overall scores are scaled out of 100 for easier interpretation.

Prior psychometric research showed the reliability of the scale, with respect to both the individual domains and the overall EMI constructs to have values exceeding 0.70 (Gold & Rodriguez, 2018). A confirmatory factor analysis also showed the six domains jointly to have a good overall model fit (Hu and Bentler, 1998, 1999). The comparative fit index (CFI) and Tucker–Lewis Index (TFI) were above .90, and the root mean square error of approximation (RMSEA) and standardized root mean square residual (SRMR) were below 0.08.

We also computed the correlation between each pair of domains and between each domain and the overall EMI to see to what extent the domain scores overlap with each other and to what extent the overall EMI represents all six individual domains (see Supplemental Appendix B). We found strong and statistically significant positive correlations between each of the six individual domain scores and the overall EMI score ($r \geq .79$; Schober et al., 2018). We also found moderate correlations between domains ($.47 \leq r \leq .70$) except for the correlation between critical thinking and problem-solving and creativity and innovation ($r = .81$). The moderate correlations suggest that the constructs tapped by each domain are reasonably nonoverlapping,

College and Career Outlook Measures

We used a battery of confidence in college and career self-report items rated on a 5-point scale within the pre/post-EMI to assess students' outlook beyond high school to conduct additional analyses. We collapsed two college-related questions, given the strong correlation between them ($r \geq 0.70$; Schober et al., 2018), resulting in two distinct self-report items: (a) Confidence in getting in and doing well academically in college and (b) Confidence in doing well in future career. We also asked about (c) students' confidence in their knowledge and skills to start a new business (6-point agreement scale) and (d) their intention to start a business (yes/no binary scale), given the study's focus on entrepreneurship education. These four measures were used in

additional analyses to assess differences between treatment and comparison groups beyond entrepreneurial mindset.

Analytic Approach

Since Rubin and his colleagues first conceptualized the idea of causal inference (Rubin, 1974), applied researchers have sought to establish valid counterfactuals in observational data. As we were unable to leverage random assignment in this study—students selected the career academy they wanted to attend—we used propensity matching techniques to balance the treatment and control samples on observable characteristics. Balanced samples allow us to obtain a more precise estimate of the average treatment effect on the treated (ATT). To select between propensity score alternatives, we used the suggested decision criterion of standardized bias, or the standardized difference of means of the propensity score, of less than 0.25 for all variables, ensuring that the most important variables had standardized bias less than 0.10 (Harder et al., 2010; Ho et al., 2007).

We used multiple linear regression analysis to assess the ATT of the entrepreneurship education intervention on survey outcomes. For our binary outcome (intention to start a business), we used a logistic regression and report log odds for the regression coefficients. Finally, we used cluster-robust standard errors, clustering on school to account for unobserved correlations among students within schools (Cameron & Miller, 2014). The final model specification is the following:

$$Y_i = \beta_{0i} + \beta(Treatment)_i + \beta(Covariates)_i + Pre_i + \epsilon_{ij}.$$

In this model, Y_i represents the observed EMI domain or total score for student i, and Pre_i represents the presurvey score when available for student i. Of particular interest is whether the β for the treatment effect (*Treatment*) controlling for all the key observable covariates (*Covariates*) in the equation is statistically significant.

Student Controls

Key observable covariates were chosen for matching and regression analysis based on a review of relevant entrepreneurship education studies that established additional factors that may influence entrepreneurial mindset (e.g., Hayes & Richmond, 2017; Moberg, 2014). These included prior history of students' confidence in their entrepreneurial mindset (baseline prescores) as well as experience working/interning and entrepreneurial exposure through family members. We also included relevant demographic and socioeconomic controls, such as gender, race/ethnicity, whether students were born in the United States, and their free reduced lunch eligibility. Finally, we controlled for predictors of traditional academic achievement, such as prior year GPA, English language learner status, gifted exceptionality, and other exceptional student education (e.g., learning disability, autism spectrum disorder).

Results

Propensity Score Matching

After analyzing the standardized bias and graphical diagnostics of three approaches, we selected the matched sample using nearest neighbor matching on all covariates and exact matching on school (see Supplemental Appendix C). This model used all the treatment variables and had the lowest standardized bias on all variables except exceptional student education, which affected a small number of students.

Outcomes Analysis

Entrepreneurial mindset. Table 3 contains the results of the multiple regression analysis. Overall, we found a statistically significant difference in the hypothesized direction in average entrepreneurial mindset for students who received the intervention (see Table 3, Column 1). Students in the intervention sample increased their overall postentrepreneurial mindset by 2.85 percentage points compared with those who did not receive the intervention, controlling for their pre-entrepreneurial mindset score and key observable covariates ($p < .05$). With respect to specific entrepreneurial mindset domains, the following were estimated to be related to the intervention in our primary hypothesis: communication and collaboration (3.88 percentage points, $p < .05$), opportunity recognition (3.26 percentage points, $p < .05$), and critical thinking and problem-solving (3.25 percentage points, $p < .05$).

While the final specification did not result in statistical significance for all domains, the coefficients on all domains were positive, suggesting that the intervention had a neutral to positive effect on students. The overall EMI model had an adjusted R^2 of 0.50, indicating that the model explained about half of the amount of variation in the post-EMI score (Chin, 1998).

To assess the magnitude of the pre/post-EMI differences between treatment and comparison groups, we plotted the baseline, average results of the overall EMI, and the six individual domains (see Figure 1). As the figure indicates, while the pre/post changes are small, students who received the intervention largely demonstrated EMI gains, whereas their counterparts largely demonstrated EMI declines. We also assessed effect size using the final regression model coefficient and the average standard deviation of the treatment and comparison groups. The overall EMI's Cohen's *d* statistic is 0.25, and the individual domains range between 0.20 and 0.32 (also found in Table 3) suggesting between small to medium effect size of the intervention on entrepreneurial mindset compared with the comparison group (Cohen, 1988).

Additional analyses. We found mixed results when assessing the difference in college and career outlook between students in the intervention and comparison groups, controlling for their EMI results (see Table 4). While the coefficients on the three confidence Likert-type agreement items were directionally positive, we did not find

Table 3. Relationship Between Treatment and Control Covariates and EMI Gains.

	EMI Overall	Communication and collaboration	Comfort with risk	Creativity and innovation	Opportunity recognition	Critical thinking and problem-solving	Future orientation
Treatment	2.85**	3.88**	4.16	4.2	3.26**	3.25**	2.71
	(0.16)	(0.16)	(1.26)	(0.95)	(0.12)	(0.21)	(1.40)
Prescore	0.77**	0.45**	0.61***	0.52**	0.65**	0.61***	0.61*
	(0.02)	(0.01)	(0.00)	(0.01)	(0.05)	(0.00)	(0.05)
School 1 (compared with School 2)	0.14	−4.45**	0.52	−0.19	0.40	−0.09	0.61
	(0.55)	(0.19)	(0.45)	(0.09)	(1.20)	(0.24)	(0.54)
11th grade (compared with 10th grade)	1.50	3.67	2.92	−0.44	1.37**	1.88	0.26
	(1.60)	(1.98)	(2.72)	(2.61)	(0.10)	(2.06)	(0.39)
12th grade (compared with 10th grade)	−5.10*	−1.07*	−3.31***	−6.82	−5.11*	−6.64	−1.23
	(0.51)	(0.12)	(0.03)	(1.99)	(0.74)	(1.69)	(1.12)
Female	−0.86	0.48	−1.81	−1.59***	−1.08	−2.91	1.36**
	(0.80)	(0.40)	(0.60)	(0.01)	(2.17)	(1.13)	(0.03)
Born in the United States	−0.28	−3.30*	−2.64	−1.50*	1.22	2.10	1.03
	(0.32)	(0.27)	(2.67)	(0.21)	(1.52)	(0.40)	(1.03)
Black (compared with White)	−2.45*	−2.00	−4.85	−4.22	−0.32	−5.54*	−3.13
	(0.35)	(1.46)	(2.97)	(1.36)	(2.42)	(0.46)	(0.99)
Hispanic and Other (compared with White)	−3.65	−3.14	−5.28	−5.24	−2.32	−7.78	−5.81
	(2.01)	(4.04)	(3.26)	(2.13)	(1.30)	(2.05)	(2.68)
2017–2018 Unweighted GPA (of 4.0)	1.21	2.86	0.45	0.91	1.93	2.06	−1.10
	(1.11)	(1.57)	(0.74)	(1.36)	(1.33)	(1.33)	(1.41)
English language learner	5.92**	−14.03*	9.44	0.87	14.94***	−3.17	5.57**
	(0.22)	(1.35)	(1.78)	(2.38)	(0.01)	(2.77)	(0.43)

(continued)

Table 3. (continued)

	EMI Overall	Communication and collaboration	Comfort with risk	Creativity and innovation	Opportunity recognition	Critical thinking and problem-solving	Future orientation
Gifted exceptionality	−1.00	2.23	1.03	−0.86	−1.76	−1.76	1.41**
	(0.29)	(1.64)	(4.78)	(0.24)	(1.77)	(0.85)	(0.08)
Exceptional student education (not gifted)	−1.77***	−2.08	4.82	−1.34	−4.42*	0.73	−6.97*
	(0.02)	(1.72)	(1.18)	(2.47)	(0.58)	(2.03)	(0.92)
Free reduced lunch status	−1.72*	−0.68**	−6.19	−3.38*	−0.34	0.60	1.62
	(0.26)	(0.02)	(1.31)	(0.29)	(2.28)	(1.22)	(2.82)
Currently working (yes)	−1.07	−4.70	1.70**	1.00	−1.16	−1.16	−4.94
	(2.21)	(2.29)	(0.05)	(3.00)	(2.55)	(1.11)	(2.10)
Had summer job/internship (yes)	1.21	5.12	0.44	−0.44	−0.04	2.19	2.04
	(2.49)	(2.35)	(0.72)	(4.78)	(2.17)	(2.81)	(3.51)
Entrepreneurial exposure through family member (yes)	1.71	0.14	4.75**	2.17	4.03**	0.35	1.65
	(0.37)	(1.24)	(0.17)	(0.81)	(0.21)	(0.15)	(0.43)
Wald test *F* statistic	314**	595**	10.8	19.5	764**	237**	3.78
Cohen's *d* statistic (effect size)	0.25	0.26	0.26	0.32	0.26	0.27	0.20
Adjusted R^2	0.50	0.28	0.40	0.23	0.39	0.33	0.39
Observations	152	152	152	152	152	152	152

Note. EMI = Entrepreneurial Mindset Index; GPA = grade point average.
*$p < .1$. **$p < .05$. ***$p < .01$.

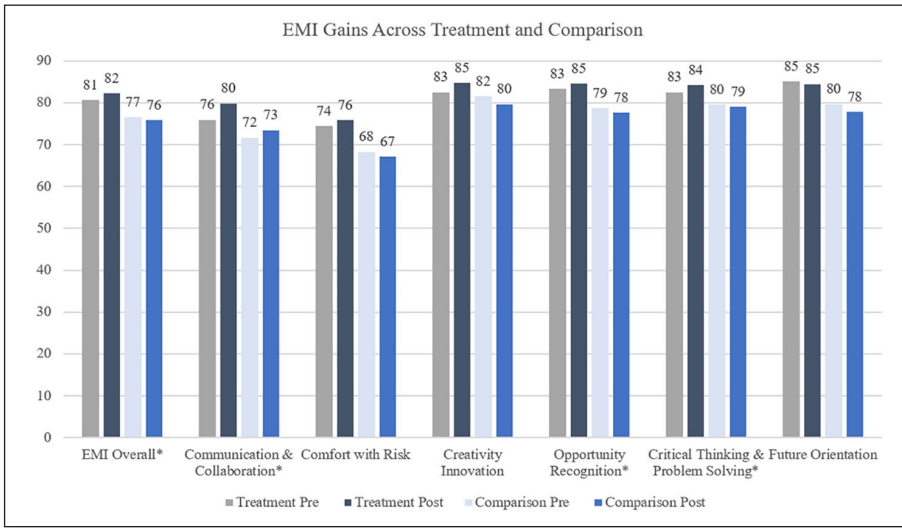

Figure 1. Baseline EMI results of treatment and comparison groups with statistical significance notation based on the final regression model.
Note. EMI = Entrepreneurial Mindset Index.

statistically significant differences at $p < .05$ for any variables. However, there was a statistically significant relationship between EMI scores at the end of the year and "Confidence in Future Career Success" at $p < .05$, irrespective of exposure to the intervention (see Table 5). Interestingly, there was no statistically significant relationship between the intervention sample or EMI increases and "Intention to start a business."

Discussion

This study used a validated measure of a constellation of noncognitive skills associated with an entrepreneurial mindset to assess the impact of an education intervention on mindset. Compared with previous literature reporting negative to marginal changes in noncognitive skills over time (e.g., McBride et al., 2016; West et al., 2016), our results suggest a positive association between the educational intervention and gains in entrepreneurial mindset overall. Given the positive, statistically significant increases in the domains of communication and collaboration, opportunity recognition, and critical thinking and problem-solving in particular, we posit entrepreneurship education may be unique in how it helps students increase their confidence in these areas at greater rates than students in other career academies. During our site visit to both schools, we observed high levels of student engagement in the intervention classes, in both peer-to-peer interactions as well as when presenting their ideas in front of the entire class. This

Table 4. Relationship Between Treatment and Control Covariates and Additional Outcomes of Interest.

	Confidence in getting in and doing well in college (5-point scale)	Confidence in future career success (5-point scale)	Confidence in entrepreneurship knowledge and skills (6-point scale)	Intention to own a business (binary)
Treatment	0.14	0.21*	0.28*	−0.01
	(0.09)	(0.03)	(0.03)	(0.14)
Prescore	0.5**	0.28	0.33***	2.74
	(0.04)	(0.05)	(0.00)	(0.57)
School 1 (compared with School 2)	0.08	−0.12	0.11**	0.33
	(0.02)	(0.02)	(0.00)	(0.11)
11th grade (compared with 10th grade)	0.07	−0.07	0.51	0.20
	(0.05)	(0.02)	(0.09)	(0.30)
12th grade (compared with 10th grade)	0.22	0.07**	0.38	−1.23
	(0.11)	(0.00)	(0.20)	(0.45)
Female	0.08	0.10	0.04	−1.2
	(0.03)	(0.10)	(0.15)	(0.25)
Born in the United States	0.14	0.04	−0.15	−0.32
	(0.21)	(0.08)	(0.02)	(0.63)
Black (compared with White)	−0.29	−0.76**	0.32	−15.97***
	(0.22)	(0.02)	(0.29)	(0.72)
Hispanic and Other (compared with White)	−0.33	−0.62	−0.08	−15.79***
	(0.19)	(0.22)	(0.41)	(0.38)
2017–2018 Unweighted GPA (of 4.0)	0.20**	−0.08	0.07	0.00
	(0.01)	(0.05)	(0.03)	(0.11)
English language learner	−0.76	−2.10*	0.21	16.77**
	(0.14)	(0.24)	(0.07)	(0.66)
Gifted exceptionality	0.10	0.20*	0.02	−0.31
	(0.14)	(0.03)	(0.33)	(0.13)
Exceptional student education (not gifted)	−0.51	−0.40*	−0.77	−0.50
	(0.09)	(0.06)	(0.29)	(0.39)
Free reduced lunch status	0.20	0.04	−0.39	−0.35***
	(0.10)	(0.06)	(0.14)	(0.00)
Currently working (yes)	−0.34	−0.04	−0.25	0.55
	(0.19)	(0.13)	(0.10)	(0.33)
Had summer job/internship (yes)	0.03	−0.02	0.13	−1.09
	(0.12)	(0.16)	(0.19)	(0.25)
Entrepreneurial exposure through family member (yes)	0.18	0.11*	−0.05**	1.10
	(0.09)	(0.01)	(0.00)	(0.64)
Wald test *F* statistic	2.46	40.5*	117*	0.01
Cohen's *d* statistic (effect size)	0.16	0.24	0.22	0.02
Adjusted R^2	0.31	0.13	0.16	0.51
Observations	152	152	152	152

Note. GPA = grade point average.
*$p < .1$. **$p < .05$. ***$p < .01$.

Table 5. Relationship Between EMI Scores and Additional Outcomes of Interest (Irrespective of Intervention).

	Confidence in getting in and doing well in college (5-point scale)	Confidence in future career success (5-point scale)	Confidence in entrepreneurship knowledge and skills (6-point scale)	Intention to own a business (binary)
Post-EMI score	0.03*	0.04**	0.02*	0.08
	(0.00)	(0.00)	(0.00)	(0.02)
Prescore	0.31*	0.09	0.27**	2.71
	(0.04)	(0.02)	(0.01)	(0.68)
School 1 (compared with School 2)	0.18**	−0.05	0.18**	0.57
	(0.01)	(0.03)	(0.01)	(0.16)
11th grade (compared with 10th grade)	0.01	−0.13	0.45	−0.08
	(0.06)	(0.03)	(0.10)	(0.11)
12th grade (compared with 10th grade)	0.20	0.08*	0.41	−1.35
	(0.07)	(0.01)	(0.20)	(0.30)
Female	0.10	0.12	0.07	−1.28
	(0.05)	(0.11)	(0.15)	(0.25)
Born in the United States	0.14	0.06**	−0.10	−0.34
	(0.17)	(0.00)	(0.02)	(0.60)
Black (compared with White)	−0.18	−0.54*	0.41	−15.64***
	(0.20)	(0.05)	(0.32)	(0.50)
Hispanic and Other (compared with White)	−0.12	−0.32	0.08	−15.28***
	(0.09)	(0.11)	(0.51)	(0.36)
2017–2018 Unweighted GPA (of 4.0)	0.20***	−0.10*	0.03	−0.08
	(0.00)	(0.01)	(0.02)	(0.21)
English language learner	−0.55*	−1.98**	0.58**	17.26**
	(0.08)	(0.10)	(0.04)	(0.36)
Gifted exceptionality	0.09	0.17	−0.03	−0.62***
	(0.14)	(0.04)	(0.28)	(0.01)
Exceptional student education (not gifted)	−0.41*	−0.44*	−0.83	−0.70*
	(0.05)	(0.05)	(0.29)	(0.11)
Free reduced lunch status	0.22	0.06*	−0.40	−0.34*
	(0.05)	(0.01)	(0.17)	(0.03)
Currently working (yes)	−0.25	0.06	−0.20	0.83
	(0.16)	(0.08)	(0.13)	(0.58)
Had summer job/internship (yes)	−0.05	−0.07	0.07	−1.52*
	(0.06)	(0.06)	(0.12)	(0.18)
Entrepreneurial exposure through family member (yes)	0.10	−0.00	−0.12	1.03
	(0.08)	(0.02)	(0.02)	(0.78)
Wald test *F* statistic	129*	630**	49.6*	28.5
Cohen's *d* statistic (effect size)	0.03	0.05	0.02	0.17
Adjusted R^2	0.45	0.30	0.18	0.58
Observations	152	152	152	152

Note. EMI = Entrepreneurial Mindset Index; GPA = grade point average.
*$p < .1$. **$p < .05$. ***$p < .01$.

type of student-centric learning was not only project based (which some of the other career academies were as well) but also stemmed from student ownership over a business idea that they continuously had to refine and share with their peers. Therefore, we feel that the combination of PBL pedagogy and an entrepreneurship education curriculum may be a contributing factor in the differences in entrepreneurial mindset.

Although it is difficult to conclusively state that the entrepreneurial mindset gains are substantially different from the comparison students, given the small effect sizes, we know from a review of prior literature that these increases are on par or higher than what previous studies have found. The small yet positive results point to the importance of exploring what may be realistic increases in the arena of noncognitive skill development. While previous literature suggests valid concerns about using self-report noncognitive measures for program evaluation (Duckworth & Yeager, 2015), we advocate for a shared understanding of what may be appropriate ranges of noncognitive skill development to help fellow researchers, practitioners, and policymakers have more informed conversations on the holistic impact of education interventions.

Specifically, this study contributes to the larger conversation around providing relevant education and skills that ultimately help young people navigate the 21st century workplace. Our results support existing literature on the linkages between experiential learning and career readiness indicators through a Career Technical Education framework (Kreisman & Stange, 2019). We add another dimension to the research by establishing a relationship between gains in entrepreneurial mindset and greater confidence in future career success. Similar to prior research, we did not find a relationship between experiential learning and college orientation (Kreisman & Stange, 2019). Interestingly, entrepreneurship education (those in the intervention group) did not have marked differences in career orientation compared with other career tracks, suggesting that students are receiving similar career-related exposure in all career academies in the study. However, given the linkages between entrepreneurship education and entrepreneurial mindset gains, there appears to be something unique in entrepreneurship education pedagogy that facilitates noncognitive skill development, which in turn is linked to career readiness and success.

Limitations and Future Research

This study faces several logistic and methodological limitations. The first limitation concerns the sample, which is relatively small and from two schools in Miami, Florida. We can also only speak to the latest implementation of the program offering, given we reduced our sample to include only teachers who were trained in the curriculum and pedagogy. While we have attempted to correct for bias through propensity score matching, students in the study were not randomly assigned and there may be unobservable differences between the treatment and comparison groups that went unaccounted.

Moreover, the measurement of noncognitive skills faces limitations. While this article uses a previously validated measure on entrepreneurial mindset, there is still no widely accepted measurement tool for noncognitive skill development in education,

especially as it relates to assessing growth in social-emotional learning. Scholars also debate the use of Likert-type agreement items, given the potential for social desirability and reference bias (Duckworth & Yeager, 2015). Future studies should include other innovative types of measurement, from forced choice items to performance tasks, as well as multidisciplinary perspectives on noncognitive measures of success when evaluating experiential education more broadly and entrepreneurship education in particular.

Finally, our findings should be replicated in larger samples across other states using random assignment where possible to support external validity. It would also be interesting to expand the study to include teachers not trained in PBL to assess the relationship between specific experiential approaches to entrepreneurship education and increases in entrepreneurial mindset. Future research should examine the relationship between entrepreneurial mindset and concrete career outcomes through a longitudinal study design, following participants as they pursue post–high school plans upon graduation.

Conclusion

This is the first quasi-experimental study to examine the relationship between entrepreneurial mindset and an entrepreneurship education intervention in high school. We found an overall association between students in entrepreneurship education classes and an increase in entrepreneurial mindset, compared with students in other career-focused academies, suggesting tentative evidence for increasing specific noncognitive skills through entrepreneurship education. In addition, we found a positive relationship between gains in entrepreneurial mindset and perceptions of future career success, which contributes to the increasing emphasis placed on K-12 education to foster relevant learning and skills that help youth succeed in today's changing workplace.

Authors' Note

Sophia Rodriguez is now affilaited with Wagner Graduate School of Public Service, New York University.

Declaration of Conflicting Interests

The author(s) declared the following potential conflicts of interest with respect to the research, authorship, and/or publication of this article: The authors were employed as researchers by the program of study during the research period. To help mitigate potential conflicts of interest, two faculty members from New York University served as external advisors to this study and received small stipends. The authors would like to thank Leanna Stiefel and Sharon Weinberg for their valuable guidance and support.

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