BEYOND THE TIP OF THE ICEBERG: MEASURING EFFICACY OF ENTREPRENEURSHIP EDUCATION IN OUTCOMES BEYOND START-UPS

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ABSTRACT

In this paper, we examine measures of entrepreneurship education efficacy. Currently, entrepreneurship education program design is often driven by a desire to perform well in ranking systems. Ranking systems focus on the number of start-ups and program inputs such as the number of courses. To better understand entrepreneurship education efficacy, educators at three universities have worked to assess the effectiveness of their programs. Our research team has taken a competencies-based approach and employed the theory of change logic model to link entrepreneurship education efficacy to both generalizable entrepreneurial competencies and early career outcomes. We propose that entrepreneurship educators should measure outputs, outcomes, and impact using this theory of change lens. Metrics associated with these areas are suggested and are linked with skills beneficial to graduates whether traditionally employed or in a start-up. The paper innovatively integrates the theory of change to propose measures in five core areas important for entrepreneurship program graduates. The discussion is intended to broaden our view of how we assess entrepreneurship education and encourage work regarding the goals of entrepreneurship education, which is overdue and will strengthen all our programs.

INTRODUCTION

The impact of entrepreneurship has been widely recognized. This impact is seen at multiple levels: personal achievement (Bolzani & Foo, 2018; Stewart & Roth, 2001), altering entire industries (Johnson, Lusch, & Schmidtz, 2020; Schumpeter, 1942), economic growth (Urbano, Aparicio, & Audretsch, 2019; McClelland, 1961), and even as a hope to cure global issues such as climate change (Dean & McMullen, 2007). This potential for positive impact has attracted efforts from both academics and university systems, which has led to the rapid growth of entrepreneurship research and entrepreneurship education programs. Generally, entrepreneurship education intends to enable students and graduates to apply entrepreneurial

skills and knowledge in a wide array of settings. However, entrepreneurial skills and knowledge are seldom the outcomes measured by research into entrepreneurship programs or used in practitioner university ranking systems, both of which inform the design of new entrepreneurship education programs. Instead, the focus is frequently on start-ups - research on entrepreneurship education examines the 'intention to start a new venture' (e.g., meta-analysis on EE by Martínez-Gregorio, Badenes-Ribera, & Oliver, 2021) and ranking systems on 'the number of start-ups' (e.g., Choi & Markham, 2019) for recent graduates. Yet, launching a new venture is just the tip of the iceberg; entrepreneurship education must account for outcomes beyond venture starts. The facts are that *less than 10%* of students pursue a start-up after graduation (NACE, 2021). Additionally, entrepreneurial skills and knowledge provide a much wider benefit applicable both within and beyond new venture creation. In this paper, we make a case to broaden the current focus from measuring start-ups and lobby for appropriate outcomes metrics to assess the efficacy of entrepreneurship education that consider the broader range of benefits to our graduates and their careers.

Prior research has acknowledged that universities need to do a more effective job of defining and measuring entrepreneurship education outcomes that relate to the needs of students (Koys, Thompson, Martin, & Lewis, 2019). This is especially true when we consider the context of our students' early careers. In theory, entrepreneurship researchers aiming to better understand the entrepreneurial process and exploit opportunities should be well-positioned to develop entrepreneurship pedagogy. Nevertheless, entrepreneurship education design is often driven more by replicating existing programs or completing items measured by prominent raking systems. This has led to the proliferation of common pedagogical practices with a limited understanding of educational outcomes (e.g. Sarooghi, Sunny, Hornsby, & Fernhaber, 2019). This is consistent with many disciplines as there is a drive to imitate the 'best' in the global ranking game (Kauppi, 2018). As Liguori et al. (2018) describe: "we outpaced our own understanding of what to teach, how to teach it, and how entrepreneurial learning is best measured" (p. 5). Significant progress has been made in individual measures and in documenting successful interventions, but as other scholars have asserted (e.g. D'Souza, Bement, & Struckell, 2022; Edelman, Manolova, & Brush, 2008; Yi & Duval-Couetil, 2021), entrepreneurship educators need to do a better job meeting the needs of students. It is challenging to measure the efficacy of entrepreneurship education broadly and compare individual programs until we as a discipline reach a consensus relating to ideal outcome metrics.

To better understand entrepreneurship education efficacy, this author team (comprised of entrepreneurship educators at three universities) has spent the past three years assessing education effectiveness to identify best practices to share across their broader regional academic alliance (the alliance contains 10 universities and over 160,000 students). Our research team has taken a competencies-based approach to defining the purpose of entrepreneurship education and employed the theory of change logic model as a framework to link efficacy to both generalizable entrepreneurial competencies and early career outcomes that capture a wide range of alumni experiences. We have examined the structure of programs across our academic alliance, which offers over 170 entrepreneurship courses. We found challenges in comparing the programs as there were differences in educational content, program structure, and emphasis on curricular/extra-

curricular initiatives. Considerable time was spent understanding the core entrepreneurship skills and knowledge each institution intended to impart.

While academic researchers often examine how entrepreneurship education influences student mindset outcomes, such as entrepreneurial intent or entrepreneurial orientation (Nabi, Linan, Fayolle, Krueger, & Walmsley, 2017), practitioners have focused on ranking lists (e.g. U.S. News). University-wide and discipline-specific ranking lists have become a global phenomenon and have a significant influence on the decision-making process, strategy, and perception of programs (Rybiński & Wodecki, 2022) and play a significant role in the shaping of programs (Fowles, Frederickson, & Koppell, 2016). Our research team found a lack of consistent entrepreneurship education efficacy assessment and a significant disconnect between best practices in performance measurement and how programs are ranked.

The contributions of this paper are threefold. First, we propose a strategy and core set of entrepreneurship education outcomes to assess program efficacy, based on an established logic model. Second, these outcomes are operationalized with quantifiable metrics. Lastly, the discussion is intended to broaden our view of how professors assess entrepreneurship education outcome metrics and encourage conversation because we believe that a dialogue about the goals of entrepreneurship education is overdue and will strengthen all our programs.

The paper proceeds as follows. First, we review the current state of entrepreneurship education and curricular offerings within the author's academic alliance as an example. Next, we discuss the theory of change model and how this framework highlights the types of metrics used in efficacy evaluations. Third, the current practitioner evaluation metrics used to rank university programs are reviewed, and explain how these metrics are poorly linked with both entrepreneurship research and pedagogy. We then propose new metrics for entrepreneurship education evaluation, which are linked with core entrepreneurship research principles. We conclude with a review of contributions and future work in this area. This paper aims to begin a conversation about the learning goals of undergraduate entrepreneurship education and propose a pathway to efficacy measurement that aligns with those goals.

BACKGROUND AND THEORETICAL FOUNDATIONS

Entrepreneurship education

There has been enormous growth and investment in entrepreneurship education at all levels of education (Morris, Kuratko, & Cornwall, 2013; O'Connor, 2013; Walter & Block, 2016). The rapid adoption of entrepreneurship education is illustrated by the number of undergraduate programs in the US more than doubled in fourteen years (Honig, 2004; Liguori et al., 2018). entrepreneurship education is a topic that is relevant to academics and practitioners because excellent pedagogy is based on validated research and entrepreneurship research has focused on practical ways to boost the success of entrepreneurs. While entrepreneurship as a discipline once considered new venture creation as a defining requirement (Gartner, 1989), the current, broader definition of entrepreneurship involves identifying and exploiting opportunities (Shane & Venkataraman, 2000) within a variety of contexts. This focus continues to be a driver of entrepreneurship research as "It seems likely that opportunities will continue as an important

concept in the field of entrepreneurship for some time" (Alvarez & Barney, 2020, pg. 300). Research has not conclusively determined the effectiveness of entrepreneurship education in part due to limitations in research design (Yi & Duval-Couetil, 2021), and in part due to fragmentation in defining effectiveness within the field (Schuhmacher & Thieu, 2022).

There has been a range of researchers advocating a competency-based approach to entrepreneurship education (Bacigalupo, Kampylis, Punie, & Van den Brande, 2016; Mawson, Casulli, & Simmons, 2022; Morris, Webb, Fu, & Singhal, 2013), or emphasizing creative self-efficacy (Tantawy et al., 2021) and human capital development (Cualheta & Abbad, 2022; Martin, McNally, & Kay, 2013), but outcomes, such as these, have been under-researched (Cualheta & Abbad, 2022; Nabi et al., 2017). Instead, the existing empirical research related to EE effectiveness commonly focuses on intentions to start a new venture (Bae, Qian, Miao, & Fiet, 2014; Nabi et al., 2017). While venture creation may be one of the long-term outcomes of entrepreneurship education, the full spectrum of what graduates do with their education should be taken into consideration when designing programs and measuring their efficacy.

The emphasis on entrepreneurial intent and start-ups in entrepreneurship education research does not capture the experience of most entrepreneurship graduates for two reasons. First, it does not reflect the reality of most recent graduates. The National Association of Colleges and Employers (NACE) conducts the First Destination Survey of the graduating classes for nearly 350 institutions within the U.S. which accounts for 28% of all bachelor's degree graduates. NACE undergraduate data shows only 7% of entrepreneurship education graduates pursue venture creation as their primary endeavor (NACE, 2021), in comparison 76% are traditionally employed, 10% continue their education, and 9% are seeking employment.

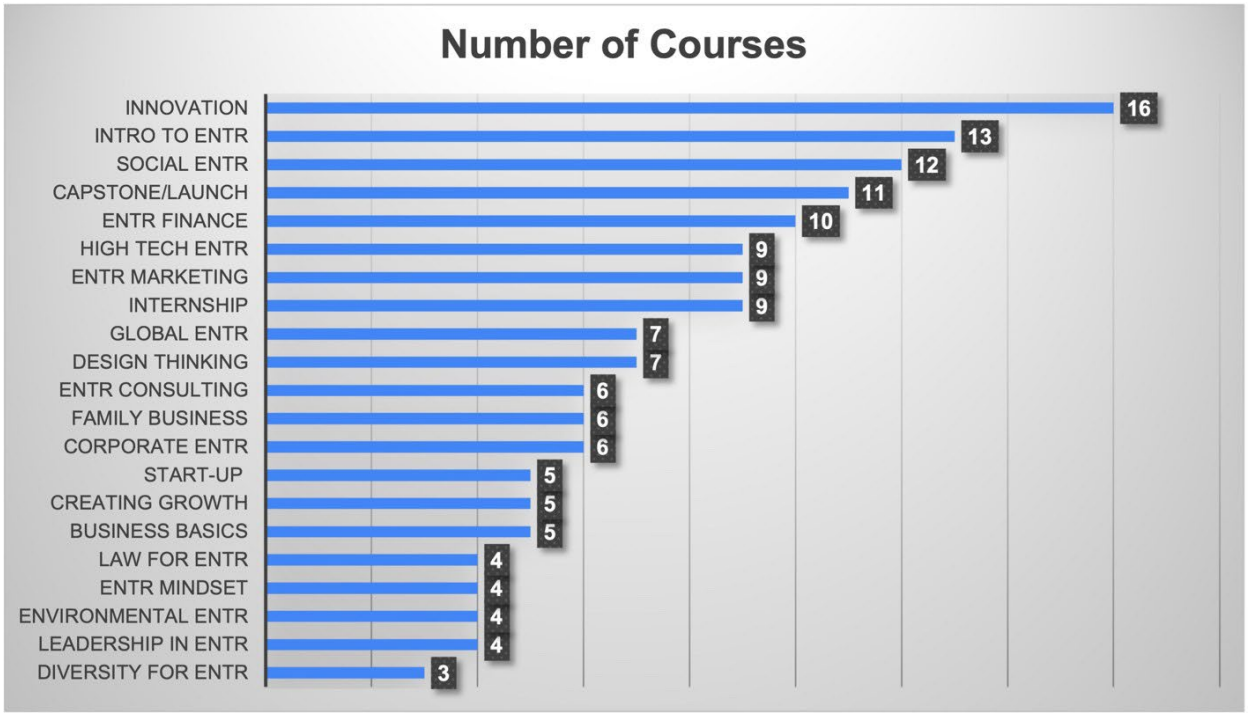
Second, launching a venture after graduation may not be in the best interest of students. Research has shown that entrepreneurship education can improve students' skills in opportunity identification and evaluation while lowering short-term intentions of new venture creation (DeTienne & Chandler, 2004). To best position EE graduates for success, it is appropriate to instill entrepreneurial skills that will lead to a long, productive career. Most entrepreneurs start firms in an industry they have prior work experience and new graduates lack this experience. The Kauffmann Foundation's research on early-stage entrepreneurship indicates that the rate of new entrepreneurs is the highest among the 45–54-year age group and the lowest among the 20-34 year age group (Fairlie, 2022). Together, this information illustrates that using venture starts as the primary outcome measure on which to evaluate entrepreneurship education programs fails to include the experiences of the overwhelming majority of graduates.

An analysis of entrepreneurship education programs within our academic alliance showed that eleven of twelve schools have an entrepreneurship major or concentration, ten offer a minor, and three have certificate programs. These programs emphasize innovation, creativity, opportunity exploration, and an experiential-action-oriented style of education. There are significant variations with some programs specializing in an area (e.g., social or technology entrepreneurship). While a full qualitative assessment of these offerings is outside the scope of this paper, a summary of course offerings is shown in Figure 1.

Entrepreneurship education is a benefit to students as they transition into work. Increasingly, employers are attracted to graduates' knowledge of innovation processes and have

high expectations for the impact entrepreneurship program graduates can have on their organizations (Killingberg, Kubberød, & Pettersen, 2022). Mawson et al. (2022) assert that an entrepreneurial mindset can be distilled into "a set of learnable cognitive and emotional competencies conducive to developing and enacting behaviors to support value creation activity" and this mindset would be valuable in a range of contexts. Based on the venture launch base rates within the NACE data, corporate entrepreneurship (using entrepreneurship skills within an existing organization and sometimes referred to as intrapreneurship) is a more likely path for our graduates to engage in value-creation activity and yet is underrepresented in the course offerings within our academic alliance. Students engaging in corporate entrepreneurship have distinct outcome expectations from those engaging in entrepreneurship (Ilonen & Hytönen, 2022) that should be captured within comparative performance assessments of entrepreneurship education.

Figure 1
Entrepreneurship Education Course Breakdown Within Academic Alliance

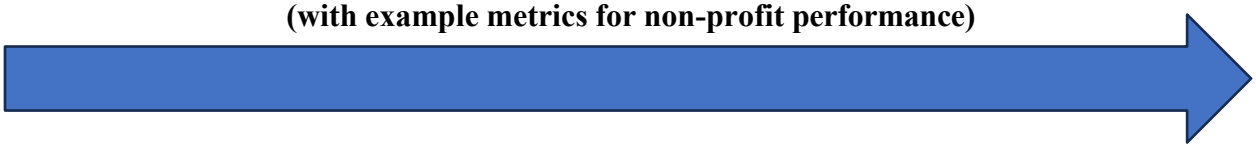


Measurements of efficacy using the logic model

The authors believe that the work on performance measurement from the non-profit field is valuable for exploring a more holistic look at the performance of entrepreneurship education outcomes beyond venture creation. The five-stage theory of change model (outlined in Figure 2) has become a key performance measurement tool (Ebrahim & Rangan, 2014; Lynch-Cerullo & Cooney, 2011), both because the process of developing the model clarifies the understanding of how the impact is created and because a theory of change logic model provides a

structure in which various aspects of performance can be evaluated. Leveraging a logic model to map the connections between inputs, activities, outputs, outcomes, and impact (Epstein & Yuthas, 2014) within a curriculum can provide much-needed clarity on the logic behind entrepreneurship education and the role educators wish it would play within the career readiness and trajectories of their students. The first stage of the model for input measurement provides the ability to understand the resources necessary to achieve the desired change and the needed investment in an intervention— in the case of educational programs this typically relates to the number of students, faculty, and/or funding available for a program. Activity metrics assess the action for implementation—for entrepreneurship education, examples of this are the number and types of courses taught, the number of competitions hosted, and/or the number of scholarships awarded. Output measurement assesses what has been concretely done—in entrepreneurship education, examples would include the number of students completing the program, the number of businesses developed, and/or the number of students mentored. Outcome and Impact measurements must occur after graduation because they seek to measure lasting changes in the lives of individuals (outcomes) and communities (impacts) (Ebrahim & Rangan, 2014)

Figure 2
Theory of change logic model
(with example metrics for non-profit performance)



Inputs	Activities	Outputs	Outcomes	Impact
• Funds • Equipment and supplies • Expertise	• Basic needs delivery • Service delivery • Infrastructure built	*Results: Immediate* • People fed, housed, or treated • People trained or educated • Roads built, markets created	*Results: Medium and long-term* • Improved quality of life, health, educational attainment • Increased incomes *Measured for individuals*	*Results: effects on root causes, sustained significant change* • Sustained drop in poverty • Improvements in human development indicators *Measured in terms of communities, populations, ecosystems*

Adapted from Ebrahim & Rangin, 2014, p 121

A challenge in performance measurement is determining which metrics to track and how to effectively establish systems to track them (Carman & Fredericks, 2010). Metric selection is a

key part of ensuring the desired efficacy is achieved because performance data influence strategic decision-making, program design, and implementation (McDavid, Huse, & Hawthorn, 2018), selecting the wrong metrics to track could inadvertently shift the focus of future decisions. It is much easier, and more common, to evaluate performance in the earlier stages of the theory of change—Inputs, Activities, Outputs—than it is to measure the later stages—Outcomes and Impacts— because determining meaningful outcome metrics is difficult (Lynch-Cerullo & Cooney, 2011) and the time lag makes data collection more difficult. In the case of entrepreneurship education efficacy, it would require assessing impacts on alumni instead of current students.

Examining the existing research on entrepreneurship education pedagogy through the theory of change lens, we see that most efforts are focused on the activities within the classroom and their direct outputs. With regards to measuring outcomes, Yi and Duval-Couteil's (2021) meta-analysis on entrepreneurship education efficacy highlighted significant gaps in our understanding of outcomes because of poor research design. Specifically, they highlight that in many studies there has not been sufficient time between the treatment and data collection to fully understand the impact or outcomes of entrepreneurship education. Further, most studies had a validity issue because they focused solely on education outcomes without employing either a pre/post-test model or a non- entrepreneurship education control group. They argue that researchers need to begin with their intended end goal and work backward to determine metrics that align with those goals. Because we, as a discipline-specific field, have not coalesced on clear goals of entrepreneurship education it makes it hard to determine the ideal metrics related to these goals.

Current outcome measurement practices

The business of ranking university education programs has become a major driver of the institutionalization of practices across disciplines (Fowles et al., 2016). These systems have been studied in many national contexts and have been found to carry significant weight in student recruitment (Rybiński & Wodecki, 2022), shape student identity and learning satisfaction (Huang, Chen, & Chien, 2015), and influence employee quality of life (Fontinha, Van Laar, & Easton, 2016). Additionally, practitioner rankings influence university marketing (Kethüda, 2022; Soh, 2016). An area we wish to emphasize is that these ranking systems have been shown to fundamentally shape program design in institutions striving to earn a top-ranked spot on the lists (Fowles et al., 2016). These systems often focus on easily collected information from universities such as the number of professors, courses, scholarships, staff-to-student ratios, competitions, and start-ups founded by recent graduates. Thus, the ranking systems focus on inputs into the education process, which does little to adequately assess the efficacy of the entrepreneurship education effectiveness. The growth in popularity of these ranking systems is representative of a drive towards an expectation of transparency and performance measurement for the education sector and an appetite from consumers for data to analyze and compare options. The algorithms that determine school and program success vary by publication. Popular systems include the US News, World University Rankings, Princeton Review, Wall Street Journal/Times Higher Education, and Poets & Quants. While many are built upon the same basic factors, they emphasize various aspects

of student outcomes, school resources, selectivity, and reputation. These systems typically focus on easily collected information from universities and many institutions use them as an indicator of success and marketing tool. The prominence of these ranking systems means that educators have ceded significant control over defining what makes an effective program to external actors outside of higher education.

For entrepreneurship education, we shall focus on three prominent ranking systems: US News, Poets & Quants, and Princeton Review. According to US News, the entrepreneurship program rankings are "based solely on peer assessment surveys" from Deans and senior faculty members (US News, 2021). This is consistent with global ranking systems such as the World University Rankings, which bases half of the teaching metric on reputation surveys (Times Higher Education, 2023). Poets & Quants ranks a limited number of programs (38) at the graduate level and the ranking methodology used for 2022 had sixteen metrics (Allen, 2021). Princeton Review aggregates data from 300 schools across twenty-one metrics (The Princeton Review, 2021). Figure 3 shows the metrics from these ranking systems overlaid on the theory of change model.

Figure 3
Theory of change applied to ranking metrics

Inputs	Activities	Outputs	Outcomes	Impact
Princeton review– ~300 schools report data and the top-ranked ones are included in their list of "Top 50 Undergrad Schools for Entrepreneurship" or "Top 50 Graduate Schools for Entrepreneurship" (EE = entrepreneurship education)				
• Number of students enrolled in EE offerings • Percent of the student body enrolled in EE • Number of faculty teaching at least 1 EE course • Faculty entrepreneurial experience • Funding for prizes • Mentors • Total cash awards for competitions • Total in-kind	• Types of degrees offered in EE • Entrepreneurship Center • Number and types of courses taught • Cross-discipline team experiences • Programs where students are mentored by someone outside of the university • Types of competitions hosted	• Number of business plans developed and tested • Number of students mentored • Percent of cash prizes awarded to students enrolled in entrepreneurship offerings • Percent of in-kind prizes awarded to students enrolled in entrepreneurship	• Money raised by student and alumni ventures at 5 and 10 years	• Alumni firm survival at 5 and 10 years

awards for competitions	• Number and dollar amount of scholarships	offerings		
Poets & Quants—38 MBA programs ranked, 29 of whom submitted data, 9 were based on publicly available information				
• Percent of Faculty involved • Ratio of start-up funding available to students • Ratio of start-up award money available to students • Ratio of number of mentors to students • Ratio of entrs. in residence to students • Ratio of incubator space to students • Percent of faculty involved in a start- up	• Percent of courses that are EE • Percent of all students taking an EE elective • Percent of students in entr. clubs	• Ratio of Entr. Mentor hours to total students • Number of students mentored • Start-up award money	• Percent of students launching • Percent of students taking positions in VC • Percent of students accepting a position with a start-up	

In comparing these ranking methodologies, there are several noteworthy items. First, peer- based surveys fail to recognize the potential reputation versus reality gap (Eccles, Newquist, & Schatz, 2007). The content of the methodologies favors established large, wealthy institutions. Second, the measured rankings are heavily weighted on Inputs and Activities, accounting for 68% of the metrics tracked (25 of 37). An emphasis on Inputs and Activities favors large universities with large resource endowments. While it seems logical that resource-rich institutions should be able to offer high-quality education, these metrics do not directly assess Outputs or Outcomes. Third, only 14% of the metrics relate to Outcomes and Impacts and are heavily focused on launching a new venture--a metric only applicable to a small number of entrepreneurship education graduates. Finally, the rankings have an emphasis on venture capital-oriented criteria. Very few start-ups access venture capital and these types of funds flow mainly to high-tech and biotech industries. Thus, rewarding entrepreneurship programs at a limited number of universities.

Other widespread forms of assessment include teaching evaluations, objective measures of learning, and self-assessments of career readiness. Teaching evaluations are the most widespread measure of effective teaching in higher education broadly. These have significant limitations in understanding the efficacy of an entrepreneurship education program because of their focus on individual class experiences (Stehle, Spinath, & Kadmon, 2012), emphasis on things not related to learning outcomes (Goos & Salomons, 2016), and time proximity to intervention. Objective measures of learning, such as standardized exams like ETS and TOEFL, used to assess performance in many business schools overcome these issues, but are still limited to measuring the immediate result of the curricular intervention, making it an Output and one that

is not specific to entrepreneurship education (Stehle et al., 2012). Finally, some universities have established programs to track early alumni transitions to the workforce as one measure of success and an example is a partnership with organizations such as the National Association of Colleges and Employers (NACE) to learn best practices and gain access to comparative data. NACE provides data on the employment of recent college graduates and surveys graduates along with their employers as to the skills of recent graduates in eight critical areas (e.g., critical thinking, written communication, and teamwork). These competencies are valuable to all graduates and provide some insight into entrepreneurship education effectiveness, but not entrepreneurship-specific competencies.

PROPOSAL

We advocate that entrepreneurship education programs should adopt measurement systems that capture an array of Impacts and Outcomes related to skills associated with exploring the entrepreneurial process and career readiness. We assert that entrepreneurship educators should take a broader human capital approach to learning goals to develop entrepreneurial mindsets in our students and meaningful evaluation metrics. The human capital theory asserts that when a person's skills, knowledge, and competencies increase, there is a resulting improvement in the person's performance leading to an improved economic condition (Gruber, Dencker, & Nikiforou, A, 2023; Becker, 1994). This is congruent with entrepreneurship research which places the entrepreneur as a central driver of change and economic development (Mehmood, Alzoubi, Alshurideh, et.al., 2019; Schumpter, 1942). A focus on developing student skills, knowledge, and competencies related to entrepreneurship would logically follow that they would do better in their careers —the question for entrepreneurship educators becomes: *Which skills, knowledge, and competencies both support early career success and venture creation for our alumni?* Entrepreneurship education researchers are encouraged to measure outcomes and impacts of graduates and this requires gathering data from alumni who have had the opportunity to put into practice the skills, knowledge and competencies they gained from their education. Most entrepreneurship pedagogy research has utilized entrepreneurial intentions from an easier to obtain student sample.

Our research team of faculty from three universities came together to explore the question of how we could more effectively evaluate entrepreneurship education programs. We believe that this conversation needs voices from a range of academics connected to the scholarship, teaching, and practice of entrepreneurship, which our team reflects. We have hosted focus groups with entrepreneurship center advisory boards and other entrepreneurship educators, interviewed early career graduates, and compared programs within our academic alliance. We have learned from those conversations that many entrepreneurship education programs have not identified their own metrics to track the efficacy of their programs and many program administrators rely on the existing ranking system questionnaires for which metrics to track. The theory of change logic model can be a useful tool to guide the development of aligned and meaningful metrics. If we as a field can agree upon shared Outcomes and Impacts then individual programs can work backward from these to develop their own set of outputs, activities, and

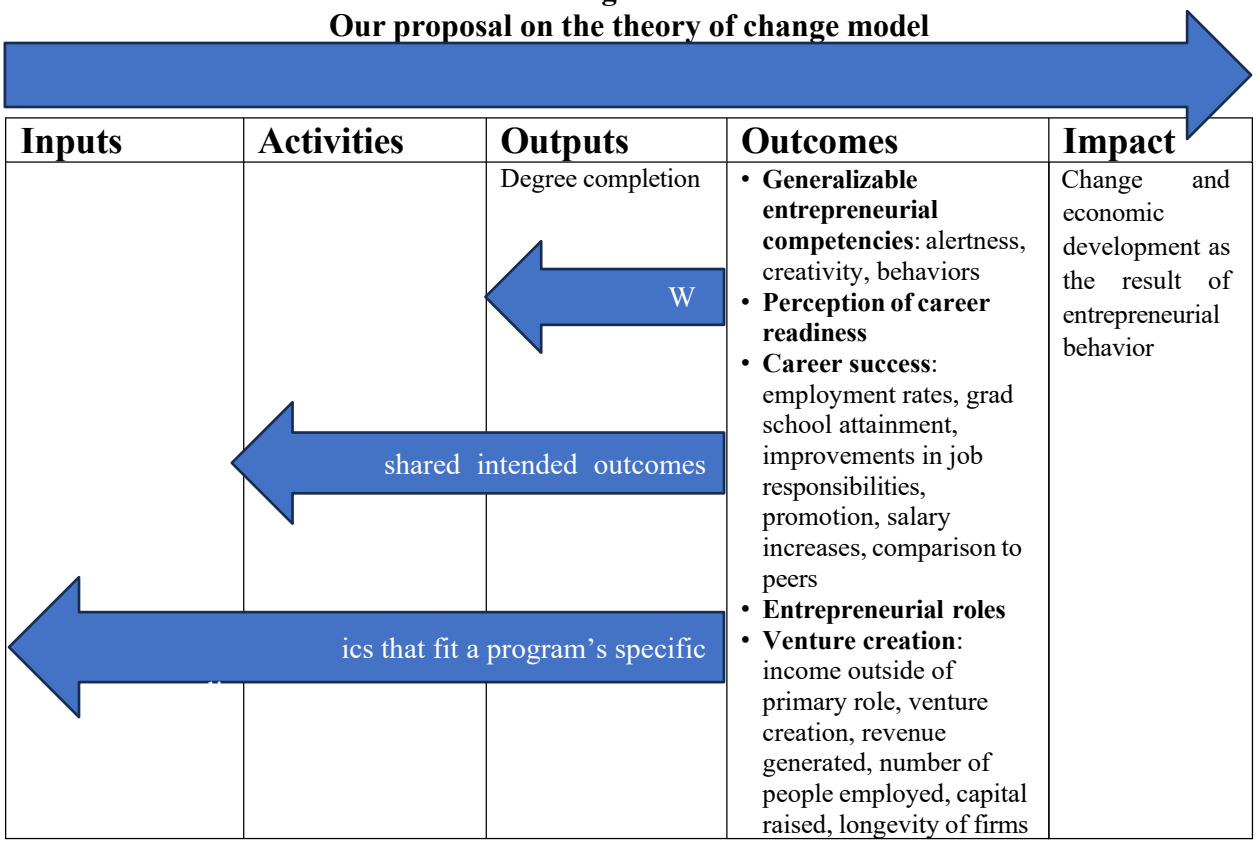
inputs necessary to achieve those desired effects. This approach would allow schools to customize a dashboard of metrics that makes sense for their institutional context.

To begin this conversation more concretely, we propose that the ultimate impact of entrepreneurship education is to encourage positive social change and economic development (Lumpkin, Bacq, & Pidduck, 2018) as the result of entrepreneurial behavior and assert that the following five outcomes would be valuable to compare across schools to achieve this impact.

1. Generalizable entrepreneurial competencies
2. Career readiness
3. Career success
4. Entrepreneurial roles
5. Venture creation

Establishing clear shared efficacy metrics allows for a more effective comparison of programs that identifies what practices lead to desired educational goals as opposed to simply replicating the practices of high-prestige programs. For example, the *Princeton Review* ranking system tracks the total cash awarded in competitions. In theory, this metric helps to ensure that entrepreneurship education programs are creating experiential learning opportunities for their students and creating increased financial support for nascent entrepreneurs, but there is no direct link between the amount of money awarded in competitions and actual student or alumni outcomes. There is however a direct link between universities with higher ranking scores and resource rich schools. We question whether competition funding is a necessary input for all schools to track and suggest that faculty working within their programs develop their own metrics. A school may utilize a different activity to achieve the same outcome and this would require tracking their own constellation of aligned output, activity, and input metrics. Figure 4 lays out our proposed metrics on top of the theory of change model. Each of the five proposed outcome categories are discussed in more detail below and Table 1 suggests potential assessment tools that would allow outcome comparisons across programs.

Figure 4
Our proposal on the theory of change model



Generalizable entrepreneurial competencies

The entrepreneurship literature outlines a range of entrepreneurial competencies (e.g. Bacigalupo et al., 2016; Gümüsay & Bohné, 2018; Morris, Webb, et al., 2013). However, some of these competencies are more relevant for students seeking to immediately create ventures and others are more generalizable to other forms of identifying and exploiting opportunities. Through this lens, three competencies stand out as generalizable to all entrepreneurship students: opportunity alertness (Tang,, & Busenitz, 2012), entrepreneurial behaviors (Pearce, Kramer, & Robbins, 1997), and creativity (Farmer, Tierney, & Kung-McIntyre, 2003). Effective entrepreneurship education programs should seek to build these competencies in their students. Measuring entrepreneurship program alumni competence in alertness, entrepreneurial behavior, and creativity in comparison to other graduates would be a more effective outcome measurement for the majority of entrepreneurship grads than entrepreneurial intent.

Career readiness

There have been calls for management education to better meet the career needs of enrolled students (D'Souza, Bement, & Struckell, 2022; Koys, Thompson, Martin, & Lewis, 2019) as well as to better understand the relationship between entrepreneurship education and employability (Killingberg, Kubberød, & Pettersen, 2022; Pittaway & Cope 2017). Business

education research has proposed three areas for universities to target to improve our programs, which are critical thinking, career self-management, and management competencies (Bunch, 2020). We adopt an expanded list of competencies created by NACE, which encompasses these three areas, is a logical approach as considerable data is available for assessment and tracking. As a professional association, NACE connects college career services, university relations, and recruiting professionals and has become a leading source of information on the employment of recent college graduates. They have identified eight core career readiness competencies that could each be measured as separate outcome metrics: career and self-development, communication, critical thinking, global awareness, leadership, professionalism, teamwork, and technology.

Effective entrepreneurship education programs should build these competencies in addition to generalizable entrepreneurial competencies. While the base rate of venture creation at the time of graduation is significantly higher for entrepreneurship than non-entrepreneurship graduates, only 7% of entrepreneurship education graduates immediately launch ventures as compared to 76% who begin their careers in traditional full-time employment (NACE, 2021). Early career alumni are ten times more likely to have traditional employment than as a start-up founder and we have an obligation to track career readiness as a part of program efficacy assessments to ensure student needs are met. We believe that further research is merited to better understand if the acquisition of generalizable entrepreneurial competencies positively influences career readiness.

Early career success

Alumni perceptions of early career success and measures of career improvement are important outcome metrics for entrepreneurship education programs. The leading reasons for attending college are related to skills that lead to a successful career. Polling shows the desire to obtain knowledge and skills (65%), allow for a fulfilling career (61%), and to land a higher paying job (60%) are the only responses that score higher than 50% (Gallup & Lumina, 2022). Entrepreneurship education alumni may turn to venture creation as a result of positive and negative career shocks (Rummel, Akkermans, Blokker & Van Gelderen, 2019) and early career success puts them in a more advantageous position to begin something new. Early career success allows alumni to earn income, gain experience, build financial security, and develop expertise necessary to identify opportunities for venture creation and effectively run their own organizations later in life. Further, entrepreneurship education alumni who remain within existing organizations can utilize their entrepreneurial skills, knowledge, and capabilities to enhance their organization's ability to capitalize on opportunities that strengthen their employer's sustainability and better serve society's needs (Anokhin, Wincent, & Oghazi, 2016). Potential outcome metrics for early career success could include: rate of promotions, salary increases, expanded responsibilities, performance evaluations, and comparisons to peers. Tracking outcome metrics related to early career success would allow programs to understand their efficacy beyond initial job placement.

Entrepreneurial roles

Killingberg, Kubberød, & Pettersen (2022) found that entrepreneurship graduates play valuable roles within firms by bridging across business disciplines and providing specific knowledge relating to innovation. Not all early career positions are created equal in terms of opportunities for employees to identify and exploit opportunities to affect change. Some jobs are very narrow in tasks, autonomy, and scope, while others are more flexible, varied, and autonomous. We would define that latter as an "entrepreneurial" role within an organization and assert that entrepreneurship education alumni in more entrepreneurial roles have a higher likelihood of helping entrepreneurship education reach its intended societal impact. The ratio of alumni in entrepreneurial roles would be a valuable outcome metric for entrepreneurship education programs to track. These entrepreneurial roles provide benefits to program graduates as they have an opportunity to practice the skills learned in their entrepreneurship education while traditionally employed.

Table 1
Proposed efficacy metrics of Entrepreneurship Education (EE)

Rationale for why this is a valuable measure of EE	Assessment Tools
Generalizable Entrepreneurial Competencies	
There is a range of generalizable entrepreneurial competencies (e.g. Bacigalupo et al., 2016; Gümüsay & Bohné, 2018; Morris et al., 2013b). Measuring EE alumni's competence in alertness, entrepreneurial behavior, and creativity in comparison to other graduates would be an effective Outcome measurement for EE grads.	**Opportunity Alertness Scale** (Tang, Kacmar, & Busenitz, 2012) Measures individual's ability to recognize opportunities, evaluate opportunities, **Entrepreneurial behaviors** (Pearce, Kramer, & Robbins, 1997) Measures actions related to entrepreneurship as drive and implementation are key metrics **Employee creativity** (Farmer, Tierney, & Kung-McIntyre, 2003) The ability to innovate, pivot and create paths forward are important skills for entrepreneurs
Career Readiness	
Most EE graduates enter traditional employment and it is important to understand their career readiness. NACE has a long track record of working with employers to identify eight key competencies. These competencies are linked with high-achieving employees. Effective EE programs should build these competencies in addition to the generalizable entrepreneurial competencies. Utilizing this type of framework would allow EE programs to benchmark themselves in comparison to other programs.	**NACE competencies:** The survey instrument for each competency is available through the NACE website: • Career and self-development • Communication • Critical thinking • Equity and inclusion • Leadership • Professionalism • Teamwork • Technology
Early Career Success	
Alumni perceptions of early career success and measures of career improvement are important outcome metrics for EE programs. The leading reasons for attending college are related to skills and career success.	**Percent of graduates who experienced measures of success in their jobs:** Self-report measures provided by recent graduates and the NACE survey have several survey questions

This is a goal for the student and why they pursued an education. It is a measure of education efficacy to provide human capital skills that will allow graduates to succeed in their endeavors.	related to this area. • Increase in responsibility • Increase in compensation • Change in job title
Entrepreneurial Role	
Graduates of EE programs should be interested in career opportunities related to their interest in entrepreneurship. Some jobs fit this interest and are more flexible, varied, and autonomous. A graduate with an "entrepreneurial" role within an organization benefits them as they have an opportunity to practice the skills learned in their EE while traditionally employed.	**Percent of graduates within "entrepreneurial roles" as measured by:** Qualitative assessment is required of the job role description. • Role Autonomy • Task variety • Job Scope • Flexibility
Venture Creation	
Entrepreneurship researchers have long recognized that new venture creation is a non-linear process with a myriad of indicators (Reynolds, 2007). Recent graduates may lack industry knowledge, contacts, and financial means to pursue a start-up right after graduation. If a graduate is working to build these resources, it is important to consider including this in the assessment of 'working on' a start-up.	**Percent of alumni who report:** Measures from the PSED (Reynolds (2007) assess numerous start-up activities • Venture start • Preparing to start • Earning income outside of the primary job

Venture creation

Finally, we cannot overlook the importance of venture creation as an outcome of entrepreneurship education programs. Entrepreneurship researchers have long recognized that new venture creation is a non-linear process with a myriad of indicators (Reynolds, 2007). This is not how non-academic program rankings measure entrepreneurship education programs and recent graduates. An important issue is the lack of data tracking recent entrepreneurship graduates as to steps they may be taking in creating a new venture. These can include the over two dozen measures from the PSED as listed by Reynolds (2007). Research has examined links between the venture creation process and entrepreneurship pedagogy and found consistent positive emphasis of start-up skills within entrepreneurship textbooks (Edelman, et.al., 2008). Examples of new venture creation activities that overlap from the PSED and entrepreneurship education pedagogy includes defining opportunities, market research, fund and resource requirements, intellectual property, and implementation planning. It is noteworthy that these skills are also valuable for employees within an existing organization. There is not a rigid, stepwise path for venture creation; the start-up process evolves and is 'messy' (Reynolds, 2007). However, this is not how universities report the number of entrepreneurship education graduates who are founding a new venture to ranking organizations. For example, many entrepreneurs are traditionally employed while they are working to launch their new venture. These individuals are not often reported as entrepreneurs to ranking systems.

CONTRIBUTIONS AND FUTURE CONVERSATIONS

The purpose of this paper is to spur a discussion about entrepreneurship education, to arrive at best practices as to what is taught and how success in our programs is determined. A theory of change logic model is proposed as a conceptual tool to act as a guide to assess the effectiveness of our entrepreneurship education programs. This model illustrates how current performance ranking metrics do not appropriately capture the full range of Outcomes and Impacts of entrepreneurship education.

Our main contribution is to provide entrepreneurship educators with a direction to assess their programs in terms of five core areas: generalizable entrepreneurial competencies, early career success, career readiness, entrepreneurial roles, and venture creation. This is consistent with the call for business educators to align our education learning goals with skills relevant to employers' needs and career readiness (Bement et al., 2020).

We aim for this work to spur future conversations that engage all entrepreneurship researchers. Because effective pedagogy is both built on high-quality academic research and can fundamentally change how the subjects of entrepreneurship research operate, we believe this is a conversation that should include all entrepreneurship researchers and aim for this proposal to spur much-needed conversations around the core questions for our discipline:

1. **What is the purpose of Entrepreneurship Education?** There have been numerous calls to better ensure that entrepreneurship education meets the needs of its students (Bement et al., 2020; Edelman et al., 2008) but there is no clear agreement as to what those needs are. What benefit can entrepreneurship theory and knowledge provide to undergraduate students who are entering the traditional workforce? What unique offerings does the entrepreneurship discipline offer these graduates that are not a part of other business and non-business disciplines? Is there a downside to reducing the primacy of venture starts within entrepreneurship education? Are these tradeoffs worth it to our discipline? Is there a way to effectively build both venture and career readiness?
2. **What specific outcome metrics align with this purpose?** How do we define program success? Which stakeholders do we prioritize in developing these metrics? You may have read this work and agreed with our assertion that our current assessment systems fail to capture key metrics of success, but do not agree with the metrics we proposed in this paper. We believe that disagreeing on metrics can lead to valuable conversations in the discipline that help us better understand the purpose and efficacy of entrepreneurship education.
3. **How would the measurement of these metrics potentially change the way we approach Entrepreneurship Education?** If the discipline agrees that the purpose of entrepreneurship education is to enable our graduates to think and act entrepreneurially in whatever career position they are in, then we should examine our programs to ensure that our coursework aligns with that purpose. For example, we know that three out of four entrepreneurship education alumni are engaged in traditional employment following the completion of our programs, yet fewer than half of the schools in our academic alliance offer courses on corporate entrepreneurship. How can entrepreneurship education provide skills that are both relevant to organizations and consistent with the entrepreneurship process? Future work could examine how to adapt corporate entrepreneurship courses to focus more on the leadership of innovation and how this can be related to a modern 'gig' economy.
4. **What is the downside of reducing the primacy of venture starts within Entrepreneurship Education?** While we believe that it is important to acknowledge the reality of the career tracks of our graduates, is there a risk of reducing the primacy of venture starts as a signal of program effectiveness? What do we as a discipline risk by shifting our focus from the minority of students launching right now to preparing graduates for traditional employment while developing a toolkit for them to use later in life? Are these tradeoffs worth it to our discipline? Is there a way to effectively build both?

These conversations are overdue, and we believe they can ultimately provide great benefits to our students, and their careers while furthering the intended impact of entrepreneurship education to positively improve economies.

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