The Entrepreneurial Mindset: Using the Questions of *What*, *Why*, and *How* as an Organizing Framework

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ABSTRACT

This paper provides the framing and details of a two-part entrepreneurial mindset symposium that was organized with the following objectives: 1) build a community of entrepreneurial mindset researchers and practitioners, 2) define an entrepreneurial mindset framework, and 3) situate efforts to identify and measure dimensions of the entrepreneurial mindset within that framework. With these objectives, we invited several individuals from a range of institutions to collaborate on addressing the three objectives. As part of the symposium activities, participants created author teams, drafted concept papers, and revised their papers in response to reviewers enlisted as part of the typical review process followed by the *Advances in Engineering Education* journal. This special issue is comprised of ten, 2500-word concept papers that address topics related to *what* entrepreneurial mindset is, *why* an entrepreneurial mindset is important, and *how* to promote, instill, or assess an entrepreneurial mindset.

Key words: Entrepreneurial Mindset, Engineering Education

BACKGROUND

Globalization and rapid advances in technology have spurred initiatives to prepare engineers to be adaptive, flexible, and forward thinking (Duval-Couetil, Kisenwether, Tranquillo, and Wheadon, 2014; National Research Council, 1990). Efforts to promote these qualities have generated a burgeoning of entrepreneurship education within engineering undergraduate and graduate programs in the U.S. and internationally (Besterfield-Sacre, Ozaltin, Robinson, Shuman, Shartrand, and Weilerstein, 2014; Fayolle, 2013). This movement has focused increasing attention on the *entrepreneurial mindset (EM)* as one way to encompass diverse goals of entrepreneurship education.

A search of the literature from 1945 to 2018 found 38,600 references to "entrepreneurial mindset"; nearly eighty percent of these were published in the last ten years. Although most resources are in business fields, EM has been researched in disciplines as disparate as early childhood education, the arts, dietetics, criminal justice, and political theory (Mbebeb, 2009; Pollard & Wilson, 2013; Matheson, 2013; Keena & Simmons, 2014; Saari & Harni, 2016). Of the nearly 30,000 EM research articles published in the last 10 years 55% include references to engineering education (e.g. Besterfield-Sacre et al., 2013; Creed et al., 2002; Purzer et al. 2016).

In engineering education, there are notable examples of programs that have both an explicit focus on propagating an entrepreneurial mindset, as well as an embedded assumption that doing so is of value to engineering education. In 2011, Epicenter was funded by the National Science Foundation (NSF) to help faculty, students, and academic leaders support entrepreneurship and innovation learning in undergraduate engineering education (see: http://epicenter.stanford.edu/; Byers, Seelig, Sheppard, and Weilerstein, 2013). The Kern Entrepreneurial Engineering Network (KEEN), which currently consists of 37 partner institutions, strives to graduate engineers with an entrepreneurial mindset so they can "create personal, economic, and societal value through a lifetime of meaningful work" (https://engineeringunleashed.com/). The I-Corps™ program was created by NSF in 2011 to help prepare scientists and engineers to commercialize innovations developed through NSF-funded research (https://www.nsf.gov/news/special_reports/i-corps/). In 2014, the NSF funded the I-Corps™ for Learning program (I-Corps™ L) to foster an entrepreneurial mindset within the engineering community in order to impact sustainability and scalability of educational innovations (McKenna et al., 2015; Smith, McKenna, Chavela, Korte, & Swan, 2016).

Epicenter, KEEN, and I-Corps™ are representative of large scale, national initiatives that aim to transform engineering education through an entrepreneurial mindset to achieve lasting and meaningful impact to society and/or industry. Yet while there is increasing consensus that entrepreneurship education is important for engineers, there is also fragmentation with regard to a common language or an organizing framework in which to situate our disparate activities.

In an effort to address this, we invited several individuals who represent a range of institutions involved with entrepreneurship and/or EM activities to take part in a two-part symposium with an overarching goal of developing a working framework for organizing various approaches to EM.

DETAILS ABOUT THE SYMPOSIUM

The Entrepreneurial Mindset Symposium was divided into two parts. Part I took place in December, 2016 at Arizona State University's (ASU) Chandler Innovation Center (https://emsymposium. engineering.asu.edu/). Part II took place on March 23rd, immediately ahead of VentureWell's 2017 Open conference (https://venturewell.org/em-symposium/). The planning committee consisted of Phil Weilerstein and Thema Monroe-White of VentureWell, and Ann McKenna of ASU. The meetings were facilitated by Gary Lichtenstein, principal of Quality Evaluation Designs. Nearly two dozen participants from fifteen institutions and organizations attended the meetings. Attendees participated in a series of small group activities designed to stimulate conversations and produce tangible results related to three objectives: 1) build a community of entrepreneurial mindset researchers and practitioners, 2) define an entrepreneurial mindset framework, and 3) situate efforts to identify and measure dimensions of the entrepreneurial mindset within that framework.

 Facilitated discussions resulted in the identification of three broad, overlapping themes to help define the EM landscape; namely, the *What, Why,* and *How* of EM. Participants self-selected into working groups around these themes. Participants posed several compelling questions throughout the symposium, the most fundamental of which had to do with whether we all agreed on what the entrepreneurial mindset is. We did not.

The one thing upon which everyone did agree was that the community represents diverse opinions about the definition of EM. We also recognized many different approaches to developing and assessing EM, and varied assumptions about the benefits or value of having an entrepreneurial mindset. As a result, the group concluded that, at this nascent stage, researchers and practitioners need to be comfortable with multiple definitions of and approaches to EM. Furthermore, attempts to construct a unifying framework across the varying perspectives (i.e., one capturing the multiple definitions, approaches and values of the symposium participants) were ultimately dismissed—it was simply too soon in the evolution of the EM phenomenon to derive a single, unifying, conceptual model.

After the symposium, several participants created author teams composed of those who attended the workshop and some who did not, and drafted concept papers. Papers were reviewed by

participants and the organizers. Over the course of several months, the author teams produced manuscripts that were sent to external reviewers for blind review, revised, and reviewed again. Those papers comprise this special issue.

AN EMERGENT FRAMEWORK: WHY, WHAT, HOW

As organizers, we had hoped that the workshop would result in what we called a "landscape" of EM that would capture diverse perspectives held across the engineering education community in a concise graphic, so that practitioners and researchers could situate their work within a framework. Instead, what emerged was a way to organize our thinking around the *What, Why,* and *How* of EM.

What Is EM?

EM has emerged as a new area of study in engineering education only within the past decade (Zappe, this volume). As evidenced by the symposium discussions and outcomes described above, there is no agreement within or across disciplines on exactly what EM is.

Korte (this volume) uses social identity theory to suggest that entrepreneurial mindset is the result of an interaction between an individual and his or her environment, adding increased dimensionality to the construct. In another paper, Korte, Smith, and Li (this volume) highlight a key competency of EM by reviewing literature on empathy as a means for understanding the wants and needs of potential customers. The multidimensional nature of constructs associated with EM (including social identity and empathy) make it difficult to define, let alone isolate, individual factors that result in EM, a challenge illustrated by Zappe, Yoder, and Hylton's analysis of the multidimensionality of the *curiosity* construct (this volume). In spite of these challenges, London, Bekki, Brunhaver, Carberry, & McKenna (this volume) offer an elaborated framework of EM, based on "the 3 Cs," (curiosity, connections, creating value) promoted by the Kern Family Foundation Entrepreneurial Engineering Network (KEEN).

Taken together, articles in the *What* section add complexity rather than simplify readers' understanding of the nature of EM and help researchers and practitioners both define and identify how their work fits into the multidimensional EM landscape.

Why Promote EM?

As a group, we realized we shared a common belief that EM is relevant and important. However, we realized that not all share this same belief. Bekki, Huerta, London, Melton, Vigeant, &

Williams (this volume) provide several arguments for the benefits of EM, including how EM has the potential to have impact at the individual, community, corporate, and national levels. They take the position that EM holds promise, but also recognize that considering arguments against EM could sharpen the focus and strengthen the rationale for the benefits. Hixson & Paretti review data that summarize the value of EM to faculty—key stakeholders for integrating EM into engineering curricula. Common themes voiced by faculty highlight their perceptions of how EM benefits students.

We are aware of examples in which faculty have pushed back against infusing EM in courses and/or degree programs for legitimate philosophical as well as pragmatic reasons. Some common questions and concerns about EM we often encounter are summarized here:

- To what extent will faculty and students who are turned off by a focus on venture creation buy into EM?
- Do employers desire freshly minted graduates with a bent on disrupting conventional engineering practices?
- What portion of faculty resist EM, either because it is not required by ABET or because the basic principles are already being taught through design and soft- or professional-skills?
- How can EM be shoehorned into already overburdened engineering curricula?
- To what extent can institutions provide the training that many faculty and graduate students need in order to teach EM?

Some of the papers in this volume (e.g., Bodnar & Hixson) address these issues explicitly or implicitly.

How Do We Promote, Instill, and/or Assess EM?

Given the proliferation of courses, programs, and degrees that promote EM, researchers and practitioners have developed strategies for teaching EM, even as the field struggles to define what EM is. Bodnar & Hixson (this volume) suggest a good starting point: observing how students conceptualize entrepreneurship. Their study reviews concept maps created by first-year engineering students. Harichandran, Erdil, Carnascial, Nocito-Gobel, & Li (this volume) summarize a promising strategy for addressing a critical practical issue; namely how to fit entrepreneurial education into an already packed engineering curriculum.

Not surprisingly, the difficulty of defining EM is mirrored in efforts to assess it. Brunhaver, Bekki, Carberry, London, & McKenna (this volume) illustrate the challenges in assessing EM reliably. Zappe (this volume) summarizes several challenges related to assessing EM for both research and teaching. She suggests, in the absence of clearly defined constructs, that researchers and evaluators take a practical approach by focusing on desired outcomes of courses and programs. Papers in the How section provide illustrative examples of how to teach and assess EM.

DISCUSSION AND SUMMARY

In an ideal world, we would teach and assess EM based on a theoretically and psychometrically sound understanding of what EM is. The ideal world in which this might happen is not the world in which we live. Sometimes we have to act before we have all the pieces figured out. In practice, why we promote EM cannot be disconnected from what EM is. What EM is cannot be separated from how EM is taught and assessed. EM outcomes cannot be disjointed from EM goals, which refer to why we include EM in engineering education to begin with. With this framing and collection, we offer a starting point. We hope the articles in this current collection promote readers' critical reflection, useful insights, and increased clarity about the goals, outcomes, methods, and assessment of entrepreneurial mindset. The researchers and practitioners who have contributed to this special edition are pioneering pathways through the swampy EM landscape and we are grateful for their efforts.

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