

The Impact of Entrepreneurship Education in Higher Education: A Systematic Review and Research Agenda

GHULAM NABI

Manchester Metropolitan University, United Kingdom

FRANCISCO LIÑÁN

University of Seville, Spain, and Anglia Ruskin University, United Kingdom

ALAIN FAYOLLE

EM LYON Business School, France

NORRIS KRUEGER

University of Phoenix, United States, and Entrepreneurship Northwest, United States

ANDREAS WALMSLEY

Plymouth University, United Kingdom

Using a teaching model framework, we systematically review empirical evidence on the impact of entrepreneurship education (EE) in higher education on a range of entrepreneurial outcomes, analyzing 159 published articles from 2004 to 2016. The teaching model framework allows us for the first time to start rigorously examining relationships between pedagogical methods and specific outcomes. Reconfirming past reviews and meta-analyses, we find that EE impact research still predominantly focuses on short-term and subjective outcome measures and tends to severely underdescribe the actual pedagogies being tested. Moreover, we use our review to provide an up-to-date and empirically rooted call for less obvious, yet greatly promising, new or underemphasized directions for future research on the impact of university-based entrepreneurship education. This includes, for example, the use of novel impact indicators related to emotion and mind-set, focus on the impact indicators related to the intention-to-behavior transition, and exploring the reasons for some contradictory findings in impact studies including person-, context-, and pedagogical model-specific moderators.

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Address all correspondence to: Dr. Ghulam Nabi, Department of Management, Business School, All Saints Campus, Oxford Road, Manchester, M15 6BH, UK. Email: G.Nabi@mmu.ac.uk

Since the first entrepreneurship course at Harvard Business School was delivered in 1947, entrepreneurship education (EE) programs in higher education have grown rapidly and globally (Kuratko, 2005; Solomon, 2007). This growth reflects increasing recognition that university-based EE programs (hereafter referred to as EE programs) promise to support a range of potential entrepreneurial outcomes (Nabi

& Liñán, 2011; Rideout & Gray, 2013). For example, enhanced student venture creation skills, knowledge, and attitudes (Greene & Saridakis, 2008) and graduate business start-ups and overall job creation (Greene, Katz, & Johannisson, 2004; Rideout & Gray, 2013) ultimately contributing to economic growth and development (Bosma, Acs, Autio, Coduras, & Levine, 2008).

Synthesizing this fast-growing body of empirical research and reviews on EE outcomes suggests three main patterns. First, reviews highlight a focus on short-term, subjective impact measures such as entrepreneurial attitudes and intentions, rather than longer term ones such as venture creation behavior and business performance, and call for future research to address this gap (e.g., Garavan & O'Cinneide, 1994; Henry, Hill & Leitch, 2005; Pittaway & Cope, 2007). Promoting and implementing EE programs entails substantial investment of time and resources, so it is critically important to take stock of what we currently know about the range of EE outcomes and provide benchmarks for further research.

Second, recent reviews suggest that the impact of EE programs on attitudes and behavior is equivocal because studies suggest both positive and negative outcomes (Dickson, Solomon, & Weaver, 2008; Fayolle, 2013; Martin, McNally, & Kay, 2013; Thompson, Jones-Evans, & Kwong, 2010). These reviews tend to argue that the contradictory findings of EE impact studies may be due in part to methodological or statistical artifacts such as cross-sectional survey methodology and lack of control groups; notably, Rideout and Gray's (2013) review and recent meta-analytical studies by Martin et al., (2013) and Bae, Qian, Miao, and Fiet (2014). However, also likely are other substantial reasons for the contradictory findings in EE impact research that can be teased out with single studies/interventions: for example, the nature and context of pedagogical interventions as well as contextual factors. In their extensive 1970–2004 review of EE research, Pittaway and Cope (2007) conclude there is a lack of research that directly links student/graduate entrepreneurial outcomes to different pedagogical methods and call for deeper investigation. Pedagogical methods may emphasize, for example, "exploration, discussion, or experimentation (e.g., library, web or other interactive searches, labs, field trips, simulations)" (Bécharde & Grégoire, 2005:111).

As well as examining a range of EE impact measures, it is therefore necessary to examine the different pedagogical methods that underpin them, not just methodological issues. Confusion regarding the

impact of EE may result from the wide diversity of pedagogical methods employed in EE programs (Fretschner & Weber, 2013). This is further complicated by the lack of detail on pedagogical interventions studied (Martin et al., 2013), and the need for a stronger, more theory-driven framework for assessing the impact of such interventions (cf. Baptista & Naia, 2015; Fayolle & Gailly, 2008; Krueger, 2015; Lackéus, 2015; Neergaard, Tanggaard, Krueger, & Robinson, 2012). It is therefore important to take stock of research on the pedagogy-entrepreneurial outcomes link within a coherent framework.

Third, few reviews focus on EE specifically in higher education. Notable exceptions are Pittaway and Cope (2007) and Rideout and Gray (2013), but the former is limited to data from over a decade ago and the latter focuses on articles until 2010/2011. We cover 100 articles published in the past 5 years, which have not been covered in previous reviews of university-based EE impact (e.g., Rideout & Gray, 2013) or meta-analyses of EE outcomes of education in general (e.g., Martin et al., 2013). There is still, therefore, a need for a current review that focuses on EE pedagogy and outcomes in higher education.

These three distinct yet related research gaps form the rationale for this article. Our aim is to review systematically the empirical evidence on the impact of higher education-based EE published in the last decade. Using the teaching model framework outlined below, we focus on assessing the range of EE outcomes in impact studies. A secondary aim is to examine the extent of the relationship between the pedagogical methods used and the specific outcomes achieved. While the former offers a broad overview of the evidence of EE impact, the latter explores whether the mixed results in impact studies are related to different pedagogical methods. To advance understanding of how to research EE impact, we need both.

We believe that the main strength of our work here is the adoption of an integrated teaching model framework (Figure 1) to offer a coherent, overarching theoretical structure that covers both a broad range of entrepreneurial outcomes and pedagogical methods (Bécharde & Grégoire, 2005; Fayolle & Gailly, 2008). Our teaching model framework integrates a range of impact measures and pedagogies. This is particularly useful here because for the first time we can now evaluate not only the range of EE outcomes in higher education impact studies, but also any patterns that connect specific types of pedagogical methods and impact measures. Our

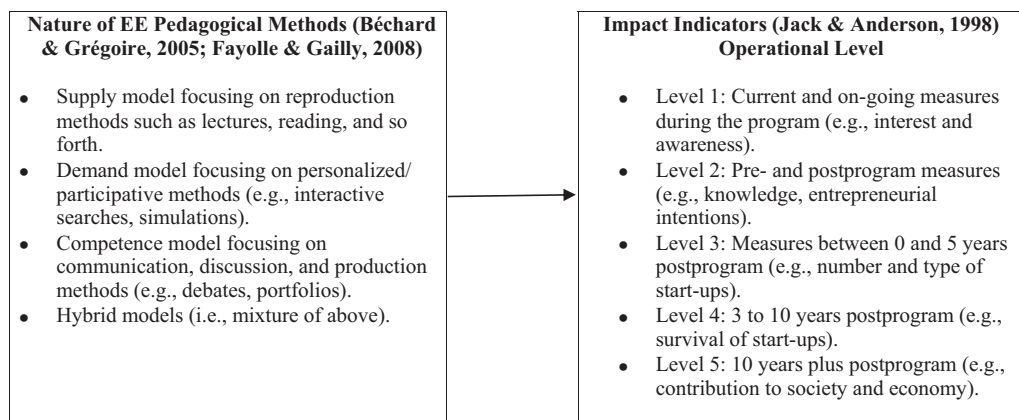


FIGURE 1

An Integrated Teaching Model Framework Encompassing EE Impact and Underpinning Pedagogy

framework therefore permits empirical review with a pedagogical slant and responds to calls for more rigorous research to explore reasons for the contradictory findings in EE research (cf. Martin et al., 2013). The teaching model approach provides critical grounding for researchers and practitioners in the field of EE.

Conceptual Framework

Pedagogical research highlights how the evaluation of impact should be a key dimension of any teaching program and therefore needs to be considered at the program design stage (Fayolle & Gailly, 2008). In our research, types of EE impact have been integrated into the broader context of a teaching model framework (Béchar & Grégoire, 2005, 2007; Fayolle & Gailly, 2008). We explore two dimensions in our review—types of impact and underpinning pedagogy—given the paucity of research that directly links student/graduate entrepreneurial outcomes to different pedagogical methods (Pittaway & Cope, 2007).

In the absence of a single impact measure within the teaching model framework, Henry, Hill, and Leitch (2003, building on Jack & Anderson, 1998) propose an impact classification system (incorporating several types of impact measures) that can be employed to assess the level of impact of EE programs. This classification system draws on earlier research on entrepreneurship (Block & Stumpf, 1992) and educational impact (Kirkpatrick, 1959), and complements the impact dimension of the teaching model framework because it highlights a range of impact measures from the beginning to the end of an EE program and beyond (see Figure 1 for a more

detailed explanation), thereby providing a basis for the systematic evaluation of EE impact studies.

Reflection on different types of EE impact measures raises the issue of underpinning pedagogical methods. Béchar and Grégoire (2005) address this issue through identifying three “archetypical” teaching models in higher education: the *supply model*, the *demand model*, and the *competence model*, plus two hybrid teaching models. The *supply model* focuses on pedagogical methods highlighting a behaviorist paradigm, in terms of the “transmission and reproduction of knowledge and application of procedures” (e.g., lectures, reading, watching/listening; Béchar & Grégoire, 2005: 111). The *demand model* focuses on pedagogical methods highlighting a subjectivist paradigm, involving personalized meaning through participation in terms of “exploration, discussion and experimentation” (e.g., library use, interactive searches, simulations; Béchar & Grégoire, 2005: 111). The *competence model* focuses on pedagogical methods, highlighting an interactionist theoretical paradigm, in terms of active problem solving in real-life situations, where “teaching is conceived as a strategic intervention to allow for—and influence—how students organize the resources at their disposal (e.g., knowledge, abilities) into competences that can be mobilized for action” (Béchar & Grégoire, 2005: 115–116). This model focuses on methods emphasizing “communication and discussion” (e.g., seminar, presentations, debates) and knowledge “production” (e.g., essays, modeling, portfolios).

In contrast to the supply model, which emphasizes a behaviorist perspective, both the demand and competence models fit within the constructivist

approach to EE (Löbner, 2006; Neergaard et al., 2012). Behaviorism assumes learning is primarily the passive transfer of knowledge from the teacher to the student, while constructivism assumes that learning involves actively participating in the construction of new understanding. Often, pedagogical methods in EE in higher education are highly behaviorist: lectures, homework, quizzes, and so forth, that focus on knowledge acquisition, rather than the deeply experiential approaches of the constructivist perspective (Neergaard et al., 2012). Béchar and Grégoire (2005) apply these teaching models (supply, demand, competence) in EE to a higher education context. This allows us to classify and analyze various pedagogical models and review empirical evidence on the link between EE pedagogy and impact.

Systematic Review Methodology

We analyze 159 EE impact studies published from 1 February 2004 to 2 January 2016, continuing where Pittaway and Cope's (2007) study left off. Following best practice from the methodological (Tranfield, Denyer, & Smart, 2003), synthesis (Cooper, 1989; Fink, 2009), and entrepreneurship literature (Pittaway & Cope, 2007; Wang & Chugh, 2014), we use a "systematic review process." Initially, we use the root word "education" to search through all 11 entrepreneurship journals listed in the Association of Business Schools (ABS) as medium- and high-ranking entrepreneurship journals (Harvey, Kelly, Morris, & Rowlinson, 2010).¹ We then use three databases (ABI ProQuest, Emerald, and Science Direct) to search for a broader range of keywords/search terms. The highest number of hits were from search terms including "entrepreneurship education," "higher education," "pedagogy," "educational interventions," "graduate," "undergraduate," or Boolean variations of these terms and an extensive range of others.

Only article citations that met the following criteria were included: (a) empirical in nature rather

than purely conceptual; (b) peer-reviewed published journal articles rather than working/conference papers or unpublished material; (c) primarily focused on higher education in terms of entrepreneurship education (or elements thereof) and its empirical impact on entrepreneurship outcomes (broadly defined to include both attitudinal and behavioral outcomes); (d) sampled recipients of EE from higher education institutions (rather than primary/secondary school, or nonhigher education level); and (e) analyzed primary rather than secondary data (Bae et al., 2014 and Martin et al., 2013 were included because of their use of meta-analysis, but reviews or research agendas were excluded).

We also added searches for articles from bibliographies, key authors, and Google Scholar, as well as checking relevant references in recent reviews of EE outcomes (e.g., Bae et al., 2014; Martin et al., 2013; Rideout & Gray, 2013). We screened these additional candidates using our selection criteria. For example, Martin et al. (2013) includes articles that are unpublished or focus on schoolchildren, and were therefore excluded from our review.² Two coauthors independently read the original collection of articles. We identified two first-order themes: (1) Types of Impact and (2) Pedagogical Methods. We then identified second-order themes by mapping our articles onto Henry et al.'s (2003) classification for impact measures (Levels 1 to 5) and Béchar and Grégoire's (2005) framework of pedagogical models (e.g., supply, demand, and competence). For example, traditional lectures and business plan writing suggested a supply model, active participation in seminars, events or out-of-class projects reflected a demand model, and real-life entrepreneurial situations indicated a competence model.

REVIEW FINDINGS: THEMES AND TRENDS

We begin by examining background characteristics of our articles. This is useful when interpreting general patterns, for example, the most prominent journal outlets, country contexts, and types of students/graduates. We then analyze our articles regarding types of EE impact and relationships between types of impact and different pedagogical methods.

¹ The ABS incorporates blind peer-reviewed journals for ranking entrepreneurship journals and expert assessment of journal quality (Harvey et al., 2010). Our 11 ABS journals include: *Journal of Business Venturing*, *Entrepreneurship Theory and Practice*, *Journal of Small Business Management*, *International Small Business Journal*, *Small Business Economics*, *Entrepreneurship and Regional Development*, *Strategic Entrepreneurship Journal*, *Family Business Review*, *Journal of Small Business and Enterprise Development*, *International Journal of Entrepreneurial Behaviour and Research*, and *Venture Capital: An International Journal of Entrepreneurial Finance*.

² Further examples of excluded articles (with reasons for exclusion) are available from the authors.

Background Characteristics of the Data Set

Our sample covers research published in 61 journals, predominantly in entrepreneurship and small business journals (39%) and management and education journals (47%). The eight journals publishing the most EE impact articles account for 86 out of the 159 articles (54%).³

Overall, the majority of our articles were published in the last 5 years and are dominated by European, undergraduate, and entrepreneurship/business student samples. A majority are from 2011 onward (100 articles, 63%) and were not covered in previous reviews or meta-analyses (e.g., Martin et al., 2013; Rideout & Gray, 2013). Data comes from 38 countries, dominated by Europe (81 articles, 51%, especially the UK with 28/18%); US (27/17%); Asia (26/16%); and then followed by Africa (16/10%); Australia (2/1%); and international comparisons (5/3%). Students in our sample are mostly undergraduate (53%) or postgraduate (12%), or alumni or unspecified university students. The majority studied entrepreneurship and business (35%) or business combination courses (24%).

Types of Impact

In the articles reviewed (see Table 1), we distinguish between studies focusing largely on our framework's (see Figure 1) lower level impact indicators (typically short-term/subjective indicators at Levels 1 and 2) and on higher level ones (typically longer term/objective indicators at Level 3 or above). More specifically, the most common impact indicators are related to lower level indicators of subjective/personal change: attitude (32 articles), skills and knowledge (34 articles), perceived feasibility (42 articles), and entrepreneurial intention (81 articles). By contrast, higher level indicators of longer term, objective, or socioeconomic impact are much less frequent: 21 articles study start-ups and 8 articles consider venture performance, both typically within 10 years of the program. Last, 41 articles report results not falling into any of these categories. These articles measure impact in terms of other variables, such as subjective norms (Souitaris, Zerbinati, &

Al-Laham, 2007), dispositional optimism (Crane, 2014), or satisfaction with the EE program (Rae & Woodier-Harris, 2012).

Most articles in the review claim a positive link between an EE program and subjective (e.g., *personal change*) or objective (e.g., *business start-up activity*) impact indicators (205 instances overall, see Table 1). Regarding lower level impact indicators, the most common indicator by far is entrepreneurial intentions (Level 2 in our framework). Most of the reviewed articles (61 articles out of 81, 75%) report a positive link between EE and participants' start-up intentions. Nonetheless, several studies report mixed, negative, or nonsignificant/ambiguous results for the link with entrepreneurial intentions (18 articles or 22%, see Table 1). Of these, some articles suggest that EE reduces entrepreneurial intention for certain groups, for example, male German students (Packham, Jones, Miller, Pickernell, & Thomas, 2010), female Finish students (Joensuu, Viljamaa, Varamäki & Tornikoski, 2013), Greek students (Petridou & Sarri, 2011), students with previous entrepreneurial exposure (Fayolle, Gailly, & Lassas-Clerc, 2006b), or students with a weaker entrepreneurial university culture (Wang & Verzat, 2011). Our results suggest we know considerably more about the direct EE-intentions relationship in general than about the moderating role of gender (e.g., Joensuu et al., 2013; Shinnar, Hsu, & Powell, 2014), culture- (e.g., Bernhofer & Han, 2014; Crane, 2014), or context-specific patterns (e.g., Piperopoulos & Dimov, 2015; Turker & Selçuk, 2009), with only nine studies focusing clearly on such relationships.

Further, using a meta-analysis of 73 studies, Bae et al. (2014) report a small but significantly positive EE-entrepreneurial intentions relationship, but that cultural values act as a moderator. For example, a high collectivistic culture or a low uncertainty avoidance culture reinforces the impact of EE. They also report that after controlling for pre-education entrepreneurial intentions, the EE-intentions relationship is not significant nor is gender a significant moderator. Although their research does not focus specifically on the impact of EE in higher education (they look at average effects across all education levels), we include them here because their findings provide some indicative evidence.

Compared to entrepreneurial intentions (51%), far fewer studies exist on the relationship between EE and other subjective impact indicators (Levels 1 and 2 of our framework) including psychological variables such as attitude (20%, e.g., Boukamcha, 2015; Chang, Benamraoui, & Rieple, 2014; Vorley & Williams, 2016);

³ *Education + Training* (31 articles), *The International Journal of Management Education* (12), *Journal of Small Business and Enterprise Development* (10), *International Journal of Entrepreneurial Behavior & Research* (9), *Journal of Small Business Management* (7), *International Entrepreneurship and Management Journal* (6), *International Small Business Journal* (6), *Academy of Management Learning & Education* (5).

TABLE 1
Main Types of Impacts in Impact Studies

		Personal change			Business		
		2a. Skills and knowledge (34 articles, 21%)	2b. Feasibility (42 articles, 26%)	2c. Entrepreneurial intention (81 articles, 51%)	3. Business start-up (21 articles, 13%)	4.5. Performance & Socio-econ. (8 articles, 5%)	Other (41 articles, 26%)
Bakotic & Kruzic, 2010	Brink & Madsen, 2015	Abaho et al., 2015 P; Armstrong, 2014 P; Barakat et al., 2014 P; Basu, 2010 P; Boukamcha, 2013 M; Chang et al., 2014 P; Collins et al., 2006 P; DeTienne & Chandler, 2004 P; Diaz-Casero et al., 2012 P; Friedrich & Visser, 2006 P; Gerba, 2012 P; Harris et al., 2007 P; Henry et al., 2004 P; Hietanen, 2015 P; Idogho & Barr, 2011 P; Izquierdo & Moberg, 2013 P; Karlsson & Moberg, 2013 P; Kassean et al., 2015 P; Kenny, 2015 P; Kirby & Humayun, 2013 P; Lamero et al., 2011 A; Lián, 2004 P; Mentoor & Friedrich, 2007 N; Packham et al., 2010 P; Petridou & Sarri, 2011 M; Pittaway et al., 2015 P; Shariff et al., 2010 P; Solesvik, 2013 P; Souitaris et al., 2007 A; Stamboulis & Barlas, 2014 P; Vorley & Williams, 2016 P; Walter & Dohse, 2012 P; Walter et al., 2013 P;	Abaho et al., 2015 P; Armstrong, 2014 P; Barakat et al., 2014 P; Basu, 2010 P; Boukamcha, 2013 M; Burrows & Wragg, 2013 P; Byabashajia & Katono, 2011 P; Diaz-Casero et al., 2012 P; Fayolle & Gailly, 2015 P; Gerba, 2015 P; Gielnik, 2012 P; Gielnik et al., 2015 P; Gilbert, 2012 P; Harms, 2015 P; Harris et al., 2007 A; Hattab, 2014 N; Heinonen et al., 2011 A; Henry et al., 2004 P; Izquierdo & Moberg, 2013 P; Jones & Buelens, 2011 P; Jones & Kirkwood et al., 2014 P; Klapper, 2013 A; Lee et al., 2005 P; Martin et al., 2013 P; Morris et al., 2013 P; Munoz et al., 2011 P; Ohland et al., 2004 P; Premand et al., 2016 P; Tam & Ng, 2006 P; Thursby et al., 2009 P; Tounès et al., 2014 P; Ulvenblad et al., 2013 P; von	Ahmed et al., 2010 N; Almobtareek & Manolova, 2012 P; Armstrong, 2014 P; Aslam et al., 2012 P; Azim & Akbar, 2010 P; Bakotic & Kruzic, 2010 P; Barakat et al., 2014 P; Basu, 2010 P; Bernhofer & Han, 2014 P; Boukamcha, 2015 P; Byabashajia & Katono, 2011 P; Canziani et al., 2015 P; Chang & Rieple, 2013 M; Cheng et al., 2009 N; Coduras et al., 2008 P; Crane, 2014 P; De Clercq et al., 2013 P; De George & Fayolle, 2008 P; Diaz-Casero et al., 2012 P; Farashah, 2013 P; Fayolle & Gailly, 2015 M; Fayolle et al., 2006 a P; Florin et al., 2007 P; Franco et al., 2010 P; Friedrich & Visser, 2006 P; Gerba, 2012 P; Gielnik et al., 2015 P; Gilbert, 2012 P; Hamidi et al., 2008 P; Hattab, 2014 N; Heinonen et al., 2011 A; Henry et al., 2004 P; Izquierdo & Moberg, 2013 P; Jones & Buelens, 2011 P; Jones & Kirkwood et al., 2014 P; Klapper, 2013 A; Lee et al., 2005 P; Martin et al., 2013 P; Morris et al., 2013 P; Munoz et al., 2011 P; Ohland et al., 2004 P; Premand et al., 2016 P; Rauch & Hulsink, 2015 P; Støren, 2014 A; Vincentt & Farlow, 2008 P; Wilson et al., 2009 P	Burrows & Wragg, 2013 P; Connolly et al., 2006 P; Daghbashiyan & Hårsmann, 2014 P; Dominginhos & Carvalho, 2009 P; Donnellon et al., 2014 P; Dutta et al., 2010 P; Gielnik et al., 2015 P; Gilbert, 2012 P; Henry et al., 2004 P; Jansen et al., 2015 P; Karlsson & Moberg, 2013 P; Lange et al., 2014 P; Martin et al., 2013 P; McAlexander et al., 2009 P; Pei-Lee & Chen, 2008 P; Pobleto & Amoros 2013 A; Premand et al., 2016 P; Rauch & Hulsink, 2015 P; Støren, 2014 A; Vincentt & Farlow, 2008 P; Wilson et al., 2009 P	Alarape 2007 P; Donnellon et al., 2014 P; Gordon et al., 2012 P; Gordon P; Groenewald 2012 P; Hamidi et al., 2008 P; Harris & Gibson, 2008 N; Hegarty, 2006 P; Heinonen et al., 2011 A; Hussain et al., 2010 P; Kirby & Ibrahim, 2011 P; Lackeus, 2014 P; Lanero et al., 2011 P; Lean, 2012 P; Li & Liu, 2011 P; Lourenço & Jayawarna, 2011 P; Lourenço et al., 2013 P; Pi; Martin et al., 2013 P; Matlay, 2011 P; McCrear, 2013 P; Millman et al., 2008 P; Mueller & Anderson, 2014 P; Newbold & Erwin, 2014 P; Ohland et al., 2004 P; Pittaway et al., 2011 P; Pittaway et al., 2015 P;	Azim & Akbar, 2010 P; Bell, 2015, P; Burrows & Wragg, 2013 P; Crane, 2014 P; Crane & Meyer, 2007 P; Cruz et al., 2009 P; Donnellon et al., 2014 P; Gilbert, 2012 P; Gordon et al., 2012 P; Groenewald 2012 P; Hamidi et al., 2008 P; Harris & Gibson, 2008 N; Hegarty, 2006 P; Heinonen et al., 2011 A; Hussain et al., 2010 P; Kirby & Ibrahim, 2011 P; Lackeus, 2014 P; Lanero et al., 2011 P; Lean, 2012 P; Li & Liu, 2011 P; Lourenço & Jayawarna, 2011 P; Lourenço et al., 2013 P; Pi; Martin et al., 2013 P; Matlay, 2011 P; McCrear, 2013 P; Millman et al., 2008 P; Mueller & Anderson, 2014 P; Newbold & Erwin, 2014 P; Ohland et al., 2004 P; Pittaway et al., 2011 P; Pittaway et al., 2015 P;

(table continues)

TABLE 1
Continued

Personal change		Business				
1. Attitude (32 articles, 20%)	2a. Skills and knowledge (34 articles, 21%)	2b. Feasibility (42 articles, 26%)	2c. Entrepreneurial intention (81 articles, 51%)	3. Business start- up (21 articles, 13%)	4/5. Performance & Socio-econ. (8 articles, 5%)	Other (41 articles, 26%)
	Graevenitz et al., 2010 M; Vorley & Williams, 2016 P; Watts & Wray, 2012 P	Erwin, 2014 P; Pei- Lee & Chen-Chen, 2008 P; Piperopoulos & Dimov, 2015 P; Rauch & Hulsink, 2015 P; Saeed et al., 2011 P; Sánchez, 2011 P; Shinnar et al., 2014 M; Solesvik, 2013 P; Souitaris et al., 2007 A; Toledano & Urbano, 2008 A; Wilson et al., 2007 P; Wilson et al., 2009 P; Zainuddin & Rejab, 2010 P; Zainuddin et al., 2012 P	al., 2012 P; Lee et al., 2005 P; Lima et al., 2015 N; Liñán, 2004 P; Martin et al., 2013 P; Miller et al., 2009 P; Mohamad et al., 2014 N; Mohamed et al., 2012 P; Muofhe & du Toit, 2011 P; Newbold & Erwin, 2014 P; Packham et al., 2010 M; Petridou & Sarri, 2011 M; Piperopoulos & Dimov, 2015 P; Raposo et al., 2008 P; Rauch & Hulsink, 2015 P; Sánchez, 2011 P; Shariff et al., 2010 P; Smith & Beasley, 2011 A; Solesvik, 2013 P; Solesvik et al., 2013 P; Solesvik et al., 2014 P; Souitaris et al., 2007 P; Støren, 2014 P; Turker & Selcuk, 2009 P; Varamäki et al., 2015 A; Von Graevenitz et al., 2010 M; Walter & Dohse, 2012 P; Walter et al., 2013 M; Wang & Verzat, 2011 M; Westhead & Solesvik, 2015 M; Wilson et al., 2009 P; Yaghmacei et al., 2015 P; Zainuddin & Rejab, 2010 P; Zainuddin et al., 2012 P; Zhang et al., 2014 P; Zhao et al., 2005 P			Premand et al., 2016 P; Rae & Woodier- Harris, 2012 P; Sánchez, 2011 P; Souitaris et al., 2007 P; Tan & Ng, 2006 P; Vincett & Farlow, 2008 P; Wee, 2004 P; Man & Farquharson, 2015 P; Woodier-Harris, 2010 P; Yusoff et al., 2012 P
P = 26 PI = 0 M = 2 N = 1 A = 3 Total = 32	P = 25 PI = 3 M = 3 N = 1 A = 2 Total = 34	P = 32 PI = 1 M = 1 N = 4 A = 4 Total = 42	P = 61 PI = 2 M = 9 N = 5 A = 4 Total = 81	P = 19 PI = 0 M = 0 N = 0 A = 2 Total = 21	P = 8 PI = 0 M = 0 N = 0 A = 0 Total = 8	P = 34 PI = 4 M = 0 N = 2 A = 1 Total = 41

Note: In first row, number of papers (and percentage of total) indicated. Percentages rounded up. Some articles consider more than one impact measure, and are, therefore, included more than once in the table. Findings: P = positive; PI = positive indirect; M = mixed; N = negative; A = ambiguous/not significant.

perceived feasibility (26%, e.g., Rauch & Hulsink, 2015; or skills and knowledge (21%, e.g., Burrows & Wragg, 2013; Premand, Brodmann, Almeida, Grun, & Barouni, 2016). Most studies suggest a positive link between the program and these variables, but some articles report results that are not significant or negative. These include, for example, the absence of a significant link between EE and entrepreneurial attitudes among Spanish students (Lanero, Vázquez, Gutiérrez, & García, 2011), and a negative link between EE and attitudes toward entrepreneurship among South African students (Mentoor & Friedrich, 2007), or perceived entrepreneurial and management skills among British students (Chang & Rieple, 2013). So again, limited studies explore the context-specificity of EE's impact.

Novel ways of assessing EE impact in higher education are limited. Only four studies explore emotion or related approaches to assessing EE impact. For example, inspiration (not learning) emerges as the most important benefit of EE, implying a "change of heart" as well as a positive link to entrepreneurial intentions (Souitaris et al., 2007). A few other studies also suggest a positive EE-outcomes link regarding uncertainty and ambiguity tolerance (Lackéus, 2014); dispositional optimism (Crane 2014); and sense of psychological ownership (Man & Farquharson, 2015). Similarly, four studies focus on EE impact on intention-to-nascent start-up activity or entrepreneurial identity. These suggest either a non-significant impact of EE on nascency (Souitaris et al., 2007), or a positive link through a dynamic process of internal self-reflection and social engagement (Donnellon, Ollila, & Middleton, 2014; Lackéus, 2014), and personal development, for example, a multiple sense of responsibility, independent thinking, and connecting to one's own and others' needs (Mueller & Anderson, 2014). Other emotion- or transition-based indicators are also completely absent from our review. For example, outside of our review, research highlights EE's role in developing the importance of entrepreneurial passion (intense positive emotion and drive, see Cardon, Wincent, Singh, & Drnovsek, 2009), yet it is strikingly missing from the articles in our review.

Our review suggests 29 instances (corresponding to 25 articles, see Table 1) focusing on objective impact indicators, typically over a longer timeframe corresponding to the higher Levels 3 (0–5 years), 4 (3–10 years), or 5 (over 10 years) in our framework. Because these types of studies are limited in our review, some examples are given. Such studies include the positive impact of undergraduate (Pei-Lee & Chen-Chen, 2008)

and postgraduate (Dominguinhos & Carvalho, 2009) EE programs on start-up rates at Level 3 of our framework. Furthermore, Lange, Marram, Jawahar, Yong, and Bygrave (2014) provide a notable example of the long-term positive impact of EE on Babson graduate performance over a 25-year period, including a major economic contribution, for example, 1,300 new full-time businesses were started, with average annual revenues of \$5.5 million and an average of 27 employees. Last, using a meta-analytical approach (including pre- and posteducation data, $N = 16,657$), Martin et al. (2013) found small but positive relationships between EE and entrepreneurial outcomes incorporating nascent behavior, and start-up and venture performance (e.g., financial success and personal income). As with Bae et al., (2014), they do not specifically focus on higher education (they look at average effect across all educational levels), but we include them here because their findings provide some indicative evidence. Most of our higher impact studies report a positive link between EE and objective indicators, but one suggests a relationship that is not significant. Using a sample of 2,827 university graduates in Norway, Støren (2014) reports graduates who have had EE are not more frequently self-employed than other graduates. Thus, our review suggests high-impact studies are scarce and need not show positive impact.

A final finding relates to the measurement methodology of the articles. Typically, articles use cross-sectional survey methodology (68%). Nonetheless, some notable exceptions employ a longitudinal design and/or a control group. These generally demonstrate a pattern of positive EE impact for entrepreneurial intentions (Souitaris et al., 2007), competencies (Sánchez, 2011), and start-ups (Karlsson & Moberg, 2013). However, even in more methodologically rigorous studies, a few still report a lack of significant results for entrepreneurial self-efficacy (Souitaris et al., 2007) or significantly negative impact on entrepreneurial attitudes (Mentoor & Friedrich, 2007). Overall, the review suggests reasonable evidence of positive EE impact. This holds especially for entrepreneurial attitudes and intentions (impact Levels 1 and 2 of our framework), but even here some examples demonstrate differential impact depending on context and the background of participants (Fayolle & Gailly, 2015; Fayolle et al., 2006b).

Pedagogical Methods Underpinning Impact

Next, we examine the extent of the relationship between the pedagogical methods used and the

TABLE 2
Overview of Alternative Pedagogies, Comparison Studies, and Types of Impact

Types of Teaching Model Pedagogy ^a	Types of Impact ^b						
	1. Attitude	2a. Skills and knowledge	2b. Feasibility	2c. Entrepreneurial intention	3. Business start-up	4/5. Perform. & socioecon.	Other
Supply			Sánchez, 2011 P; Shinnar et al., 2014 M	Crane 2014 P; Sánchez 2011 P; Solesvik et al., 2013 P; Solesvik et al., 2014 P			Crane 2014 P; Sánchez 2011 P
Supply-Demand	Fretschner & Weber, 2013 P; Henry et al., 2004 P; Henry et al., 2004 P; Izkierdo & Buelens, 2011 P; Liñán, 2004 P; Sharriff et al., 2010 P; Stamboulis & Barlas, 2014 P	Henry et al., 2004 P; Klapper, 2014 P; Thursby et al., 2009 P	Henry et al., 2004 P; Izkierdo & Buelens, 2011 P; Liñán, 2004 P	Hamidi et al., 2008 P; Henry et al., 2004 P; Liñán, 2004 P; Shariff et al., 2010 P	Henry et al., 2004 P		Crane & Meyer, 2007 P; Hamidi et al., 2008 P
Demand	Boukamcha, 2015 P; Fayolle & Gailly, 2015 P; Kirby & Humayun, 2013 P; Souitaris et al., 2007 A	Lans et al., 2013 A; Munoz et al., 2011 P; Premand et al., 2016 P	Boukamcha, 2015 P; Fayolle & Gailly, 2015 P; Souitaris et al., 2007 A	Boukamcha, 2015 P; Fayolle et al., 2006a P; Fayolle & Gailly, 2015 M; Kirby & Humayun, 2013 P; Miller et al., 2009 P; Souitaris et al., 2007 P; Varamäki et al., 2015 A	McAlexander et al., 2009 P; Premand et al., 2016 P		Bell, 2015 P; Millman et al., 2008 P; Mueller & Anderson, 2014 P; Pittaway et al., 2011 P; Premand et al., 2016 P; Souitaris et al., 2007 P
Demand-Compet.	Friedrich & Visser, 2006 P; Harris et al., 2007 A; Hietanen, 2015 P; Kossann et al., 2015 P; Kenny, 2015 P; Vorley & Williams, 2016 P	Burrows & Wragg, 2013 P; Chang & Rieple, 2013 M; DeTienne & Chandler, 2004 P; Garalis & Straziene, 2007 P; Gondim & Mutti, 2011 A; Harms, 2015 P; Jones & Jones, 2011 P; Kirkwood et al., 2014 P; Morris et al., 2013 P; Tounès et al., 2014 P; Vorley & Williams, 2016 P	Abaho et al., 2015 P; Armstrong, 2014 P; Burrows & Wragg, 2013 P; Harms, 2015 P; Harris et al., 2007 A; Jones & Jones, 2011 P; Kasseean et al., 2015 P; Kirkwood et al., 2014 P; Piperopoulos & Dimov, 2015 P; Raich & Hulsink, 2015 P	Armstrong, 2014 P; Chang & Rieple, 2013 M; De George & Fayolle, 2008 P; Florin et al., 2007 P; Friedrich & Visser, 2006 P; Kasseean et al., 2015 P; Piperopoulos & Dimov, 2015 P; Raich & Hulsink, 2015 P	Burrows & Wragg, 2013 P; Dutta et al., 2010 P; Jansen et al., 2015 P; Rauch & Hulsink, 2015 P		Burrows & Wragg, 2013 P; Man & Farquharson, 2015 P; Tang & Ng, 2006 P; Wee, 2004 P

(table continues)

TABLE 2
Continued

Types of Impact ^b							
	1. Attitude	2a. Skills and knowledge	2b. Feasibility	2c. Entrepreneurial intention	3. Business start-up	4/5. Perform. & socioecon.	Other
Compet.	Chang et al., 2014 P; Pittaway et al., 2015 P	Brink & Madsen, 2015 M; Chang et al., 2014 P; Gielnik et al., 2015 P; Gilbert, 2012 P	Gielnik et al., 2015 P; Gilbert, 2012 P; Toledano & Urbano, 2008 A	Bae et al., 2014 A; Gielnik et al., 2015 P; Gilbert, 2012 P	Donnellon et al., 2014 P; Gielnik et al., 2015 P; Gilbert, 2012 P; Vincett & Farlow, 2008 P	Donnellon et al., 2014 P; Gordon et al., 2012 P; Lackeus, 2014 P; McCrea, 2013 P; Pittaway et al., 2015 P	Donnellon et al., 2014 P; Gordon et al., 2012 P; Lackeus, 2014 P; McCrea, 2013 P; Pittaway et al., 2015 P
Comparisons	Walter & Dohse, 2012 P			Walter & Dohse, 2012 P; Wang & Verzat, 2011 M	Lange et al., 2014 P	Lange et al., 2014 P	

Note: Articles without teaching model information not shown (13 for Level 1, 13 for L2a, 21 for L2b, 53 for L2c, 9 in L3, 4 in L4/5 and 22 in other). Some articles consider more than one impact measure, and are, therefore, included more than once in the table.

^a Based on our framework drawing on Bécard & Grégoire (2005).

^b Based on our framework drawing on Henry et al.'s (2003) classification. See Table 1 for details on the sign of impacts (positive, negative, mixed, or ambiguous). For the comparison studies (Lange et al., 2014; Walter & Dohse 2012; Wang & Verzat 2011), supply models are consistently found to have less positive impact.

specific outcomes achieved (see Table 2). In our review, studies that provide sufficient pedagogical detail are limited. Only 72 of our 159 articles (45%) provide enough detail for us to determine their pedagogical approach. The following section focuses on these 72 articles.

Supply and Supply–Demand Model Pedagogy

Only five articles can be classified in terms of supply model pedagogy. These are positively related to self-efficacy (Sánchez, 2011) and entrepreneurial intentions (e.g., Crane, 2014; Solesvik et al., 2013, 2014). For example, Sánchez (2011) focuses on transmitting knowledge to students so that they “know about entrepreneurship,” and this mainly behaviorist course has a positive impact on a range of student perceptions (at Level 2 of our framework, e.g., intention, self-efficacy). This suggests a supply model link to lower level impact indicators, although Shinnar et al., (2014) find mixed results, primarily at Level 2, based on a moderating effect of gender. In turn, programs that combine pedagogies from the supply and demand model tend to be positively related to lower levels of our framework. Of the 12 supply–demand articles, only one (Henry et al., 2004) addresses impact at higher levels. A typical example of a supply–demand article is the program analyzed by Hamidi, Wennberg, and Berglund (2008) which despite concentrating on knowledge transmission, includes some experiential learning, in this case, creativity development exercises whereby the authors report a positive link with entrepreneurial intentions.

Demand and Demand–Competence Model Pedagogy

Fifteen articles analyze interventions adhering to demand model pedagogy. These typically focus on short-term intensive experiential programs (e.g., Fayolle & Gailly, 2015), or longer experiential residential-based programs (e.g., Boukamcha, 2015). They also include student-led entrepreneurship clubs that allow students to work on collaborative projects and gain awareness from experienced entrepreneurs (Pittaway, Rodríguez-Falcon, Aiyegbayo, & King, 2011), and a pedagogical method that goes beyond formal classroom teaching, incorporating, for example, network events and interaction with entrepreneurs (Souitaris et al., 2007). All these studies share a focus on exploration, discussion, and experimentation, with a preoccupation on students’

needs and interests. Moreover, these studies largely suggest a positive link of this model’s pedagogy with lower level impact indicators—our framework’s Level 2 indicators (entrepreneurial intention, Fayolle et al., 2006a; Souitaris et al., 2007), or other personal change, such as satisfaction with the course or participation (Millman, Matlay, & Liu, 2008; Pittaway et al., 2011).

Of the EE programs studied in the review, 27 are consistent with demand–competence model pedagogy. They share the inclusion of an important element of realism, such as real-life problems to be solved. This is powerful, because despite the challenges to the learner, the learning is more transferable to the real world (cf. outside our review, Neergaard et al. 2012). In the articles in this stream, the pedagogical methods are experiential and entail working side by side with, for example, entrepreneurs (e.g., Chang & Rieple, 2013); realistic entrepreneurial exercises (e.g., Gondim & Mutti, 2011); starting and running a “real” business (e.g., Burrows & Wragg, 2013); and problem-based learning (e.g., Kirkwood, Dwyer, & Gray, 2014). Again, these studies report a positive link with lower level impact measures (skills and knowledge, and feasibility, e.g., Jones & Jones, 2011). However, ambiguous or mixed results are also found for intention and feasibility (Chang & Rieple, 2013; Harris, Gibson, & Taylor, 2007). Overall, the pattern suggests a positive link between demand and demand–competence model pedagogy and primarily lower level impact indicators.

Competence Model Pedagogy

Twelve articles fall into this category. Pedagogical methods entail students who are starting up businesses by consulting external experts, typically for legal, accounting, and sales help (Vincett & Farlow, 2008) or dealing with real-world problems or opportunities in industry-engaged environments to enhance social interaction and deeper learning (Gilbert, 2012). These articles are positively related to Level 2 (skill development, learning; Gilbert, 2012), Level 3 (actual start-ups; Gilbert, 2012; Vincett & Farlow, 2008), and Level 4 of our framework (positive changes in the person and business that run 5 years after the course: e.g., increase in social capital and socioeconomic bonds; Gordon, Hamilton, & Jack, 2012). Given the limited number of articles in this category, we see our results as indicative rather than confirmatory.

Comparison Studies

Only three articles compare EE programs using competing pedagogical methods. Lange et al. (2014) suggest that experiential courses (featuring demand and competence models) better predict multiple entrepreneurial behaviors: The rare behaviorist courses in their study ("how to write a business plan") are essentially a negative predictor. They measure impact at the highest impact level of our framework (Level 5) and show a positive socioeconomic impact up to 25 years postprogram. Similarly, Walter and Dohse (2012) compare active learning (constructivist) to traditional learning (behaviorist) in locations with either weak or already-strong entrepreneurial cultures, finding the constructivist model to have a stronger impact in terms of, for example, entrepreneurial intention.

Overall, our review highlights that each category of pedagogical methods (supply, demand, competence, hybrids) has some positive relationship with the lower level impact indicators of our teaching model framework (e.g., attitudes and intentions). However, the demonstrated pattern of pedagogy impact depends to an extent on the aims of researchers. Although articles featuring fewer experiential programs (supply, supply-demand, demand) focus more on basic or lower levels of our framework, articles examining more experiential programs (demand-competence and competence) also focus on impact at higher levels (e.g., actual start-ups and socioeconomic impact over time). These latter studies ask more from their programs and typically obtain higher impact.

DISCUSSION

Guided by a unique, theory-driven teaching model framework, we undertook a systematic review of a range of EE impacts in higher education, drawing on empirical evidence published since 2004. This entailed a thematic analysis of the evidence using our adopted teaching model framework to classify different types of outcomes and pedagogies. We also explored the extent of the relationship between pedagogical methods and outcomes achieved.

Reaffirmation of Past Reviews

Despite the increase in the amount of research on EE and entrepreneurial outcomes in higher education

over the past 12 years (nearly two thirds of our 159 articles are published in the last 5 years), there is still a general focus on lower level, short-term, subjective impact indicators, especially the EE-entrepreneurial intentions link (51%), and the lack of specifying even minimal pedagogical detail (55%). Hence, in general, we reconfirm the findings and repeat the calls of previous reviews for more research on entrepreneurial *behavior* (e.g., Pittaway & Cope, 2007) and greater pedagogical detail (cf. Martin et al., 2013). Our teaching model framework urges a focus on higher level impacts such as start-ups, firm survival rates, business performance, and societal contribution. Furthermore, it also means that future researchers provide detailed information about the pedagogical methods, so we can understand the impact of pedagogical designs and methods.

Extending previous reviews, our findings lead us to focus on new or underemphasized calls for future research. As a general pattern from our findings, progress on the previous calls outlined above has been slow, and EE impact research continues to be limited. For example, in our review, it is rare to see articles on novel EE impact measures or exploring the reasons behind the contradictory findings in higher education-based EE research that go beyond statistical/artifactual reasons (cf. Martin et al., 2013; Rideout & Gray, 2013). Table 3 presents our recommendations for future research and these are discussed in more detail below.

Types of EE Impact

Focus on Novel Impact Indicators Related to Emotion-Based Approaches

Given the dominance of entrepreneurial intentions as an impact indicator in our research, we suggest it is important to understand alternative impact measures. Although entrepreneurship is considered a "journey of the heart" and the importance of understanding entrepreneurial emotion (affect, emotions, feelings), especially during the new venture creation process is acknowledged (Cardon, Foo, Shepherd, & Wiklund, 2012), there is surprisingly little empirical research in our review that focuses on emotion-based impact indicators. We therefore urge scholars to pursue the following important avenues.

First, we are surprised by the scarcity of research that addresses emotion or affect. Given the growing consensus on their importance in entrepreneurial

TABLE 3
Future Research Directions: Types of EE Impact and Pedagogical Models

Reaffirmation of past reviews

1. Ongoing requirement for increased research on higher level impact indicators by examining objective and higher level measures at Levels 4 and 5 of our teaching model framework (see Figure 1) including entrepreneurial behavior.
 2. More detail about the specifics of the pedagogy in impact studies.
-

New or underemphasized research directions

1. Types of Impact

A. Focus on novel impact indicators related to emotion-based and mind-set approaches

- i. Explore role of EE program-derived inspiration in higher education as an impact indicator and a mediator between EE and a range of other impact measures. For example, does inspiration mediate the EE-behavior relationship?
- ii. Examine the development of the entrepreneurial mind-set in higher education such as dispositional optimism, uncertainty and ambiguity tolerance.

B. Focus on impact indicators related to the intention-to-behavior transition

- i. Build on Souitaris et al. (2007) to generate new knowledge about why there is (or is not) a transition from entrepreneurial intentions into nascent or start-up behavior, specifically for example, why do some recipients of higher education-based EE with high entrepreneurial intentions start up their own businesses after graduating, while others (despite high intentions) do not? What is the role of EE in higher education in this process?
- ii. Explore the development of entrepreneurial identity in higher education.

C. Explore contextual reasons for some contradictory findings in impact studies

- i. Explore individuals' background in terms of previous entrepreneurial exposure and pre-educational intentions to clarify the impact of higher education-based EE.
- ii. Directly examine if the impact of EE programs in higher education on a range of entrepreneurial outcomes is gender-specific and for which outcomes.
- iii. Consider contextual factors in higher education, e.g., type of course, type of institution.
- iv. Expand existing research by looking at relationship between culture and national context in EE impact studies. For example, how do cultural values moderate the impact of EE on outcomes? What outcomes are culture specific? Our teaching model framework could be expanded to incorporate culture-specific frameworks (e.g., Hofstede, 2003; Schwartz, 2004).
- v. Explore underexamined fast-growing/emerging countries/continents in our sample e.g., Brazil, Russia, Africa, and Australia.
- vi. Examine *double-moderator* interaction effects. For example, does EE impact outcomes as a function of culture *and* gender?

2. Pedagogical methods underpinning impact

- A. Investigate competence model-related pedagogical methods to determine if they are truly more effective than other models, and why they are effective.
 - B. Building on our teaching model framework, directly compare and contrast a broad range of pedagogical models (supply, demand, competence, and hybrids) in terms of their impact on a range of impact indicators (from Levels 1 to 5).
-

General recommendations

1. Explore EE at other levels, i.e. other than higher education.
 2. Explore impact of university-based EE on stakeholders other than students and graduates. For example, university faculty, donors/ investors, and community.
-

thinking, for example, passion (Cardon et al., 2009, 2012; Gielnik et al., 2015), this is startling. For example, only one empirical study in our sample measures EE program-derived *entrepreneurial inspiration* (Souitaris et al., 2007) that identifies emotional inspiration (not learning or incubation resources) as the most important EE "programme benefit" with inspiration also positively related to entrepreneurial intentions (Souitaris et al., 2007). Moreover, they define it as "a change of hearts (emotion) and minds (motivation) evoked by events or inputs from the programme and directed towards considering becoming an entrepreneur" (Souitaris

et al., 2007: 573). Thus, we consider it of central importance as both an impact indicator in its own right (i.e., if EE increases inspiration), and as a predictor of other impact measures. Indeed, Souitaris et al. (2007: 587) conclude: "Universities that want to assess the effectiveness of their programmes should capture not only how much their students learn about entrepreneurship or whether they are satisfied with the courses, but also whether they are inspired from the programme." Despite its importance, inspiration from EE programs in higher education remains an under-researched phenomenon and warrants further research attention.

A second key knowledge gap centers on impact measures focusing on the *development of the entrepreneurial mind-set*, defined here as cognitive phenomena deeper than intent⁴ (Krueger, 2007, 2015; Lackeus, 2015). Few studies in our review even reference this phenomenon. One rare example (Crane, 2014) suggests *dispositional optimism* as a key indicator of EE impact because of its self-regulatory function and dealing with uncertainty and setbacks. They find their program improves such optimism, suggesting another fruitful avenue to explore. Similarly, under OECD's Entrepreneurship360 initiative, Lackeus (2015) identifies the importance of uncertainty/ambiguity tolerance as impact indicators for action-based EE programs that tie back to the issue of emotions in entrepreneurial thinking.

Focus on Impact Indicators Related to the Intention-to-Behavior Transition

Our findings also suggest a paucity of studies of EE in higher education that bridge the transition from intention to behavior, that is Levels 2 to 3 in our teaching model framework. This is an important avenue because intention does not always translate into entrepreneurial behavior and little is known about this transition. Indeed, Pittaway and Cope (2007: 498) conclude "what is not known . . . is whether propensity or intentionality is turned into 'entrepreneurial behavior', either in its broad sense or when focused narrowly on venture creation." Although we re-emphasize their claim here, we also extend their call, by suggesting two specific avenues that we encourage more scholars to pursue.

First, our review suggests very little empirical attention on analyzing how entrepreneurial intention translates into nascent or start-up activities. Although this relationship is examined in our review regarding start-up activities for nascency after an EE program (e.g., Souitaris et al., 2007), the lack of a positive significant relationship (albeit via entrepreneurial intentions) suggests more research is required on how intention follows through to action (or not). For example, why do some recipients of EE with high entrepreneurial intentions start up their own businesses after graduating, while others (despite high intentions) do not? What is the role of EE in this process? Second, very few studies in our review analyze the *development of entrepreneurial*

identity, although we see hints that EE relates to personal development beyond knowledge and skill acquisition, for example, by a change in thinking style (Mueller & Anderson, 2014), internal self-reflection, and external engagement (Donnellon et al., 2014; Lackeus, 2014). Given how little we know of how intent becomes behavior, this is exceptionally important for further research.

Explore Contextual Reasons for Contradictory Findings: Background, Gender, and Culture

As our results report, most papers suggest positive results between EE and a broad range of impact indicators, but with some contradictory studies (consistent with Martin et al., 2013). These authors advance methodological concerns as an explanation of such contradictory results; however, it would be remiss not to also assess person- and context-specific factors.

Concerning student backgrounds, for those who have less exposure to entrepreneurship, the general effect tends to be positive, because they usually increase their entrepreneurial intention, attitudes, and self-efficacy by participating in the programs (e.g., Fayolle & Gailly, 2015; Fayolle, Gailly, & Lassas-Clerc, 2006a; Sánchez, 2011). In contrast, for those students who already have entrepreneurial experience, family background, or high previous entrepreneurial intention, the effects are generally weaker and may even be negative (see, e.g., Fayolle et al., 2006b; Von Graevenitz, Harhoff, & Weber, 2010). Similarly, Bae et al. (2014) found that after controlling for pre-educational entrepreneurial intentions, the relationship between EE and postprogram entrepreneurial intentions is not significant. However, given that Bae et al.'s (2014) meta-analysis did not focus specifically on higher education, we encourage more studies to focus on the role of student background in this context.

Regarding students' background, gender-specific differences are also an important source of contradictory findings. Few studies in our review focus on the differential impact of EE for male and female students/graduates, although those that did identify gender-specific effects. For example, Wilson, Kickul, and Marlino (2007) show that EE has a stronger impact on self-efficacy among females than males. Other studies also suggest the impact of EE on entrepreneurial intentions is gender-specific (e.g., Joensuu et al., 2013; Packham et al., 2010), although there are too few studies to indicate if this favors males or females. A controversial finding in Bae et al.'s (2014) article concludes that gender does not significantly moderate the EE-entrepreneurial intention

⁴ Education researchers often refer to "noncognitive skills" to differentiate from more surface level learning such as facts and rote-learned skills (e.g., Krueger, 2015).

relationship. However, Bae et al. (2014) did not specifically examine studies of EE in higher education (as we do), but rather looked at averages from a meta-analysis across educational levels. Furthermore, unlike Bae et al. (2014), we look at higher level impact in terms of entrepreneurial behavior. Although we did not find any reported gender-specific effects at this level, in our view, this does not mean that they do not exist, merely that studies have not specifically focused on these effects.

Looking at further aspects of context (e.g., type of program: optional or compulsory; type of institution), there is evidence from our review that initial positive attitudes toward entrepreneurship, which are, however, not fully formed, change once they are confronted with the complexities and pitfalls of business start-up during EE. In our review, Hytti, Stenholm, Heinonen, and Seikkula-Leino (2010) analyze the motivations of students taking a compulsory EE program, finding that students with intrinsic motivation report lower learning and less satisfaction with the course (they expected more). Those taking the program with extrinsic motivation express a greater degree of satisfaction. Similarly, Petridou and Sarri (2011) find that attitudes and intentions are raised by an EE program in a generalist university, but lowered in a technology institute. The latter can be explained by the realization of the complexities involved in starting up a technology venture.

Similarly, culture and national context are likely significant factors but rarely tested directly because almost all studies in our review focus on a single-country or culture (or at least do not investigate cultural differences). However, Bae et al.'s (2014) meta-analysis suggests some salient cultural dimensions, at least with respect to entrepreneurial intentions. For example, some national or cultural contexts may be higher on some cultural dimensions, on average, like uncertainty avoidance (level of comfortableness with uncertainty and ambiguity; Hofstede, 2003, also see Krueger, Liñán, & Nabi's, 2013 Special Issue in this area). This suggests culture-specific moderators are worthy of further consideration. In addition, our sample is dominated by studies in the United Kingdom, United States, and Asia, but only 5% are from the fast-growing emerging BRIC (Brazil, Russia, India, and China) economies. There are no studies from Russia or India, and Africa and Australia are also under-represented, suggesting such countries and continents are largely absent from studies.

Moreover, culture is also likely to exhibit interaction effects with other impact factors like gender as implied in a handful of our articles regarding

culture- and gender-specific findings. Packham et al. (2010), for example, suggest findings that EE negatively relates to entrepreneurial intentions for male German students. This *double-moderator* effect is consistent with limited research outside our review, for example, Shneor, Camgöz, and Karapinar (2013), who look at gender effects in two cultural settings, while analysis of Culture x Gender effects is absent from the studies reviewed here.

Considering our discussion on how student background and context (the "audience" dimension of the teaching model; Fayolle & Gailly, 2008) seem to explain contradictory findings in previous studies, future research in this field is especially promising. Knowing the background and the profile of the students (e.g., prior entrepreneurial knowledge and skills, motivators, gender) and context (e.g., type of program, type of institution, program and country context) can also lead to better design and implementation of EE programs, and ultimately to more efficient learning processes, environments, and hence, impact (Bécharde & Grégoire, 2005; Fayolle & Gailly, 2008, 2015). It also opens the door for future impact research that is more mindful of potential moderating factors and exploring a range of related questions. For example, to what extent is the impact of EE programs in higher education on a range of entrepreneurial outcomes gender-, culture-, and context-specific? Which impact indicators in our framework are dependent on moderator effects and which are more universally applicable? Our teaching model framework could also be expanded to incorporate culture-specific frameworks (e.g., Hofstede, 2003; Schwartz, 2004) allowing further consideration of the impact of higher education-based EE programs in different international and cultural contexts.

Pedagogical Methods Underpinning Impact

Pedagogical Reasons for Contradictory Findings: Differences in Pedagogical Methods

Our review suggests that all the pedagogical methods (supply, demand, competence, hybrids) have positive impact at Levels 1 and 2 of our teaching model framework (e.g., attitudes and intentions). However, our reviewed studies suggest that pedagogical methods based on competence are better suited for developing higher level impact. The evidence suggests that competence model pedagogy is associated with both subjective measures at Level 2 (e.g., entrepreneurial intention), and objective ones at Levels 3 (e.g., actual start-ups up to 5 years

postprogram) and 4 (longer term impact on business up to 10 years postprogram). To put it more simply, such deeper, more experiential pedagogies seem to have the most potential to have impact at higher levels because students focus on developing behavioral competency in solving problems in real-life entrepreneurial situations.

Our findings suggest that the use of different pedagogical methods is at least partially responsible for the inconsistent findings in impact studies. However, given that our findings are based on a partial sample of our population of articles, they are indicative rather than confirmatory.⁵ To the best of our knowledge, this is the first systematic review that uses a teaching model framework to assess the impact of EE. In our view, this provides novel and meaningful insights. EE makes strong claims to have significant impact and a strong bias toward experiential pedagogies. This review confirms that we need to focus strongly in this direction. For example, it is essential to expand research on competence-model-related pedagogical methods. Do they really have stronger impact than other models, especially at higher levels of our teaching model framework? How do they work regarding underlying processes?

Focus on Comparison Studies to Compare Pedagogical Methods

Our review reveals very few comparison studies that directly compare the impact of different pedagogical methods. Considering the growing number of EE programs and the growing demand to assess them, should we not ask for evidence of what pedagogical methods work, desired impact, and actual impact? We thus encourage researchers to compare types of impact across different teaching pedagogical methods. This is the only way for us to understand EE impact in an incremental and meaningful way.

Our review includes comparison studies that link EE pedagogical methods in higher education to a broad range of impact measures using a teaching model framework. However, comparison studies in our review only tend to compare pedagogical methods in a limited way (e.g., supply versus competence; Lange et al., 2014; Walter & Dohse, 2012; Wang & Verzat, 2011). In our review, we identify five different pedagogical models

including hybrid versions (supply, supply–demand, demand, demand–competence, competence). We urge scholars of future comparison studies to directly compare the impact of a broader range of pedagogical methods using a teaching model framework. We believe that such a comparative approach offers great opportunities to explore a number of theoretically, practically, and empirically meaningful research questions that may help to explain the contradictory findings on the impact of higher education-based EE programs and increase generalizability. For example, what pedagogical models work for which types of impact and in which contexts? We encourage future researchers to rigorously isolate the impact of a pedagogical intervention, controlling for the context- and person-specific factors outlined earlier.

Limitations and General Recommendations

Three limitations of our review are noteworthy. First, we only cover EE in higher education, although EE also flourishes in high school programs, and adult (nondegree and non-academic) education. Focusing on other educational levels and means of delivery outside higher education was outside the scope of our research, but our findings do open the door for assessing EE impact at other levels.

Second, data on whether an individual is exposed to multiple training before, during, and after higher education is limited. However, some articles in our review do use more sophisticated research designs, for example, adopting a pretest–posttest control group design (e.g., Souitaris et al., 2007), or controlling for prior entrepreneurial exposure (e.g., Fayolle & Gailly, 2015). Although focusing on methodological designs is outside the primary scope of our research and is covered elsewhere (e.g., Rideout & Gray, 2013), we still include a range of articles with different methodologies in our research, and our findings confirm those of existing reviews with an emphasis on methodological rigor (e.g., Martin et al., 2013; Rideout & Gray, 2013). Rather than reiterate the methodological weaknesses that other reviews found, we sought to identify perhaps less obvious, yet greatly promising new or underemphasized directions for future research.

Third, our review focuses on the recipients of university-based EE programs and their entrepreneurial attitudes, knowledge, skills, and behaviors. However, such programs obviously also influence a wider set of stakeholders, such as the instructors themselves and, in the case of field projects, the

⁵ Reduced from 159 to 72 due to insufficient pedagogical information from 55% of our articles. Further, we suspect that it could be extremely valuable to assess the quality of pedagogy, not just its intended characteristics.

individuals and organizations involved. For example, "real-life cases" where students work on various consultancy tasks (such as market validation studies). The impact of EE can be on entrepreneurial behavior of staff and lecturers, when teaching entrepreneurship influences academics to become engaged in it themselves (whether in commercializing research or in nonresearch-based entrepreneurial activity at the side of academic work). EE programs where students engage in market validation studies and so forth also expose students to the entrepreneurial community. This can be built into higher levels of our teaching model framework to examine stakeholder impact. For example, we can assess the value of EE to university faculty, donors/investors, and communities at Levels 3, 4, and 5 of our framework (cf. Duval-Couetil, 2013).

CONCLUSIONS

While confirming the weaknesses in EE impact studies (e.g., dominance on lower level attitudinal and intentionality impact measures, and a lack of key detail concerning pedagogy), we also identify three main ways of moving forward. First, as indicated in Table 3, we add value by providing an up-to-date and empirically rooted call for future research in higher education. Second, by applying a teaching model framework, we offer several intriguing and under-emphasized suggestions for improving EE research. Last and relatedly, we provide some critical insights into the reasons for the contradictory findings in EE research (e.g., rarity of cross-cultural, gender-specific and pedagogical-comparison research) that can be further teased out through single studies/interventions, so we can understand how EE really works in theory and practice.

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Ghulam Nabi (PhD, University of Central Lancashire, UK) is a senior lecturer in entrepreneurship and organizational behavior, Manchester Metropolitan University Business School, UK. Current research interests include student-to-entrepreneur transition, entrepreneurial intentions, entrepreneurship education, and the role of mentoring in entrepreneurial development. Ghulam has published over 18 articles in leading international journals.

Francisco Liñán (PhD, University of Seville, Spain) is professor of entrepreneurship and innovation at Anglia Ruskin University (UK), and University of Seville. Francisco's main research interests include entrepreneurship as a process, entrepreneurial intentions, and culture's role in entrepreneurship. He has published over 25 articles in international journals and edited books.

Alain Fayolle (PhD, University of Lyon, France) is a professor and Research Centre director, EM Lyon Business School, France. Alain is also the Academy of Management ENT Division Chair. His research interests are entrepreneurship education, corporate entrepreneurship, entrepreneurial intention, and behavior.

Norris Krueger (PhD, The Ohio State University, US) is a senior research fellow of the Center for Management and Entrepreneurship, University of Phoenix. Norris is passionate about developing entrepreneurial thinking, the most cited author on entrepreneurial intentions, and is now researching deeper cognitive phenomena (e.g., "neuroentrepreneurship"). He is equally passionate about growing entrepreneurial ecosystems (Entrepreneurship Northwest; organized Startup Weekends, & 1 Million Cups).

Andreas Walmsley (PhD, Leeds Beckett University, UK) is an associate professor at Plymouth University, UK. Andreas's current research revolves around entrepreneurship education, entrepreneurship in tourism and hospitality, and employment in the service industries.

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