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Assessing entrepreneurial competences: insights from a business model challenge

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Education + Training



Assessing entrepreneurial competences: Insights from a business model challenge

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Assessing entrepreneurial competences: Insights from a business model challenge

STRUCTURED ABSTRACT

Purpose: While the number of entrepreneurship education programmes offered around the world is on the rise, research into the assessment of entrepreneurship education programmes is still lacking. In this paper, we take the stance that entrepreneurship education has to focus on a set of transversal competences aimed at teaching individuals to become more enterprising, and develop a framework and practical proposal for the teaching and assessment of entrepreneurial competences.

Design/methodology/approach: We followed a three-pronged research design. Firstly, we reviewed literature and practices on the definition of entrepreneurial competences and measures for their assessment, and identified a rubric of competences and a set of assessment tools. Secondly, we tested the identified tools to assess entrepreneurial competences, through the development of an intensive extra-curricular initiative on entrepreneurship based on a business model challenge. Thirdly, we evaluated the outcomes of this experience based on 72 student pre-test and post-test survey responses.

Findings: We assessed the impact of participation in a business model challenge with regard to five competence areas: positive attitude and initiative; communication and interaction; teamwork and collaboration; critical and analytical thinking or problem solving, including risk assessment; creativity and innovation. We found no relevant changes across these dimensions, concluding that the mere exposure to the business challenge was not a sufficient condition for stimulating the development of entrepreneurial competences in our sample.

Originality/value: This work provides a relevant contribution to researchers, educators and policy-makers by taking an interdisciplinary approach to reviewing previous literature and proposing ways of assessing transversal competences in the context of entrepreneurship education.

Keywords: Entrepreneurship education; Entrepreneurship; Entrepreneurial competences; Transferable competences; Entrepreneurial learning; Soft skills; Assessment

INTRODUCTION

The number of educational entrepreneurship programmes in higher education offered around the world is on the rise (Kuratko, 2005; Lekoko, Rankhumise, & Ras, 2012; Mohamad et al., 2015), pushed by widespread recognition of entrepreneurship as an important driver of economic development and employment (e.g., OECD, 2017; United Nations, 2016). The rise in entrepreneurship education opportunities is therefore accompanied by growing demands for accountability from educational stakeholders and accreditation organisations (Duval-Couetil, 2013). In this landscape, assessment practice in entrepreneurship education is an increasingly important issue that educators and policy-makers have to tackle, since assessment is a key element for ensuring coherent and quality learning patterns (e.g., Banta, 1999). Previous literature has highlighted that the success of entrepreneurship education can be analysed either from a “macro” perspective, for instance by analysing dedicated policies or the university context, or a more “micro” perspective, focusing on the learning outcomes of programmes (e.g., Pittaway & Cope, 2007; Duval-Couetil, 2013). In this paper, we are interested in the latter perspective and focus on student assessment, which regards the evaluation of the correspondence between desired educational outcomes and actual student achievement (Banta, 1999; Pittaway & Edwards, 2012). Despite its relevance, this topic has received relatively poor academic attention, for instance overlooking educators’ aspired or actual assessment practices (e.g., Pittaway et al., 2009; Pittaway & Edwards, 2012) or methodological implications for the measurement of the effectiveness of entrepreneurship education (e.g., Falkäng & Alberti, 2000; Penaluna & Penaluna, 2009).

The breadth of research in this area can be explained by two issues that make student assessment in entrepreneurship education particularly complex. First, entrepreneurship education is characterised by different ontological foundations and interpretations about the relevant contents and learning objectives (Fayolle & Gailly, 2008; Gibb, 2002; Johannisson,

2016). In fact, scholars have distinguished between education related to educating “in” entrepreneurship (i.e., making individuals to become more entrepreneurial in their existing firms or place of work), educating “for” entrepreneurship (i.e., aiming to teach individuals how to start a business) or “about” entrepreneurship (i.e., giving a general understanding about entrepreneurship as a phenomenon) (Kirby, 2004; Mwasalwiba, 2010). Secondly, and related to the previous point, entrepreneurship programmes are characterised by a variety of pedagogical approaches (Fayolle & Gailly, 2008), many of them action- and experience-based, requiring assessment practices able to assess learning in an innovative and effective way (Pittaway et al., 2009).

We position our contribution to this debate by acknowledging that nowadays entrepreneurship education is more than just learning about new business creation or small business management, but rather learning to become enterprising individuals (e.g., Gibb, 2002; Henry, Hill, & Leitch, 2005; Hoppe, 2016). This implies a focus on the “know-why” and “know-when” aspects of entrepreneurship (Fayolle & Guilly, 2008; Williams-Middleton & Donnellon, 2014; Johannisson, 2016), with an emphasis on cognitive constructs (e.g., attitudes, motivations, self-efficacy) or transversal competences (e.g., creativity, innovation, problem-solving, decision-making) rather than on managerial/small business management contents (Gibb, 1993, 2002). In addition, it implies students’ involvement with a wider audience outside the business field (Cooper, Bottomley, & Gordon, 2004; Fayolle & Guilly, 2008; Johannisson, 2016), which requires the adoption of cross-disciplinary or cross-cultural education approaches (e.g., Hynes, 1996; Kazakeviciute, Urbone, & Petraite, 2016). We therefore suggest that student assessment in entrepreneurship education should be based on teaching methods and assessment practices that are able to stimulate and evaluate students’ “transversal” competences.

Drawing on previous literature, we refer to transversal competences as a range of cognitive (e.g., critical thinking), personal (e.g., awareness) and interpersonal competences (e.g., communication, cooperation and teamwork), which span various scientific disciplines or educational subjects, and are thus transversal to many social fields (OECD, 2012; Rychen & Salganik, 2000)¹. To date, assessing transversal competences in entrepreneurship education has been problematic because, while literature has provided several classifications and lists of entrepreneurial competences, there are no standardised tools and methods clarifying *how instructors can assess transversal entrepreneurial competences developed through entrepreneurship education*. In this paper we aim to shed some light on this important and overlooked area, thus contributing to the literature on entrepreneurship education and its effectiveness (e.g., Henry et al., 2005; Fayolle, 2013; Pittaway et al., 2009). We empirically explore the practical case of a short, intensive entrepreneurship education programme based on a business model challenge involving university students from different countries and disciplinary fields. Our results highlight some of the challenges that university educators need to consider when designing entrepreneurship education programme assessment, underlining the limitations of assessment techniques based on mainstream quantitative approaches.

The paper is organised as follows. Firstly, we present a literature review to set the background for understanding the assessment of entrepreneurial competences. Secondly, we analyse the case of an extra-curricular entrepreneurship education initiative, highlighting the critical components regarding the enhancement and assessment of entrepreneurial competences in a cross-disciplinary and cross-cultural environment. Thirdly, we conclude by describing the implications of our study in terms of research and practice in the domain of entrepreneurship education assessment.

¹ In this paper, we deal with the terms “soft”, “transferable” and “transversal” as interchangeable in the discussion of related competences (OECD, 2012), and we use the term ‘transversal’ as a summary of the three terms. We nevertheless acknowledge that the debate is broader and could include other approaches and terms, such as socio-emotional skills, life skills, or 21st century skills (Sánchez Puerta, Valerio, & Bernal, 2016).

LITERATURE REVIEW

Assessing entrepreneurial competences

Assessment in education is defined as a process of systematic gathering of evidence, review and use of information to make judgements and draw inferences about students' achievements and performances, and about potential improvements in student learning and development (Palomba & Banta, 1999; Pellegrino, Chudowsky, & Glaser, 2011).

The assessment of entrepreneurship education is particularly difficult because it is a relatively young discipline, characterised by conceptual and methodological debates (Duval-Couetil, 2013; Fayolle, 2013; Mwasalwiba, 2010). An important issue in this regard is that entrepreneurship education comprises four categories, including educating “about” entrepreneurship, i.e., aimed at increasing the understanding of theoretical concepts in entrepreneurship; “for” entrepreneurship, i.e., focusing on new business creation and small business management, and thus on practical enterprise-related contents; educating “through” entrepreneurship, i.e., applying a learning style involving enterprising behaviours based on trial and error; and educating “in” entrepreneurship, i.e., focusing on a wider set of skills (e.g., innovation, problem-solving, self-efficacy), knowledge, and experiences, aimed at teaching individuals to become more enterprising (Kirby, 2004; Mwasalwiba, 2010; Hoppe, 2016).

Several scholars and policy-makers have supported the idea that entrepreneurship education can be distinguished from small business education, because its major objectives are to develop enterprising people rather than merely stimulating business ownership and growth (Blenker et al., 2011; Gibb, 1993, 2002; Hoppe, 2016). This has important implications on two levels. At macro-level, it entails a shift from policies fostering enterprise education (i.e., “about” and “for” approaches), to policies fostering entrepreneurial learning (i.e., “through” and “in” approaches) (e.g., Hoppe, 2016). At micro-level, it implies the adoption of different

practical teaching and assessment approaches, which can accommodate wider learning objectives in terms of reflexive action and experimental learning (e.g., Cooper et al., 2004; Pittaway & Edwards, 2012). To approach this wider understanding of entrepreneurial education, both scholars and policy-makers have pragmatically adopted the concept of entrepreneurial competences (e.g., European Parliament and Council, 2006; Edwards-Schachter et al., 2015; Man, Lau, & Snape, 2008; Mitchelmore & Rowley, 2010; Morris et al., 2013). The concept of entrepreneurial competences is not unitary in social sciences (OECD, 2012), because the notion of competences is complex – comprising components that are deeply rooted in a person’s background (traits, personality, attitudes, social role and self-image) as well as those that can be acquired at work or through training and education (skills, knowledge, and experience) (Man, Lau, & Chan, 2002). In this paper, we propose to adopt the concept of entrepreneurial competences as a description about something which a person should be able to demonstrate or achieve to successfully exercise entrepreneurship (Mitchelmore & Rowley, 2010). This concept includes a range of transversal competences referred to the cognitive, personal and interpersonal domain and span across social fields (e.g., Luppi & Bolzani, 2019).

Drawing on these considerations, entrepreneurship educators need to reflect on three key elements of assessment practice, defined as “the assessment triangle”: observation, data collection and interpretation, and learners’ cognition (Ketchagias, 2011). This entails answering to a set of key questions about what is assessed; how, when and where the assessment is carried out; and who is the assessor (Pittaway & Edwards, 2012).

With reference to “what” it is assessed (i.e., learning objectives), as previously discussed, assessing transversal competences in entrepreneurial education refers to a wide range of competences referred to engagement in entrepreneurial behaviours (e.g., opportunity seeking; taking initiative), understanding and management real-business uncertainty and complexity, and developing interpersonal relationships (Pittaway & Edwards, 2012). It is important to

highlight that specifying learning outcomes in competence-based education should be viewed holistically rather than “an effort to describe or list educational and behavioural objectives” (European Commission, 2012, p. 13). In fact, when learning outcomes are over-specified, competences are reduced to atomised tasks (for example described by long check lists of actions and behaviours).

The “how” assessment carried out (i.e., methods) is influenced by the teacher’s education paradigm. Firstly, according to the so-called classical test (or measurement) theory, which relies on behaviourism, associationism, traits and fundamental abilities theory (Mislevy, 1996), knowledge is an organised accumulation of associations and skills, and learning is the process that allows them to be acquired (Skinner, 1958). This paradigm maintains an overall epistemological positivist orientation and an empirical approach. In this view, learning can be tested by measuring behavioural skills in discrete tasks, while the process of learning can be shown by monitoring changes in behaviour, according to regular task practice and reinforcement. Assessment is limited only to measurable and objectively observable facts, performances and events (e.g., Lindquist, 1951) and carried out through quantitative tests that ensure the reliability and validity of assessment. A second paradigm is based on a cognitive psychology perspective on learning (e.g., Neisser, 1976). According to this view, individuals are active when acquiring knowledge (e.g., the selecting and processing of stimuli and provision of responses; metacognitive experiences and self-questioning) (e.g., Anastasi, 1967; Carroll, 1981; Sternberg & Smith, 1988). In this perspective, assessment implies dealing with complex abilities and competences (e.g., synthesis, analysis, planning, evaluation, decision making, problem solving, etc.). A third perspective is the social constructivist one, which assumes that learning is an active and continuous process where knowledge is constructed and reconstructed, influenced by prior knowledge and experience (Handley et al., 2004). Constructivism assumes that students become creators of their personal knowledge structures

(Herman, 1997) through identifying personal relevance, using a critical voice and acting in negotiations (Taylor, Fraser, & Fisher, 1997). In this view, assessment focuses on learners' processes of experiential reflection, which can be represented by mind maps, self-questioning, self-explanations and search for meaning (Fenwick, 2000). In addition, according to approaches rooted in intersubjective ontology, students' learning can be construed by focusing on the nature of their living relationships with others, recognising that they are always deeply embedded, and embodied, in mutual relationships with communities of people (Cunliffe, 2016).

Going on to discuss the “when” of assessment, we need to distinguish between formative and summative assessment (Bloom et al., 1971). Formative assessment is carried out as part of the learning process in a specific context (e.g., via diagnostic testing or feedback), providing information on where students are with respect to the expected performance (Huhta, 2010) and how they could be supported to progress further, in order to promote meaningful learning. Summative assessment is the assessment that attests that the student is competent at a certain level and, as a result, can earn credits or a certification at the end of a learning process. A connected issue regards “where” the assessment is carried out. Looking at learning environments, besides traditional classroom-based learning, several programmes entail non-classroom learning environments that facilitate experiential, reflexive or critically reflexive learning, while at the same time supporting students by scaffolding teaching activities and explicit instructions where relevant (e.g., Brookfield, 2017; Cooper et al., 2004; Lackeus & Williams Middleton, 2015; Macht & Ball, 2016). It is thus important to align assessment to the chosen learning environment, especially for students exposed to authentic learning, i.e., activities that are representative of the reality and complexity of situations of entrepreneurial activity (e.g., within start-up or entrepreneurial behaviour in other contexts) (Blenker et al., 2011; Match & Ball, 2016).

Finally, “who” does the assessment is an important issue to be addressed, by choosing between the possibility to engage only the educator, or make use of self- or peer assessment (e.g., peers, entrepreneurs, other professionals) (e.g., Pittaway & Edwards, 2012).

AN EMPIRICAL ASSESSMENT OF ENTREPRENEURIAL COMPETENCES

To answer our research question about how to assess transversal entrepreneurial competences developed in entrepreneurship education, we followed a research design characterised by two phases (summarised in Figure 1), as explained below. The research team endorsed an interdisciplinary approach (Fayolle et al., 2016), merging an education- and a management-science view on the topic.

Insert Figure 1 about here

Phase 1 – Identifying entrepreneurial competences and assessment tools

The first phase of the research consisted in a baseline analysis of literature and practice about the definition and measurement of entrepreneurial competences, with the aim of identifying a rubric of competences and a set of assessment tools. To accomplish this, we mapped the approaches and methods in teaching and assessing entrepreneurial competences (1) through a review of existing programmes, policy documents and existing literature on entrepreneurial skills and competences; (2) through interviews with experts to produce a complementary mapping of current educational environments and practices in relation to the teaching and assessment methods/tools of transversal competences.

The review of academic literature was carried out by searching for relevant articles on Scopus² as of December 2015 by extracting combinations based on the following keywords: *entrepr**, *competenc*/skill**, *transversal*, *transfer**, *soft*³. We narrowed our search to journal articles in the English language. We merged the results from our searches and eliminated the redundant documents, ending up with a sample of 3,085 articles. The relevance of the articles for our review was coded by two independent judges, who reached an inter-rater agreement of .92 and solved disagreement by discussion, so that all articles were assigned for inclusion/non-inclusion for our review. A total of 474 articles were retained as relevant for providing a list of transversal competences for entrepreneurship and a set of measures to assess them. It is important to underline that this search was used as a first initial step into the field, and later we included additional up-to-date literature. In addition to academic literature, in January 2016 we carried out a general search on the Internet for policy and practice documents on the topic, retrieving around 20 relevant documents.

In addition to the literature review, we carried out 15 expert interviews with teachers working in five partner institutions of a European project on the assessment of entrepreneurial competences (project SOCCES)⁴, with the aim of evaluating the current educational environments and practices at their institutions, and their perceived main development needs regarding the assessment of the defined competences.

² Started in November 2004 and owned by Elsevier, Scopus is recommended by some scholars and bibliometricians as having a wider coverage for the social sciences and humanities than the Web Of Science Social Sciences Citation Index (SSCI-WOS) database (e.g., Harzing 2013). Scopus contains over 21,500 titles from more than 5,000 publishers. It consists of over 38 million records back to 1996 (63%) and over 22 million records pre-1996 (37%) going back as far as 1823 (Scopus, 2016).

³ More specifically, our search was carried out as follows: *entrepr** AND *competenc**, *entrepr** AND *skill**, *entrepr** AND *competenc** AND *soft*; *entrepr** AND *competenc** AND *transversal*; *entrepr** AND *competenc** AND *transfer**; *entrepr** AND *skill** AND *soft*; *entrepr** AND *skill** AND *transversal*; *entrepr** AND *skill** AND *transfer**. For a similar approach, e.g., Haq, 2016.

⁴ The project SOCCES - SOCIAL Competences, Entrepreneurship and Sense of Initiative - Development and Assessment Framework (Erasmus+ 2014-1-UK01-KA203-001660) aimed at developing and piloting a framework for the methodical assessment for two competences that are very important for working life, namely the sense of initiative and entrepreneurship, and social competences.

Based on the insights gained through coding and grouping entrepreneurial competences from our literature review and expert interviews, we developed a framework and methodology to assess transversal entrepreneurial competences belonging to the following five areas:

1. Positive attitude and initiative
2. Communication and interaction
3. Team-work and collaboration
4. Critical and analytical thinking or problem solving, including risk assessment
5. Creativity and innovation

For each area of competence, a list of specific competences and validated tools to assess them were identified, as summarised in Table 1. An in-depth description of skills, together with levels against which to assess them, is provided in Table A1 in Appendix.

Insert Table 1 about here

Phase 2 – Pilot test of assessment tools

Based on insights gained during the first phase of the research, in 2016 we organised a pilot test of the assessment tools, with the aim of assessing their reliability and feasibility in assessing students' performances in terms of entrepreneurial competences before and after an entrepreneurship education programme.

Our pilot test was carried out as part of the activities of the project XX. The partner institutions launched two virtually-enabled, real-life business challenges to be solved through a cross-disciplinary, international collaborative teamwork. Seventy-two students were recruited to participate in the two business challenges from Bachelor (67%) and/or Master courses across the partner universities. On average, students were 23 years old (SD=4.06). 56%

of them were males. One business challenge required students to creatively propose new services and opportunities for developing active participation by citizens in the new public Central Library in Helsinki. This challenge was addressed by students with a management and an applied sciences background. The second business challenge required civil engineering and management students to collaborate to develop a business idea to market a new retrofitting technology to non-domestic buildings. Details about the two business cases are provided in the Appendix (Table A2). For both challenges, students set up teams at national level to work on the project, which were matched with other teams from other countries to work collaboratively to solve the business challenge. The virtual platform FairShare⁵ was set up as a joint learning environment for all the participating students. The students had one month to complete the business challenge. During this period, the students received a one-day introductory class on entrepreneurship, business modelling and teamwork; they were asked to deliver intermediate outputs every week. The final result was presented to other students and professors from participating institutions.

We deemed this learning environment particularly suited to testing the transversal competences for entrepreneurship that we identified in the first phase of our research for two reasons. Firstly, the two business challenges were developed to reflect real world problems, characterised by complexity and having possible multiple solutions. Students could thus attempt to solve them through debate, experimentation, exploration and creativity (Kirriemuir & McFarlane, 2004). This type of activities can motivate learners more than traditional approaches (Gordon et al., 2009) and make them more likely to remember concepts they discover on their own (De Jong & Van Joolingen, 1998). Secondly, the business challenges were organised in such a way as to encourage learners to be active and autonomous, and to activate collaboration between learners both within and across countries, developing social and

⁵ <https://fairsharetraining.eu/frontpage-en>

communicative competences. In addition, the learning environment was not classroom-based but technology-enhanced, involving the use of a communication platform and other communication technologies to engage students. We thus believed that the two settings allowed several transversal competences to be addressed simultaneously.

The business challenges were implemented smoothly, with students being able to follow the prescribed activities and deliver all the expected outputs. Based on a survey administered at the end of the experience to students (n= 55, response rate= 76.4%) and teachers (n= 10; response rate= 100%), the general evaluation of pilot workload, challenge and relevance of the experience was positive (Appendix, Table A3). The survey also investigated whether, according to students and teachers, the business challenge was perceived as effective in generating awareness of the selected entrepreneurial competences and useful in activating them. The data show that the initiative was highly effective in generating awareness and useful for activating competences with regard to communication and teamwork; and least effective with regard to awareness of risk assessment competences (Table 2). Similarly, the business challenge was perceived as most useful in activating communication and teamwork competences; and least useful in activating risk assessment competences (Table 3). We interpret these results in two ways. Firstly, they may indicate that simulations like ours can allow students to engage in action and experiential learning, but that the “protected” conditions in which students operate in these projects do not allow them to fully experiment with the real, uncertain life of entrepreneurial endeavours (Daly, 2001; Macht & Ball, 2016). Secondly, the organisation of our business challenge as a group work, in such a short time frame, was more suited to stimulating the competences needed to participate in the group activities (e.g., communication and collaboration) than business-related competences (e.g., creativity, problem solving, critical thinking).

Insert Tables 2 and 3 about here

To assess the defined entrepreneurial competences, a pre- and post-test questionnaire was administered to students through an online survey. A total of 72 students filled in the pre-test questionnaire; 61 students completed the post-test questionnaire. All the constructs demonstrated good reliability in both questionnaires (all Alphas > .70). We carried out a comparison between pre-test and post-test scores with a set of paired *t-tests*, and found that no statistically significant change could be detected across all the tested constructs. To interpret this result, we organised one focus group with students and in-depth interviews with teachers one week after the post-test survey, in order to have additional insights to reflect on our pedagogical approach and our assessment method. Why did we register a null difference between the mean scores on competences before and after the participation to the business challenge, while the initiative was perceived as effective in raising awareness on the selected entrepreneurial competences and useful for activating them? We can offer three explanations. Firstly, the length of the learning experience (around one month) might have been too short to ensure proper engagement and reflection on learning outcomes by students, also considering that this was an extra-curricular initiative possibly conflicting with other personal or study priorities. Furthermore, the short length of the initiative, together with the fast timing of activities, made it unfeasible for the teachers to plan an effective combination of formative and summative assessment. We therefore reason that students in our study were not actively engaged in exercising metacognition, self-assessment and transfer of knowledge and competences acquired within other settings (Packer & Goicoechea, 2000) and in reflecting about what they could do to improve their competences (Bransford, Brown, & Cocking, 2000). Secondly, and connected to the previous point, students taking part in the business challenge did not receive any specific training, nor were they offered any opportunity to further reflect

on their learning achievements with regard to any of the entrepreneurial competences assessed by our tools. We therefore suggest that being merely exposed to an experiential entrepreneurial education initiative, such as our business challenge, might not be a sufficient condition to stimulate the development of entrepreneurial competences. Thirdly, we reason that a null statistical change over pre- and post-test scores in the identified competences does necessarily signal a null learning process. The adoption of a qualitative rather than quantitative approach to assess the same competences might have produced different results.

Based on our quantitative findings and the discussion of pilot tests with the participating teachers and students, we performed a SWOT analysis to offer a synthesis of the assessment of the two pilot tests (Figure 2). We believe that such analysis is relevant for the implementation of business case challenges in other educational contexts.

Insert Figure 2 about here

DISCUSSION AND CONCLUSION

Entrepreneurship education is increasingly seen as “critical for developing entrepreneurial skills, attitudes and behaviours that are the basis for economic growth” (Volkman et al., 2009) and as a key competence for individual development and fulfilment, active citizenship, social inclusion and employability in a knowledge society (European Parliament and Council, 2006). Entrepreneurial competences not only refer to enterprise management but to a wider set of transversal competences (Luppi & Bolzani, 2019). This poses several challenges to educators, regarding both the teaching side—how and where entrepreneurial cross-curricular competences will fit the educational set-up of subject-based timetables of schools and universities; and the assessment side—how, when, and where to assess such multifaceted

competences, and who should assess them. Several authors have engaged in the effort to measure the outcomes of entrepreneurship education around the globe (e.g., Martin, McNally, & Kay, 2013). However, to date the issues of what entrepreneurial competencies should be developed through education and training, how should they be developed, and how they could be specifically assessed are still in need of further understanding (Edwards-Schachter et al., 2015; Pittaway & Edwards, 2012).

In this paper we specifically tackle the issue of how to assess entrepreneurial competences at student level, by presenting insights from the test of an assessment framework for entrepreneurial competences within an extra-curricular business challenge. While our learning context was perceived as effective in raising awareness on the selected entrepreneurial competences and useful for stimulating their development, and although we used validated quantitative tools with good reliability and data from multiple sources (self- and peer assessment), we found no statistically significant change in the pre-test and post-test scores of any of the competences we tested. We have interpreted this as a result of three key issues: (1) the short time frame during which the students were exposed to the learning initiative and the lack of formative assessment; (2) the lack of any form of specific training on the selected competences or meta-cognition on the learning experience; (3) the use of a mono-method quantitative approach to assess competences.

Theoretical contribution and future research paths

This study contributes to the literature on entrepreneurship education, specifically extending previous literature on the assessment of entrepreneurial competences in an entrepreneurship education context (e.g., Chell, 2013; Fayolle, 2013; Markman, 2007; Mitchelmore & Rowley, 2010). By embracing an interdisciplinary perspective, our paper presents an overview of theoretical and empirical issues regarding the assessment of entrepreneurial competences, an

assessment framework and two business challenges that can be used by teachers, and examines practical issues regarding the assessment of entrepreneurial competences based on such learning environment.

The findings and limitations of this study provide valuable insights into some of the issues that should be considered in the design and implementation of assessment practices in the domain of entrepreneurship education. Firstly, our study seems to confirm that entrepreneurship “educators may not be able to depend on traditional assessment techniques” (Pittaway et al., 2009, p. 90), especially those based purely on a positivistic stance where assessment outcomes are clearly defined and quantitatively measured (Penaluna & Penaluna, 2009). This sets the stage for future studies investigating whether and how learning designs, learning outcomes and assessment approach in entrepreneurship education can be aligned; and how educators can make use of different methods of assessment, for instance through narrative or reflexive accounts by students (e.g., Blackwood et al., 2015; Lackéus & Middleton, 2018) rather than only using strong inferential designs (Rideout & Gray, 2013).

Secondly, there is a trade-off about measuring entrepreneurial competences through self-reported measures or peer-reported or observed measures. In fact, on one hand, entrepreneurial competences are manifested in a social context (i.e., in the interaction with other people), and therefore assessment should ideally involve the learners being assessed during socially-situated actions (e.g., during group work). On the other hand, it is individual learners that are interested in having their competences assessed. In our study, we therefore made the choice of proposing a standardised assessment aimed at testing and evaluating entrepreneurial competences at individual level, acknowledging that they are key to social interaction. For instance, it was noted that the specific competences pertaining to the area of team-work and collaboration consisted of more granular and basic competences linked to interpersonal communication, and therefore the choice was made to not include team-work and collaboration tools. In addition,

given that transversal competences tend to overlap in many aspects, future studies should take care to design assessment tools to avoid the inclusion of redundant constructs. This could be also solved by building assessment tools focusing on specific competence areas and adopting a modular structure; or by allowing a one-time self-standing assessment session (e.g., serving as a full certification of entrepreneurial competences similar to the European computer skills certification released by ECTL)⁶.

Thirdly, nowadays scholars agree that assessment should be considered as part of the learning process, rather than simply playing the role of certification or final stage of a teaching a learning programme (Segers, Dochy, & Cascallar, 2003; Wiggins, 1998). Given the short time span of our study, it was not possible for us to engage in formative assessment (e.g., diagnostic testing or feedback) during the learning process. It might be that this choice has limited the learning process in our students, as they did not receive important information about their strengths and weaknesses and thus may not have been able to decide how to improve their competences. We thus urge educators to combine both formative and summative assessment in the design of their assessment approaches.

Fourthly, our study adopted self- and peer assessment of entrepreneurial competences based on quantitative methods. However, a key concept that has emerged in education studies is that of authentic assessment (Rennert-Ariev, 2005). Authentic assessment is representative of the reality and complexity of situations which typically occur in real life in students' fields of study, helping students to create "discourse, products and performances that have value or meaning beyond success in school" (Newmann & Wehlage, 1993, p. 8). Authentic assessment integrates multiple types of knowledge and skills, relying on multiple sources of evidence collected over time and in different contexts which are evaluated using codified professional standards (Darling-Hammond, 2000). Therefore, authentic assessment is characterised by

⁶ For more information on the European Computer Driving Licence, see <http://ecdcl.org/>

students' active engagement, exploration and inquiry (Wiggins, 1989). In the future, we suggest that entrepreneurial competences should be carried out resorting also to authentic assessment (e.g., Macht & Ball, 2016), so that competences can be assessed by making reference to the students' real personal or professional situations and experiences.

Lastly, our study highlights how learning and assessing transferable competences requires attention to the social context of learning (i.e., learning environment). Simulations and games, such as the business challenge analysed in our study, can foster students' debate, experimentation, exploration, creativity, collaboration, social and communication competences (Kirriemuir & McFarlane, 2004). As in our study, learning environments do not necessarily have to be classroom-based. In many cases, they are increasingly technology enhanced – some examples include the use of virtual worlds offering opportunities for interactive learning, and the use of communication technologies (e.g., also mobile technology) to engage students over long term project-based learning experiences. We believe that further studies should investigate the use of these tools as a way to create and assess students' entrepreneurial competences (e.g., Daly, 2001; Human et al., 2005; Lackéus & Middleton, 2018; Sousa et al., 2019).

Implications for policy-making and practice

This study is of interest to policy-makers and educators. The global rise of entrepreneurship programmes in the last decades has been fuelled by unprecedented demand, as students look for a style of business education that will provide them with the transversal skills needed to succeed in an increasingly divergent business environment (Cooper et al., 2004). For instance, the “sense of initiative and entrepreneurship” is one of an individual's key competences in workplaces and in private life contexts, according to the European Union (European Parliament and Council, 2006). Here, policy-makers have contributed to a progressive definition of entrepreneurship education policy and educational practices as related to a set of competences

referred to the individual sense of initiative and an entrepreneurial mindset, to be fostered through reflexive action and experiential knowledge (Bacigalupo et al., 2016; Komarkova et al., 2015; Hoppe, 2016). Therefore, this paper is relevant for education policy-makers because it addresses the topic of developing appropriate assessment of transversal competences, such as entrepreneurial ones, in curricula: an important issue which is still lagging behind (EACEA/Eurydice, 2012).

Our study is useful for entrepreneurship and management educators. Assessment is an important part of educational practice, and educators should think carefully about this aspect (Banta, 1999). In line with previous studies, we call for closer consideration of the link between the intended entrepreneurial learning outcomes and the assessment approach for measuring them, also taking into account that students gear their learning behaviour (e.g., what they learn and how they learn) to the assessment method used (Pittaway et al., 2009). The assessment of entrepreneurial competences will also partly depend on the assessment purpose: the learning outcomes for summative assessment for a qualification will be more tightly specified than the learning outcomes for formative assessment within the university curriculum. Our work highlights that students' performances in entrepreneurial competences can be demonstrated in different ways, in different contexts, and not taking into account single specific outcomes but rather a holistic view of these competences. In this regard, using a method mix in assessment seems essential for compensating for strengths and weaknesses in the validity, reliability and generalisability of different methods.

Adopting a competence-based approach to teaching and assessing entrepreneurial competences has relevant implications in terms of teacher training. For example, training will need to tackle the re-orientation of initial teacher training frameworks; the development of a shared understanding of outcome specification and teacher judgement; knowledge of active

learning, gamification, technology-based teaching techniques; and continuous learning and peer-to-peer support.

To conclude, our paper highlights that the assessment of entrepreneurial competences needs to be based on the integration of different epistemological and empirical approaches, adopting mixed-, multi-source, and real-life methods, aimed not only at summative but also formative purposes. We see numerous issues and possibilities for continuing the debate and research with regard to the assessment of entrepreneurial competences, both from the theoretical and practical point of view. We therefore hope that our findings can stimulate new directions of research and practice aimed at introducing a game-changing approach to learning, teaching and assessing entrepreneurship as a set of transversal competences.

TABLES AND FIGURES

Table 1 – Assessment framework for entrepreneurial competences

Area of competence	Specific competence	Assessment tools
Positive attitude and initiative	Self-assessment	Empowerment scale (Rogers et al., 1997) (self-assessed)
	Growth mindset	Mindset Scale (Dweck, 2006) (self-assessed)
	Emotional intelligence	Brief Emotional Intelligence Scale (Davies et al., 1998) (self-assessed and alter-assessed)
	Perseverance	Perseverance scale (Kyndt & Baert, 2015) and narrative form (self-assessed and alter-assessed)
	Coping strategy	Self-knowledge, orientation towards learning, and planning for future scale (Kyndt & Baert, 2015) (self-assessed and alter-assessed)
Communication and interaction	General communication	Interpersonal Communication Competence Scale (Rubin & Martin, 1994) and narrative form (self-assessed and alter-assessed)
	Interaction	Interpersonal Communication Competence Scale (Rubin & Martin, 1994) and narrative form (self-assessed and alter-assessed)
	Presentation	Presentation exercise and Interpersonal Communication Competence Scale (Rubin & Martin, 1994) and narrative form (self-assessed and alter-assessed)
	Negotiation and persuasion	Entrepreneurial competences scale (ability to persuade scale (Kyndt and Baert, 2015) and narrative form (self-assessed and alter-assessed)
Team work and collaboration	Group work and team management	Belbin role self-assessment tool (self-assessed)
	Conflict resolution	Interpersonal Communication Competence Scale (Rubin & Martin, 1994) (self-assessed)
Critical and Analytical Thinking or Problem Solving, including Risk Assessment	Problem solving attitude	Creative problem solving scale (Morris et al., 2013) (self-assessed)
	Recognizing opportunities	Opportunity recognition scale + conveying a vision/seeing the future scale) (Morris et al, 2013) (self-assessed)
	Risk management	Risk management scale (Morris et al., 2013) (self-assessed)
Creativity and Innovation	Creativity and lateral thinking	Creative problem solving scale (Morris et al., 2013) (self-assessed)
	Adaptability	Making Decisions scale (Rogers et al., 1997) (self-assessed)
	Innovation	Innovativeness scale (Mueller & Thomas, 2001) (self-assessed)

Table 2 – Evaluation of pilot effectiveness in generating awareness of entrepreneurial transversal competences (Likert scale ranging from 1=very much to 5=very low)

	Teamwork	Critical thinking	Problem solving	Risk assessment	Communic.	Creativity	Positive attitude
Teachers	1.31	2.63	2.50	3.81	1.63	2.69	2.25
N	10	10	10	10	10	10	10
Students	1.96	2.31	2.26	2.48	1.98	2.02	1.96
N	55	55	54	54	55	55	55
Overall	1.64	2.47	2.38	3.15	1.81	2.36	2.11
N	65	65	64	64	65	65	65

Table 3 – Evaluation of pilot perceived usefulness in activating entrepreneurial transversal competences (Likert scale ranging from 1=very much to 5=very low)

	Teamwork	Critical Thinking	Problem Solving	Risk Assessment	Communic.	Creativity	Positive Attitude
Teachers	1.44	2.56	2.56	4.14	1.94	2.69	2.50
N	10	10	10	9	10	10	10
Students	2.00	2.22	2.27	2.59	1.91	2.20	2.06
N	55	55	55	54	55	55	53
Overall	1.72	2.39	2.42	3.37	1.93	2.45	2.28
N	65	65	65	63	65	65	63

Figure 1 – Summary of research methodology

Phase of the research	Activity	Outcomes
1- Identification of entrepreneurial competences	1.1. Literature review	- identification of entrepreneurial competences - identification of assessment tools
	1.2. Interviews with teachers and experts	- discussion of entrepreneurial competences - selection of assessment tools
2 - Pilot test of assessment tools	2.1. Pilot test	- business challenge and survey to students - analysis of results

Figure 2 – SWOT analysis of the business challenge for pilot test

Strengths	Weaknesses
<ul style="list-style-type: none"> - Activating and capturing teamwork and communication competences - Attracting students with an interest in improving their skills - International collaboration, especially valuable for students with low exposure to international environments during ordinary university-level courses - Cross disciplinary working and appreciating other profession’s perspective and requirements. 	<ul style="list-style-type: none"> - Business challenges are carried out in a relatively safe environment and thus are potentially not able to capture risk assessment competences - Technically “simple” business challenges might not be suitable for making students focus on problem solving and creativity; technically “complex” business challenges might exacerbate differences in students’ disciplinary skills - Short timeframe of exposure to the assigned activities is not “realistic” and might negatively impact quality of outputs - International virtual interaction does not work automatically, it needs to be planned in great detail, allowing students to get introduced and guided through a clear pattern of solution to the business challenge
Opportunities	Threats
<ul style="list-style-type: none"> - Business challenges implemented in different countries can enhance the cross-cultural aspects of transversal competences for entrepreneurship - Longer test time frames ensure interim feedbacks to monitor activities and improve the work carried out by students and guidance by teachers - The methodology can also be replicated in a non-international and non-virtual environment - Enabling activities in a virtual environment offers possibilities for interaction (e.g., webinars), also through additional interaction tools integrated with other media/social media 	<ul style="list-style-type: none"> - Students losing interest in the project contest or collaboration with other students (locally and internationally) during time - Business challenges carried out in virtual environments might generate superficial interactions if “compulsory” interactive sessions are not planned - Exposure to business challenges might not be particularly valuable to students with previous experience in teamwork or other similar simulations - Business challenges carried out over a short period of time might not be effective in developing different transversal competences for entrepreneurship

REFERENCES

- Anastasi, A. (1967). Psychology, psychologists, and psychological testing. *American Psychologist*, 22(4), 297–306.
- Bacigalupo, M., Kamylyis, P., Punie, Y., & Van den Brande, G. (2016). *EntreComp: The Entrepreneurship Competence Framework*. Luxembourg: Publication Office of the European Union; EUR 27939 EN; doi:10.2791/593884.
- Banta, T.W. (1999). *Assessment Essentials: Planning, Implementing and Improving Assessment in Higher Education*. San Francisco, CA: Jossey-Bass.
- Blackwood, T., Round, A., Pugalis, L., & Hatt, L. (2015). Making sense of learning. Insights from an experientially-based undergraduate entrepreneurship programme. *Industry and Higher Education*, 29(6), 445–457, doi: 10.5367/ihe.2015.0278
- Blenker, P., Korsgaard, S., Neergaard, H., & Thrane, C. (2011). The questions we care about: paradigms and progression in entrepreneurship education. *Industry and Higher Education*, 25(6), 417-427.
- Bloom, B. S., Hastings, J. T., & Madaus, G. F. (1971). *Handbook on formative and summative evaluation of student learning*. New York: McGraw-Hill.
- Bransford, J., Brown, A. ., Cocking, R. R., Donovan, M. S., & Pellegrino, J. W. (2000). *How People Learn, Brain, Mind, Experience, and School*. Washington: National Research Council, National Academy Press.
- Brookfield, S. D. (2017). *Becoming a critically reflective teacher*. San Francisco: John Wiley & Sons.
- Carroll, J. B. (1981). Ability and task difficulty in cognitive psychology. *Educational Researcher*, 10(1), 11–21.
- Chell, E. (2013). Review of skill and the entrepreneurial process. *International Journal of Entrepreneurial Behaviour & Research*, 19(1), 6–31.
<http://doi.org/10.1108/13552551311299233>
- Cooper, S., Bottomley, C., & Gordon, J. (2004). Stepping out of the classroom and up the ladder of

- learning: an experiential learning approach to entrepreneurship education. *Industry and Higher Education*, 18(1), 11–22.
- Cunliffe, A. L. (2016). “On becoming a critically reflexive practitioner” redux: What does it mean to be reflexive? *Journal of management education*, 40(6),740-746.
- Daly, S. P. (2001). Student-operated Internet businesses: True experiential learning in entrepreneurship and retail management. *Journal of Marketing Education*, 23(3), 204-215.
- Darling-Hammond, L. (2000). Authentic assessment of teaching in context. *Teaching and Teacher Education*, 16, 523–545.
- Davies, M., Stankov, L., & Roberts, R. D. (1998). Emotional intelligence: In search of an elusive construct. *Journal of Personality and Social Psychology*, 75, 989-1015
- De Jong, T., & Van Joolingen, W. R. (1998). Scientific discovery learning with computer simulations of conceptual domains. *Review of Educational Research*, 68(2), 179–201.
- Duval-Couetil, N. (2013). Assessing the impact of entrepreneurship education programs: Challenges and approaches. *Journal of Small Business Management*, 51(3), 394–409.
<http://doi.org/10.1111/jsbm.12024>
- Dweck, C. (2006). *Mindset: The new psychology of success*. New York, NY: Random House.
- EACEA/Eurydice. (2012). *Developing key competences at school in Europe: Challenges and opportunities for policy*. Brussels. Retrieved from http://eacea.ec.europa.eu/education/eurydice/documents/thematic_reports/145en.pdf
- Edwards-Schachter, M., García-Granero, A., Sánchez-Barrioluengo, M., Quesada-Pineda, H., & Amara, N. (2015). Disentangling competences: Interrelationships on creativity, innovation and entrepreneurship. *Thinking Skills and Creativity*, 16, 27–39.
<http://doi.org/10.1016/j.tsc.2014.11.006>
- European Commission. (2012). *Thematic work group on “Assessment of Key Competences”*. Literature review, glossary, and examples. Retrieved from http://ec.europa.eu/dgs/education_culture/repository/education/policy/school/doc/keyreview_e

n.pdf

- European Parliament and Council. (2006). *Recommendation of the European Parliament and of the Council of 18 December 2006 on key competences for lifelong learning*. Brussels.
- Falkäng, J., & Alberti, F. (2000). The assessment of entrepreneurship education. *Industry and Higher Education*, 14(2), 101-108.
- Fayolle, A. (2013). Personal views on the future of entrepreneurship education. *Entrepreneurship & Regional Development*, 25(7–8), 692–701. <http://doi.org/10.1080/08985626.2013.821318>
- Fayolle, A., & Gailly, B. (2008). Teaching models and learning processes in entrepreneurship education. *Journal of European Industrial Training*, 32(7), 569-593.
- Fayolle, A., Verzat, C., & Wapshott, R. (2016). In quest of legitimacy: The theoretical and methodological foundations of entrepreneurship education research. *International Small Business Journal*, 34(7), 895–904.
- Fenwick, T. J. (2000). Expanding conceptions of experiential learning: A review of the five contemporary perspectives on cognition. *Adult Education Quarterly*, 50(4), 243–272.
- Gibb, A. (1993). Enterprise culture and education understanding enterprise education and its links with small business, entrepreneurship and wider educational goals. *International Small Business Journal*, 11(3), 11–34.
- Gibb, A. (2002). In pursuit of a new “enterprise” and “entrepreneurship” paradigm for learning: creative destruction, new values, new ways of doing things and new combinations of knowledge. *International Journal of Management Reviews*, 4(3), 233–269.
- Gordon, J., Halasz, G., Krawczyk, M., Leney, T., Michel, A., Pepper, D., Putkiewicz, E., & Wiśniewski, J. (2009). *Key competences in Europe: Opening doors for lifelong learners across the school curriculum and teacher education*. CASE Network Reports No. 87. Warsaw: CASE – Center for Social and Economic Research.
- Handley, K., Clark, T., Fincham, R., & Sturdy, A. (2004). Knowing how to know: an inquiry into methods of studying knowledge and learning. In *5th Conference on Organizational Knowledge*,

Learning and Capabilities. Innsbruck.

- Haq, M. (2016). Human capital resources: a review and direction for future research. *International Journal of Management Development*, 1(4), 261-286.
- Harzing, A. (2013). *The Publish or Perish Book*. Melbourne: Tarma Software Research Pty Ltd.
- Henry, C., Hill, F., & Leitch, C. (2005). Entrepreneurship education and training: can entrepreneurship be taught? Part II. *Education+Training*, 47(3), 158-169.
- Herman, J. L. (1997). Large-Scale Assessment in Support of School Reform: Lessons in the Search for Alternative Measures. *International Journal of Educational Research*, 27(5), 395-413.
- Hoppe, M. (2016). Policy and entrepreneurship education. *Small Business Economics*, 46(1), 13-29.
- Huhta, A. (2010). Diagnostic and Formative Assessment. In B. Spolsky & F. M. Hult (Eds.), *The Handbook of Educational Linguistics* (pp. 469–482). Oxford: Blackwell.
- Human, S. E., Clark, T., & Baucus, M. S. (2005). Student online self-assessment: Structuring individual-level learning in a new venture creation course. *Journal of Management Education*, 29(1), 111-134.
- Hynes, B. (1996). Entrepreneurship education and training – introducing entrepreneurship into non-business disciplines. *Journal of European Industrial Training*, 20(8), 10-17.
- Kazakeviciute, A., Urbone, R., & Petraite, M. (2016). Curriculum development for technology-based entrepreneurship education: A cross-disciplinary and cross-cultural approach. *Industry and Higher Education*, 30(3), 202–214.
- Ketchagias, K. (2011). *Teaching and assessing soft skills*. Thessaloniki: 1st Second Chance School of Thessaloniki (Neapolis).
- Kirby, D. A. (2004). Entrepreneurship education: can business schools meet the challenge? *Education+ Training*, 46(8–9), 510–519.
- Kirriemuir, J., & McFarlane, A. (2004). *A literature review in games and learning*. NESTA Futurelab Research Report No. 8.
- Komarkova, I., Gagliardi, D., Conrads, J., & Collado, A. (2015). *Entrepreneurship competence: An*

overview of existing concepts, policies and initiatives. Luxembourg: Publication Office of the European Union; EUR 27472 EN; doi: 10.2791/067979.

- Kuratko, D. F. (2005). The emergence of entrepreneurship education: Development, trends, and challenges. *Entrepreneurship Theory and Practice*, 29(5), 577–598.
- Kyndt, E., & Baert, H. (2015). Entrepreneurial competencies: Assessment and predictive value for entrepreneurship. *Journal of Vocational Behavior*, 90, 13–25.
- Johannisson, B. (2016). Limits to and prospects of entrepreneurship education in the academic context. *Entrepreneurship & Regional Development*, 28(5-6), 403-423, DOI: 10.1080/08985626.2016.1177982
- Lackéus, M., & Williams Middleton, K. (2018). Assessing Experiential Entrepreneurship Education: Key Insights from Five Methods in Use at a Venture Creation Programme. In D. Hyams-Ssekasi & E. F. Caldwell (Eds.), *Experiential Learning for Entrepreneurship* (pp. 19-49). Palgrave Macmillan, Cham.
- Lekoko, M., Rankhumise, E. M., & Ras, P. (2012). The effectiveness of entrepreneurship education: What matters most? *African Journal of Business Management*, 6(51), 12023-12032.
- Lindquist, E. F. (1951). Preliminary considerations in objective test construction. In E. F. Lindquist (Ed.), *Educational Measurement* (pp. 119-184). Washington, DC: American Council on Education.
- Luppi, E., & Bolzani, D. (2019). The assessment of transversal competences in entrepreneurship education. In A. Fayolle, D. Kariv, and H. Matlay (Eds.), *The Role and Impact of Entrepreneurship Education* (pp. 202-223). Cheltenham: Edward Elgar. ISBN 978 1 78643 822 5 (cased).
- Macht, S. A., & Ball, S. (2016). “Authentic Alignment”—a new framework of entrepreneurship education. *Education+ Training*, 58(9), 926-944.
- Man, T. W. Y., Lau, T., & Chan, K. F. (2002). The competitiveness of small and medium enterprises. A conceptualization with focus on entrepreneurial competencies. *Journal of Business Venturing*,

17, 123–142.

- Man, T. W. Y., Lau, T., & Snape, E. (2008). Entrepreneurial competencies and the performance of small and medium enterprises: An investigation through a framework of competitiveness. *Journal of Small Business and Entrepreneurship*, 3(3), 257–276.
- Markman, G. D. (2007). Entrepreneurs' competencies. In R. Baum, M. Frese, & R. Baron (Eds.), *The Psychology of Entrepreneurship* (pp. 67–92). NJ and London: Robert Erlbaum.
- Martin, B. C., McNally, J. J., & Kay, M. J. (2013). Examining the formation of human capital in entrepreneurship: A meta-analysis of entrepreneurship education outcomes. *Journal of Business Venturing*, 28(2), 211-224.
- Mislevy, R. J. (1996). Test theory reconceived. *Journal of Educational Measurement*, 33(4), 379–416.
- Mitchelmore, S., & Rowley, J. (2010). Entrepreneurial competencies: a literature review and development agenda. *International Journal of Entrepreneurial Behavior & Research*, 16(2), 92–111. <http://doi.org/10.1108/13552551011026995>
- Mohamad, N., Lim, H. E., Yusof, N., & Soon, J. J. (2015). Estimating the effect of entrepreneur education on graduates' intention to be entrepreneurs. *Education+ Training*, 57(8-9), 874-890.
- Morris, M. H., Webb, J. W., Fu, J., & Singhal, S. (2013). A competency-based perspective on entrepreneurship education: Conceptual and empirical insights. *Journal of Small Business Management*, 51(3), 352–369. <http://doi.org/10.1111/jsbm.12023>
- Mueller, S. L., & Thomas, A. S. (2001). Culture and entrepreneurial potential: A nine country study of locus of control and innovativeness. *Journal of Business Venturing*, 16(1), 51-75.
- Mwasalwiba, E. S. (2010). Entrepreneurship education: a review of its objectives, teaching methods, and impact indicators. *Education+ Training*, 52(1), 20–47. <http://doi.org/10.1108/00400911011017663>
- Neisser, U. (1976). *Cognition and reality: Principles and implications of cognitive psychology*. New York, NY: WH Freeman/Times Books/Henry Holt & Co.

- Newmann, F. M., & Wehlage, G. G. (1993). Five standards of authentic instruction. *Educational Leadership, 50*(7), 8–12.
- OECD. (2012). *Transferable skills training for researchers: Supporting career development and research*. Paris: OECD Publishing.
- OECD. (2017). *Entrepreneurship at a glance 2017*. Paris: OECD Publishing.
- Packer, M. J., & Goicoechea, J. (2000). Sociocultural and constructivist theories of learning: Ontology not just epistemology. *Educational Psychologist, 35*(4), 227–242.
- Palomba, C. A., & Banta, T. W. (1999). *Assessment essentials: Planning, implementing, and improving assessment in higher education* (1st edition). San Francisco, CA: Jossey-Bass Publishers.
- Pellegrino, J. W., Chudowsky, N., & Glaser, R. (2011). *Knowing what students know: The science and design of educational assessment*. Washington, DC: National Academies Press.
- Penaluna, A., & Penaluna, K. (2009). Assessing creativity: drawing from the experience of the UK's creative design educators. *Education+ Training, 51*(8-9), 718-732.
- Pittaway, L., & Cope, J. (2007). Entrepreneurship education: A systematic review of the evidence. *International Small Business Journal, 35*(5), 479–510. doi:10.1177/0266242607080656.
- Pittaway, L., Hannon, P., Gibb, A., & Thompson, J. (2009). Assessment practice in enterprise education. *International Journal of Entrepreneurial Behaviour & Research, 15*(1), 71–93. <http://doi.org/10.1108/13552550910934468>
- Pittaway, L., & Edwards, C. (2012). Assessment: examining practice in entrepreneurship education. *Education+ Training, 54*(8-9), 778-800.
- Rennert-Ariev, P. (2005). A theoretical model for the authentic assessment of teaching. *Practical Assessment Research & Evaluation, 10*(2), 151–163.
- Rideout, E. C., & Gray, D. O. (2013). Does Entrepreneurship Education Really Work? A Review and Methodological Critique of the Empirical Literature on the Effects of University-Based Entrepreneurship Education. *Journal of Small Business Management, 51*(3), 329–351

- Rogers, E.S., Chamberlin, J., Ellison, M.L., & Crean, T. (1997). A consumer-constructed scale to measure empowerment among users of mental health services. *Psychiatric Services, 48*, 1042–1047.
- Rubin, R.B., & Martin, M.M. (1994). Development of a measure of interpersonal communication competence. *Communication Research Reports, 11*(1), 33–44.
- Rychen, S., & Salganik, L. H. (2000). A Contribution of the OECD Program Definition and Selection of Competencies: Theoretical and Conceptual Foundations Definition and Selection of Key Competencies. INES General Assembly. Retrieved 21 October 2019, from <http://deseco.ch/bfs/deseco/en/index/02.parsys.69356.downloadList.26477.DownloadFile.tmp/2000.desecocontrib.inesg.a.pdf>
- Sánchez Puerta, M. L., Valerio, A., & Bernal, M. G. (2016). *Taking stock of programs to develop socioemotional skills: A systematic review of program evidence*. Washington, DC: The World Bank.
- Scopus. (2016). *Scopus - Content coverage guide - updated January 2016*. Retrieved from https://www.elsevier.com/__data/assets/pdf_file/0007/69451/scopus_content_coverage_guide.pdf
- Segers, M., Dochy, F., & Cascallar, E. (2003). *Optimising new modes of assessment: In search of qualities and standards*. Dordrecht: Kluwer Academic Publishers.
- Skinner, B. F. (1958). Teaching machines. *Science, 128*, 969–977.
- Sternberg, R. J., & Smith, E. E. (1988). *The psychology of human thought*. Cambridge: Cambridge University Press.
- Sousa, M. J., Carmo, M., Gonçalves, A. C., Cruz, R., & Martins, J. M. (2019). Creating knowledge and entrepreneurial capacity for HE students with digital education methodologies: Differences in the perceptions of students and entrepreneurs. *Journal of Business Research, 94*, 227-240.
- Taylor, P. C., Fraser, B. J., & Fisher, D. L. (1997). Monitoring constructivist classroom learning environments. *International Journal of Educational Research, 27*(4), 293–302.

- United Nations. (2016). *Entrepreneurship for development. Report of the Secretary-General*. 26 July 2016, A/71/210.
- Volkman, C., Mariotti, S., Rabuzzi, D., & Vyakarnam, N. S. (2009). Educating the next wave of entrepreneurs. In *Unlocking entrepreneurial capabilities to meet the global challenges of the 21st Century. A report of the global education initiative*. Geneva: World Economic Forum.
- Wiggins, G. (1989). A true test: Toward more authentic and equitable assessment. *Phi Delta Kappa*, 70(9), 703–713.
- Wiggins, G. (1998). *Educative assessment: Designing assessments to inform and improve student performance* (1st ed.). San Francisco, CA: Jossey-Bass.
- Williams Middleton, K., & Donnellon, A. (2014). Personalizing Entrepreneurial Learning: A Pedagogy for Facilitating the Know Why. *Entrepreneurship Research Journal*, 4(2), 167-204.