

Assessing Entrepreneurship Education Outcomes in an Innovative Way: Situational Judgment Tests

Entrepreneurship Education and Pedagogy

2022, Vol. 5(1) 89–112

© The Author(s) 2020

Article reuse guidelines:

sagepub.com/journals-permissions

DOI: 10.1177/2515127420975176

journals.sagepub.com/home/eex



Luciana Padovez Cualheta¹  and
Gardenia da Silva Abbad¹

Abstract

Entrepreneurship education outcomes have been poorly evaluated. Previous research focused mostly on subjective measures like entrepreneurial intention that does not necessarily turn into behavior, and have mostly used self-perception questionnaires. Learning and competence results have been under researched. Therefore, the use of situational judgment tests to assess entrepreneurship education learning outcomes is proposed. This is an exploratory study that presents the development and validation process of situational judgment tests, following twelve steps, including the analysis of course's materials, focus groups with professors and former students, expert validation, semantic validation, empirical validation, the definition of correction sheets and equivalence tests. The course is presented in details and its goals are defined using a learning taxonomy. Results present the three situational judgment tests that were developed and the correction sheets that can be used to guarantee correction in an objective manner. The situational tests developed in this study can be used to evaluate courses with similar goals and the development and validation process can be adopted to evaluate other courses.

¹Faculty of Economics, Administration, Accounting and Public Policy Management, University of Brasilia, UnB, Brasilia, Brazil

Corresponding Author:

Luciana Padovez Cualheta, Faculty of Economics, Administration, Accounting and Public Policy Management, University of Brasilia, UnB, Brasilia GO 70910-900, Brazil.

Email: lucianapadovez@outlook.com

Keywords

entrepreneurship education, learning evaluation, situational judgment tests

Entrepreneurship education helps students develop the mindset, skill set and practice necessary to start new ventures (Neck & Corbett, 2018) deal with uncertainties (McNally et al., 2018) and learn entrepreneurial competences to survive in an ever-changing world (Lackéus, 2015). Regardless of their career choice, every student can benefit from learning how to solve problems in an innovative way, and, therefore, entrepreneurship education will continue to grow (Henry et al., 2005).

Even though entrepreneurship education is supposed to be innovative and encourage innovation, its assessment practices are still traditional and conventional (Pittaway et al., 2009). In fact, there is insufficient research focusing on assessment practices and its relationships with entrepreneurship outcomes (Fayolle, 2013, 2018; Pittaway et al., 2009). Entrepreneurship education requires practices of assessment capable of effectively assessing learning and, for that, these should be innovative (Pittaway et al., 2009).

Although entrepreneurship education has a positive impact on students' intentions and attitudes towards entrepreneurship, there is still little evidence as to whether it helps create better entrepreneurs (Martin et al., 2013; Matlay, 2006; Nabi et al., 2017; Pittaway & Cope, 2007). There is a continuum of the desired outcomes of entrepreneurship education. At a minimum, it is expected that students learn about entrepreneurship. It would be even better if students develop an entrepreneurial mindset and entrepreneurial competences. Ideally students will start their own business, or truly practice entrepreneurship (Neck & Corbett, 2018).

Researchers that investigate entrepreneurship education outcomes have found both positive and negative results. Most research is below the expected methodological rigor, which could help explaining controversial results (Martin et al., 2013; Nabi et al., 2017).

Nabi et al. (2017) analyzed 159 studies on entrepreneurship education outcomes published between 2004 and 2016. The most common indicators were related to lower-level indicators of personal change, such as intention to start a business. Intention does not necessarily turn into behavior and more research is needed to understand the link between both (Bauman & Lucy, 2019; Fayolle, 2018; Loi, 2018; Nabi et al., 2017). Even though students intend to start a business in the future, they might not do it right after they finish the course, because they are more worried about getting their degree than starting a venture (Maritz & Brown, 2013), and because of timing and financial issues (Loi, 2018). Therefore, intention is not a good enough measure of entrepreneurship education outcomes (Fayolle, 2013; Loi, 2018).

The main goal of entrepreneurship education is to develop some level of entrepreneurial competences (Lackéus, 2015), but previous reviews and

meta-analysis (Martin et al., 2013; Nabi et al., 2017; Rideout & Gray, 2013) have shown that competence-related outcomes have been under researched. Moreover, competence instruments frequently used were developed to assess competences of entrepreneurs who already own a business, and are not appropriate measures for students, as they may not want to start their business right away. Educators probably wonder if their graduates feel they have the adequate skill sets to successfully launch their business venture (Bauman & Lucy, 2019), to know if their teaching efforts are paying off. Entrepreneurship education could help clarify how entrepreneurial learning happens and how entrepreneurial competences develop (Fayolle, 2018).

Learning is observed through relatively permanent change in behavior and can be inferred by comparing the individuals' behavior before and after the learning situation (Gagné & Medsker, 1995). Therefore, entrepreneurship learning outcomes could be the fulfillment of certain competences (Man, 2012).

Most learning outcomes of entrepreneurship courses in higher education are usually assessed only through exam scores (Mwasalwiba, 2011), which are traditional declarative-knowledge tests that require students only to recall the contents they have learned and not to demonstrate their behavior (Duval-Couetil, 2013). These exam scores are declarative-knowledge tests that only require students to remember the contents they have learned and not to demonstrate their behavior (Duval-Couetil, 2013). Therefore, these are not proper measures of learning outcomes (Gagné & Medsker, 1995).

In addition, researchers tend to use self-report measures which can cause biases, due to students' perceptions when comparing themselves to others (Lans et al., 2018), and due to social desirability (Bell et al., 2017). Competences are latent constructs and therefore are context-dependent. By using self-perception questionnaires, the researcher identifies how students feel at that moment, but not changes on behavior (Lans et al., 2018). Therefore, the assessment of entrepreneurial competences should be behavior-based (Schelfhout et al., 2016), performance-based and invite learners to show behavior as close to reality as possible using scenarios, cases, simulations and others (Lans et al., 2018).

There is a need for more innovative learning assessment methods (Fayolle, 2013) that are behavior-based and performance-oriented (Lans et al., 2018), and that can measure the students' learning outcomes, whether they start their business or not. We propose the use of situational judgment tests (SJTs), which are low-fidelity simulation tests designed to assess preferences for behaviors in job-related situations (Gessner & Klimoski, 2006). Students are presented with situations they are likely to face in real life, when evaluating a business opportunity and planning and creating their businesses, and are asked to answer what they would do in each situation. Each SJT captures job-related competences and skills and can be used to evaluate learning outcomes of training (Fritzsche et al., 2006).

This article goal is to present the development process of situational judgment tests that can evaluate undergraduate entrepreneurship courses. The course will be presented, as well as the twelve steps taken to elaborate and validate the SJTs. The article contributes to the literature on entrepreneurship education as it presents a new assessment practice that does not rely on self-report measures, which can be biased due to students perceptions or to social desirability (Bell et al., 2017).

The SJTs are an innovative way of assessing entrepreneurship education learning outcomes, which can be performance indicators (Whetzel & McDaniel, 2009). Moreover, SJTs are low-fidelity simulations (Gessner & Klimoski, 2006) that can be effective for evaluating courses that adopt practice-based teaching methods that rely on activities based on design thinking, customer development and business models. The tests presented in this article can be used to evaluate the learning outcomes of courses with similar goals, and the development process of the tests can be replicated to other courses with different goals.

Still, SJTs can be a point of departure of a discussion between educators and students about how to make decisions and how to behave best according to the situation (Lans et al., 2018). They can also help students better understand how to behave in each situation and help educators make decisions about the course, after analyzing the students' performance on the tests.

Entrepreneurship Education

Bauman and Lucy (2019), based on the frameworks of what skills are necessary to successfully launch a new business, state that academic programs should provide a combination of theoretical and practical experiences. Courses should focus not only on the entrepreneurial process, but should also prepare students to handle with unpredictable situations and deal with failure. Students can only learn entrepreneurial skills if they experience and practice the various aspects of new venture creation. The lessons from new venture creation can stimulate creativity, team building, and the willingness to solve numerous problems around the globe (Neck & Corbett, 2018).

Neck and Corbett (2018) present the activities that constitute practice of entrepreneurship, such as “generating new ideas, using design thinking, customer development, experimenting, negotiating contracts, pitching ideas, prototyping, developing and testing business models, and actually starting a venture” (Neck & Corbett, 2018, p. 28). These activities require students not only to recall contents and talk about them, but also to act and practice what they have learned (Neck & Greene, 2011).

Rather than developing a business plan, customer development emphasizes the need to go to the market and test the critical assumptions about the product, service or business by developing minimum viable products, and continuously

testing and pivoting their business ideas in an iterative process (Blank & Dorf, 2012). Several academics use the Business Model Canvas to stimulate students to leave the classroom and interact with customers (Ramani et al., 2018).

The Business Model Canvas proposed by Osterwalder and Pigneur (2010) is composed of nine blocks and helps people understand their business idea in a holistic way, answering what is the business value proposition, what are the customer segments, how to establish a relationship with customers and get to them, the activities and resources necessary for to run the business, important partnerships and financial decisions. It is particularly useful when students work in teams, helping them to organize and discuss their ideas (Lackéus, 2015).

Design Thinking also encourages students to develop ideas that are human-centered, based on their customers' needs and opinions. These approaches are important, because they stimulate students to act, instead of just planning. Students interact with various stakeholders in the value creation process, learn how to make decisions and take risks (Lackéus, 2015). Although these are valuable teaching methods, more research is necessary to understand their outcomes (Fayolle, 2013).

Entrepreneurship Education Outcomes

Pittaway and Cope (2007) conducted a systematic review of the literature of 185 articles published between 1970 and 2004, and mapped entrepreneurship education in themes. They found that student attitudes and perceptions change when they engage in experiential learning, but found no or little evidence that these attitudinal changes lead to action. They also found empirical support that entrepreneurship education increases intention to start a business, but, as studies do not follow intentionality into to action, there is little evidence that intention actually leads to the creation of new ventures or if entrepreneurship education increases the success of ventures. In turn, Rideout and Gray (2013) conducted an extensive literature review regarding entrepreneurship education outcomes and found that EE stimulates the creation of business startups, increases intention to start business, increases self-efficacy, but can also decrease self-efficacy, contributes to the development of entrepreneurial competencies, and improves opportunity identification.

Martin et al. (2013) conducted the first meta-analysis grounded in the human capital theory that evaluates entrepreneurship education outcomes, and found that the entrepreneurship human capital assets that have been researched are knowledge of the entrepreneurial process, competency in identifying innovative business opportunities, competency in dealing with ambiguity in decision-making, positive perceptions of entrepreneurship, attitudes towards entrepreneurship, self-efficacy and intention to become an entrepreneur. Entrepreneurial outcomes usually investigated are nascent behavior, start-ups opened, entrepreneurship performance and success.

Recently, Nabi et al. (2017) analyzed 159 studies on entrepreneurship education impact published between 2004 and 2016, and found that the most common indicators are related to lower-level indicators of personal change, such as intention to start a business (51% of the articles), perceived feasibility (26%), skills and knowledge (21%) and attitude (20%). Higher-level, long-term indicators were less frequent and only 21 articles (13%) studied startups, and 8 (5%) considered venture performance.

These outcomes can be classified according to Kirkpatrick's (1995) taxonomy for training evaluation, with four levels: (1) reaction, which are positive or negative perceptions towards the course, intention to become an entrepreneur, attitudes toward entrepreneurship; (2) learning, which are the knowledge, skills, and attitudes students have learned; (3) behavior, like the decision to pursue a business idea, or developing a business model; and, (4) result levels, which are the number of startups created, number of jobs created by new businesses, and growth of existing firms.

The second level of Kirkpatrick's (1995) taxonomy, namely learning, refers to the processes of retention, generalization and application of knowledge, skills and attitudes (KSAs) acquired during training (Baldwin & Ford, 1988). According to Gagné and Medsker (1995) learning is defined as a change in behavior, typically an increased capability for some type of performance. Therefore, entrepreneurship learning outcomes can be the achievement of certain competences (Man, 2012) and should be measured using behavior-based tests. Instead of asking students how competent they think they are, we should present them with a situation, so they can say what they would do and how they would behave in that situation. Thus, situational judgment tests will be presented next.

Situational Judgment Tests

Situational Judgment Tests (SJTs) are measurement tools that capture job-related competences (Lievens et al., 2008) by presenting respondents with a situation and asking them what they *should do* or *would do* in a given situation (Whetzel & McDaniel, 2009). These are low-fidelity simulations (Gessner & Klimoski, 2006) that have been widely used as human selection tools (Fritzsche et al., 2006), to assess performance at work (Lievens et al., 2008), to measure attributes like empathy, integrity and resilience (Patterson et al., 2012), and can be used to assess learning outcomes in training (Fritzsche et al., 2006).

SJTs can be used as a part of the training itself. Trainers can guide discussions regarding the respondents' choices and why an answer is appropriate. More advanced trainees can help less advanced ones. Feedback can be provided to improve learning and reflective practices. So, SJTs can be used as an active

learning tool to improve training outcomes (Fritzsche et al., 2006). Table 1 presents a summary of its definitions.

Anderson et al. (2017) evaluated different measurement approaches to students’ interpersonal and intrapersonal skills, and found that SJTs can reduce some concerns related to bias and validity present in self-report measures. Self-reports include questionnaires, in which respondents do not depend on the researcher and read and respond to an assertion, selecting the best response option. SJTs, in turn, can measure knowledge, skills and decision-making by creating relevant scenarios for learning contexts. SJTs may represent real life and is a better approach than self-report questionnaires to measure changes in students’ perceptions, behaviors and attitudes (Anderson et al., 2017).

In psychology research SJTs are used to assess various constructs, such as knowledge and skills, applied social skills, teamwork skills, leadership and basic personality tendencies (Christian et al., 2010). They have been used to evaluate business games as teaching tools in Technology Management (Ben-Zvi & Carton, 2008). Recently, these have been reviewed for use in medical education (Anderson et al., 2017) and for assessing social competence in vocational education and training (Monnier et al., 2016). In the present article we propose its

Table 1. Situational Judgment Tests Definitions.

Definition	Author
“STJ items present respondents with work-related situations and a list of plausible courses of action. Respondents are asked to evaluate each course of action for either the likelihood that they would perform the action or the effectiveness of the action.”	Whetzel & McDaniel, 2009, p. 188
“SJTs are considered measurement tools that aim to capture job-related competences and skills.”	Lievens et al., 2008, p. 346
“In the typical SJT, an applicant is presented with a variety of situations he or she would be likely to encounter on the job- these situations are usually gleaned from critical incidents or other-job-analytic methods.”	Weekley & Ployhart, 2006, p.1
“The SJT can be defined as a low to moderate-fidelity simulation or work sample designed to assess preferences for appropriate behaviors in work situations.”	Gessner & Klimoski, 2006, p. 26
“SJTs are tests that present brief descriptions of problematic situations like those that occur on the job and ask applicants to indicate how they would or should respond to them”	Motowidlo et al., 2006, p. 58

Source: Prepared by the authors.

use to evaluate learning outcomes in entrepreneurship education in higher education. SJTs development process and validation will be presented next.

Method

This is an exploratory study that aimed to develop situational judgment tests with evidences of validity to evaluate learning in entrepreneurship education. To operationalize the research, an entrepreneurship undergraduate course was chosen. According to Lievens and de Soete (2015) the development of SJTs requires job analysis to identify crucial KSAs to performance. Therefore, the course, its goals and the situational judgment tests design process will be presented.

The Course

The course evaluated is a 32-hour university extension course. It is held in 8 meetings of 4 hours each, and its general goal is the development of entrepreneurial skills at the University. The course combines active and passive teaching methods, with lectures, case discussions, development of business models and activities that stimulate product sales, and validation of the business idea with potential clients. Some of the contents covered are: Market Research, Entrepreneurial Behavior, Design Thinking, Customer Development, Business Model Canvas and Pitch. The course is delivered by professors engaged in entrepreneurship education research.

In the first class, students learn the concepts of entrepreneurship and entrepreneurial skills, and a successful entrepreneur is invited to participate and share his/her story. Then, the class is divided into groups, with no more than 5 students each. Each group receives R\$20,00 (approximately five dollars) and are challenged to think of ideas to multiply that money, making profit in one week. The team making the most money is the winner. In the next class, students think over what they have learned from this activity.

Then, students are divided into new workgroups and are encouraged to think of a business idea. This idea is developed until the end of the course. Professors use practical activities, so students can validate their business idea with potential customers, partners and suppliers. Students learn to research the market; design customer relationship strategies; define channels; what activities and resources are necessary for the business to work; calculate costs; define sales price; how to choose partners and funding sources. In the last class the pitch of each business is presented to an examination board that simulates a pitch competition, and the best idea is chosen and awarded with entrepreneurship books and a special certificate.

Situational Judgment Tests Design Process

To elaborate situational judgment tests that could measure learning, 12 steps were followed (Figure 1). First, courses materials, documents, syllabuses and slides were analyzed. That allowed identifying the course content, teaching methods adopted, and activities proposed.

Then, two focus groups sessions were held. Two professors of the course and the coordinator of the technological innovation department (who was responsible for the course) participated in the first focal group session. This goal of the session was to identify which competencies they expected students to develop during the course, and what were the learning goals of the course. They also had to describe in which situations they expected students to use each competence and the complexity levels of each learning goal. The focal group lasted fifty-three minutes.

Six former students that attended the course in 2016 participated in the second focus group session. They were chosen because of accessibility issues. The goal of that session was to identify which competencies students had developed during the course, what they had learned, and in which situations they used each of the competences. To do that, a definition of entrepreneurial competence was presented to students, and they were asked to write down which

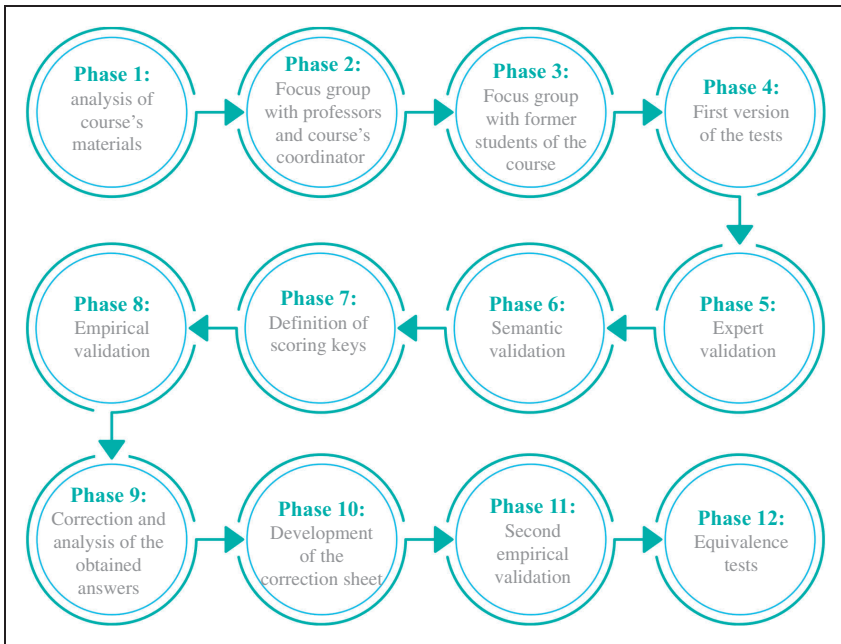


Figure 1. Situational Judgment Tests Development.

ones they believed they had developed during and because of the course. This activity lasted twenty minutes.

Then, each student read what they wrote, and the group discussed their answers. During the discussion, they were asked to describe situations in which they used each of the competencies. They had to recall situations in which they believed they were successful, and which competence contributed to that success, and should recall situations in which they made mistakes and what competence could have been used to avoid that mistake. This second part of the focus group session was seventy-two minutes long. Both focal group sessions were recorded, upon participants' authorization.

Data was transcribed and analyzed, according to Bardin (1977) recommendations. The corpus of analysis consisted of 40 pages and 14,347 words. Three independent researchers categorized the entrepreneurial competences and situations mentioned by the participants. This analysis grounded the elaboration of the first version of the situational judgment tests, accordingly to the learning goals of the course presented in Table 2. Three different situational tests were elaborated, so that it was possible to test if they were equivalent and use them in pre and posttests.

There is no consensus in literature regarding which scoring key is the best option (Whetzel & McDaniel, 2009). As entrepreneurship is a complex and dynamic field, there are no definitive or wrong answers, so multiple answers would not be appropriate, because students would be able to infer the best answer by reading all the possible answers. Therefore, we decided to use open-ended items. Instructions were behavioral based and asked respondents what they *would do* in each situation, because these are considered to be better performance measures (Lievens & de Soete, 2015; Motowidlo et al., 2006).

It is important to use pilot tests to get opinions about instructions, modality, item format and item order (Gessner & Klimoski, 2006). So, after the three situational judgment tests were elaborated, they were validated by experts. Three entrepreneurship researchers were asked to analyze which competence each of the items was trying to measure. They also should analyze if instructions were clear and if tests were balanced in terms of complexity levels. They were contacted by e-mail in 2017 and received an evaluation sheet. After their analysis and recommendations, one item was excluded, two items were modified and the instruction of the second test was better described.

Then, three former students of the course were asked to read the tests and evaluate if instructions were clear and if tests were balanced in terms of complexity levels. They suggested changes in three words in two different items, and suggested enlarging the larger blank spaces for answers between each question, because students' handwriting was not the same and some of them could need more space. The final version of the tests is composed of three situations and fifteen items that refer to each of these situations.

Table 2. Learning Goals According to Anderson's et al. (2001) Taxonomy.

	Remember	Understand	Apply	Analyze	Evaluate	Create
Conceptual	Remember the concept of entrepreneurship; Report the resources required to run the business; Declare the business cost sources; Declare potential forms of investment in the business.		Exemplify the different types of entrepreneurship.	Identify proper partners to the business.	Select partners with supplementary skills and shared goals to the business.	
Procedural	Declare the main activities required to run the business.		Apply techniques to select one or more customer segments that fit into the business.		Evaluate business opportunities through market survey; Evaluate if the business model selected is suitable to meet the customers' needs; Be capable of selecting the channels to be used to raise awareness among customers about the product; that are related to the enterprise, and suitable to deliver the product to them. Select the proper pricing strategy so that the product or service price is competitive and suitable to the target audience.	Conceive strategies of relationship with customers according to the segment elected; Prepare the business value proposal, emphasizing benefits and differentials; Produce an adequate prototype to validate the business ideas; Summarize a business idea validated in the business model canvas. Make a presentation that summarizes all important and required information about the business, and that could be presented in no longer than 5 minutes.

(continued)

Table 2. Continued.

	Remember	Understand	Apply	Analyze	Evaluate	Create
Metacognitive					Evaluate the entrepreneurial competences s/he has. Evaluate the entrepreneurial competences s/he should develop.	

Source: Prepared by the authors.

Next, tests were presented to three entrepreneurship professors and researchers from the Federal University of Goiás. These professors were selected because they teach entrepreneurship courses of content and methods similar to the course to be assessed using the situational tests. Tests were e-mailed to them jointly with the explanation about the elaboration process, and the instructional goals of the course and of each item to be assessed. They were then asked to answer which was the ideal right answer expected from respondents, the answer to be best scored.

Then, the three professors attended a focal group session, where they presented their answers to each of the test items. Each answer was discussed until reaching consensus on the ideal answer intended, and the minimum requirements to score 10 in each item. This was the first stage to prepare the scoring key to the tests. Preparing the whole scoring key demanded identifying the likely answers to each item, and defining the ideal score to each of them. Thus, the questionnaire was submitted to an initial sample of respondents.

Undergraduate professors belonging to the researcher's contact network were contacted to ask authorization for their students to participate in the research. Questionnaires were applied in the year of 2018 to a sample of 175 undergraduate students of the Administration, Law, Accounting Sciences and Information Systems courses of the Federal University of Goiás (UFG), Pontificia Universidade Católica of Goiás (PUC-GO) and Faculdade Cambury. Among respondents, 90 had previously attended some entrepreneurship course or course, while 75 had never attended. Moreover, 10 successful entrepreneurs (running their businesses for more than 5 years) have also completed the tests.

As stated by Weekley et al. (2006), participants could be subject matter experts and nonexperts, assuring response variability and different points of view. The purpose was to get a wide range of answers that could be graded and scored by the entrepreneurship professors to outline the test scoring keys. Moreover, applying the tests to that sample allowed discovering if the test items were balanced in terms of difficulty. To encourage participation, all respondents that completed the situational judgment tests would win a free entrepreneurship or digital media course delivered by the researcher.

Tests were randomly distributed, and 57 participants completed the situational test A, 59 completed the situational test B, and 59 completed the situational test C. Tests were printed and applied on-site, in the presence of the researcher. The shortest time of response was 18 minutes and the longest time of response was 47 minutes. As soon as the questionnaire was delivered, the researcher checked if all questions had been completed.

Then, all answers were inserted in an Excel table made up by 15 tabs (1 to each item), with 175 rows each (one to each respondent). The same three entrepreneurship professors and researchers that participated in the first stage of the scoring key elaboration were invited to participate in this stage. Each of them should individually assess the participants' responses to each test item. They

were asked to read and score each answer from 0 to 10, having in mind the expected maximum score (10) answer, as defined in the previous stage. This stage lasted 4 months.

As soon as the spreadsheets with the score assigned by each evaluator were returned, scores were compared. Mean and standard deviation statistics were prepared using the evaluations by the three experts. Mean score of answers with standard deviation lower than two were considered. Answers with standard deviation higher than two were subjected to a new on-site and group discussion among evaluators, until consensus was reached.

These stages allowed preparing a correction sheet, with standardized criteria to be followed by any evaluator willing to grade the tests. As the research employed open questions, and to respect the dynamic nature of entrepreneurship that allows a wide range of answers to the same item, it demanded a correction sheet. The sheet eliminates the subjective nature of grading, and converses all answers in 0 – 10 score, based on criteria defined by experts and empirically validated. The correction sheet shows several criteria, scoring each criterion. The evaluator should read the answer and check on the sheet which criteria were met. Even if the sum of criteria exceeds the score 10, the maximum score to be assigned to an item is 10 points.

Finally, the last stage was a second empirical validation of the situational tests to check equivalence, so these could be applied in pre and post-tests and used to assess the course in terms of learning. To that, a sample of Administration undergraduate course students, selected by convenience, was picked. In this stage, variability of answers was not as important as checking the answers equivalence, even upon the change of situation in each of the three questionnaires.

Each student should complete the three questionnaires (A, B and C) so their answers could be compared and any alteration ensuing from change on situation could be observed. To avoid testing and tiredness effects, tests were balanced when they were distributed to students. Therefore, one third of the students received the tests in the ABC sequence, one third in the BCA sequence, and one third in the CAB sequence. The sample was made up by 67 students, of which 35 were female students and 32 were male students. The mean response time was 60 minutes, and each test comprised 15 questions.

The students' responses were inserted in an Excel spreadsheet. Three professors graded the items, supported by the previously designed correction sheet. Only item 1 had problems regarding the score assigned by evaluators, as some answers were not given in the previous stages and had not been included in the correction sheet. Therefore, the three professors discussed the grading of this item in group, and the correction sheet was reviewed.

The scores of the answers to each item were compared, two by two, using the Wilcoxon test to evaluate if the mean population signed ranks were different, as data did not present normal distribution (Tabachnick & Fidell, 2013). Results

pointed out equivalence of answers ($p > 0.05$), indicating that situational tests are equivalent and may be used to evaluate the course learning effects over time, using at least three measures with pre and post-tests, as recommend by Abbad and Carlotto (2016).

Results

Entrepreneurial learning outcomes and assessment practices are (or should be) deeply connected with the course's learning goals (Fayolle, 2013; Pittaway et al., 2009). Learning can only be assessed if one knows what students are supposed to learn. Still, entrepreneurship education learning goals are usually poorly described (Fayolle, 2013) and educator-centered, when they should be student-centered (Fayolle & Gailly, 2008; Loi, 2018; Neck & Corbett, 2018). Therefore, we propose the use of Anderson's et al. (2001) taxonomy to help educators properly define and assess entrepreneurship education learning goals.

Anderson's et al. (2001) taxonomy table is composed of two dimensions, which can be represented as a table. The horizontal dimension is known as the Cognitive Process Dimension and goes from the least complex (remember) to the most complex (create) cognitive process. The vertical dimension is known as the Knowledge Dimension and consists of four types of knowledge: factual (terminology, details and elements needed to be acquainted with a subject matter), conceptual (classification in categories, principles, theories and structures), procedural (knowing how to make or do something), and metacognitive (awareness and knowledge of one's cognition, self-knowledge). Table 2 shown in the Method section presents the educational objectives of the course analyzed in this paper, following Anderson's et al. (2001) taxonomy. These were fundamental to elaborate the situational judgment tests, and to the elaboration of the fifteen items that refer to each of the situations.

Situational judgment tests were elaborated considering the course's goals, the complexity levels of cognitive process required by the students, and the types of knowledge they were expected to learn. Therefore, situations are similar to what they have learned in classes, assuring that they measure the competences learned during the class, without demanding from students any knowledge that they do not know. Situations are presented in Figure 2.

After each situation, students are presented with fifteen items, that were elaborated according to the educational objectives of the course. Situations change, but the fifteen items are the same. The educational objectives of the course and the items that refer to each of them are presented in Table 3.

As entrepreneurship is a dynamic and complex area, the use of objective questions could interfere with the test results, since students can infer which was the right answer just by reading all the options and identifying the one that seems to be ideal. To avoid this problem, the items related to the situational

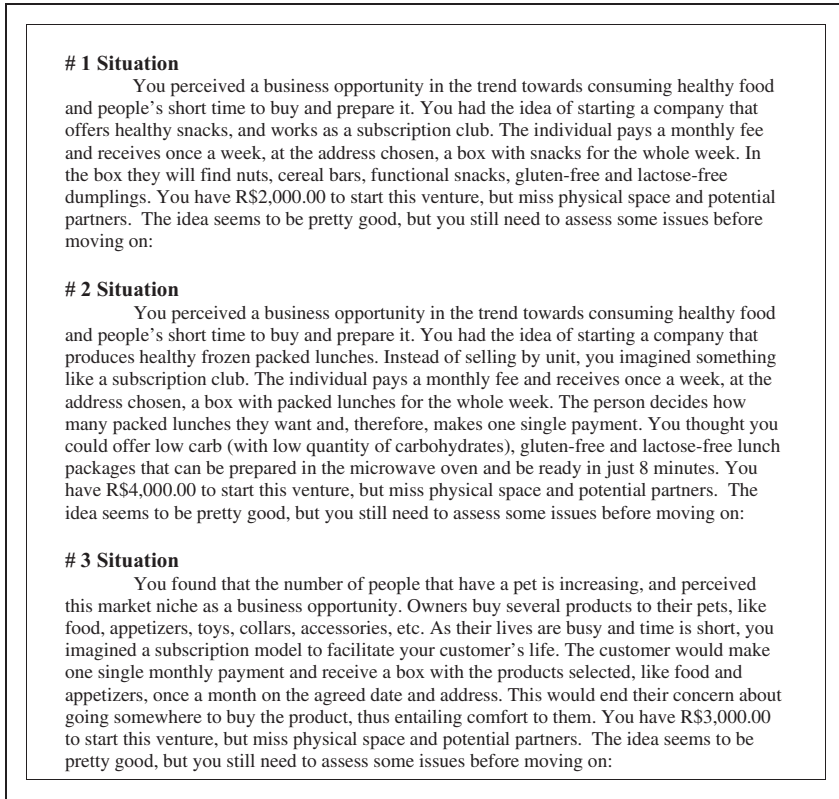


Figure 2. Situational Judgment Tests.

tests proposed in this research are open-ended, allowing the student to freely write what he/she would do in each situation.

To that, several steps were followed to elaborate the correction criteria, ensuring that correction was as objective as possible. Tests were applied to a large sample of respondents made up of both experts and laypeople, allowing a wide range of responses, and identifying the likely responses for when the test is actually applied to evaluate an entrepreneurship course. Still, answers were graded by experts, professors and researchers of entrepreneurship, and the items presenting disagreement in the evaluation were discussed until a consensus was reached. That allowed preparing the correction sheets to be used to support grading. The correction sheets present the likely answers and number of points that should be assigned to each answer.

Table 4 presents the correction sheet prepared for item 15. If the student answers only "what is the problem solved by the business", he/she scores 4

Table 3. Situational Judgment Tests Elaborated According to Educational Objectives.

Educational Objective	Item
Evaluate business opportunities through market survey.	What would you do to know if this is really a good business opportunity, considering that your intended market is limited to Goiania?
Apply techniques to select one or more customer segments that fit into the business.	What would you do to elect your target audience?
Evaluate if the business model selected is suitable to meet the customers' needs.	What would you do to understand if the business model chosen (subscription fee) is really the one desired by the target audience?
Declare the business value proposal, emphasizing benefits and differentials.	When selling this service to a customer, what value proposal would you communicate to them?
Conceive strategies of relationship with customers according to the segment elected.	What types of relationship with customer would you choose to this business? Why?
Be capable of selecting the channels to be used to raise awareness among customers about the product, which are related to the enterprise, and suitable to deliver the product to them.	What channels would you elect to this business? Why?
Produce an adequate prototype to validate the business ideas.	You decided to produce a prototype to validate your business idea. What type of prototype would you choose? What resources would you use to produce this prototype?
Report the required resources to run the business.	What key resources you should have to successfully start your business?
State the main activities required to run the business.	What are the main key activities you should perform?
Identify the proper partners to the business.	To be successful, you need business partners. What partners would you choose?
State the business cost sources.	What would be the main costs of this business?
Select the proper pricing strategy so that the product or service price is competitive and suitable to the target audience.	How would you price your service?
State potential forms of investment in the business.	You don't have money enough to start your business and, thus, decided to seek for support. What potential sources could you choose to fund your business?

(continued)

Table 3. Continued.

Educational Objective	Item
Select partners with supplementary skills and shared goals to the business.	You have skills and knowledge in the field of management and marketing, but miss experience with nutrition and distribution. Therefore, you decided to find the ideal partner to your business. What characteristics would you pursue in that person to consider him / her an ideal partner?
Make a presentation that summarizes all important and required information about the business, and that could be presented in no longer than 5 minutes.	You have been selected to attend an event in your city, where you will meet several investors. To that, you should prepare a pitch (brief presentation of your business idea). Please write here the bullet text of the pitch, considering you will have no more than 5 minutes to speak.

Source: Elaborated by the authors.

points. If they answer “what is the problem solved by the business” and also “what is the solution proposed by the company”, the score is 8, and so on. Even if the student’s answer covers all items presented in the correction sheet, the maximum score assigned to each item should not exceed 10. This ensures that responses variability is considered by the time of grading.

Discussion

Teaching entrepreneurship in higher education is not enough; evaluating outcomes is equally necessary. Educators should be able to answer what students must be able to do by the end of the program, if they have learned and if learning can be improved. Assessment-associated benefits refer to the capability of delivering improved education for students, creation of basic standards for scholars, and legitimization of the program with different stakeholders, which may help funding (Duval-Couetil, 2013).

Possible stakeholders are students, faculty, university administrators, program administrators, donors and communities. Students are interested in acquiring knowledge and skills that are valuable to the market. Faculty wants to demonstrate that learning in their classes is recognized by students and peers, and that students are actually learning. Program administrators want to know how valuable the program is to the university, students and community. University administrators want to prove that the university is fulfilling its mission. Donors need to know the program benefits, how they relate to their

Table 4. Correction Sheet for Item 15.

Possible answer	Yes	No	Weight
What is the market pain/problem solved by the business			4
What is the proposed solution			4
What is the size of this market			3
How the proposed solution differs from other solutions			3
What are the monetization strategies?			3
Technical capacity			3
Validation with customers			3
Initial investment / payback			3

Source: Prepared by the authors.

interests and goals, and if they actually work; community wants to know the program's contributions (Duval-Couetil, 2013).

Therefore, assessment measures must be innovative and demonstrate the competences students have learned, and changes in their behavior. One cannot expect students to start their business right after they finish the course or graduate from college, because they might want to work in other organizations before starting their business (Loi, 2018), or because they do not have the financial support required to start (Maritz & Brown, 2013). As educators in higher education, professors teach people who probably never started a business (Fayolle, 2018) and for that reason, instruments have to rely on the competence set students have learned during the course, instead of focusing only on the competences of successful entrepreneurs.

Still, self-assessment questionnaires capture students' perceptions of their feelings in that moment (Lans et al., 2018), and students may compare themselves with their classmates and judge their capacities based on that comparison. Also, self-perception measures involve high levels of social desirability. So, assessment instruments that measure competences should invite respondents to behave as close to reality as possible (Lans et al., 2018) answering how they would behave in each situation, instead of how much they believe they have developed that competence.

Although situational judgment tests are a good alternative, some issues should be considered. People can fake their answers to score favorably, especially when SJTs are used for selection purposes. However, faking can be reduced by using knowledge-based instructions (would do items), like the ones proposed in this article (Whetzel & McDaniel, 2009). Also important is the problem of coaching. If tests are used at the end of the course in every semester, individuals may wish to coach friends, for example. So, the educator may randomly select SJTs from a larger sample or split an existing SJT in two halves (Cullen et al., 2006).

Regarding scoring issues, we adopted a hybrid strategy. Empirical scoring, because tests were answered by a large sample of students, including experts and non-experts. Expert-based scoring, because subject matter experts (SMEs) were asked to make judgments about the items to correct them so the correction sheets could be developed. And theoretical scoring, because the right and wrong answers were developed according to entrepreneurship theories (Bergman et al., 2006). Even though we used open-ended questions, the correction sheets make it possible for various educators to grade the tests using the same objective criteria, which is an important contribution of this article.

The SJTs presented in this article were developed (a) from entrepreneurship tools, especially Business Model Canvas, Customer Development and Design Thinking; (b) from the course instructional goals; and, (c) from former students' and educators' perceptions regarding in which situations students could use the competences they have learned in the course. Therefore, the tests do not have a purely practical orientation and are also theory-based and SJTs that are more theoretically grounded tend to have higher reliability (Campion et al., 2014).

Conclusion

The goal of this article goal was to present the development process of situational judgment tests to evaluate entrepreneurship education in higher education in a more innovative way. Situational judgment tests are behavior-based assessments and ask students what they would do in a situation, instead of asking them how competent they think they are. Not only they help avoid social desirability issues or self-assessment problems that can happen when using self-report questionnaires, but they are also useful to measure entrepreneurial competences, which require students to do more than just talk about a topic, actually demonstrating their behavior.

The steps proposed by Lievens and de Soete (2015) were taken and Anderson's et al. (2001) taxonomy table was used. To our knowledge, this is the first time that entrepreneurship education goals are defined using a taxonomy that considers both the type of knowledge and the cognitive process complexity levels. As tests were elaborated using the instructional goals as departure points and reviewed by experts, construct validity is not an issue.

The questions are open-ended, but theoretical-based, expert-based and empirical-based scoring key strategies were applied, so items can be graded in an objective manner. The correction sheets developed and presented in this paper are an innovative way of grading situational judgment tests.

As the course and its goals are described in detail, the situational judgment tests developed in this article can be used to evaluate learning outcomes of courses with similar goals. Yet, the development process can be replicated to other courses, that have other goals than that presented herein.

Next, we suggest using the tests to evaluate entrepreneurship education in higher education learning outcomes, using pre and pos-tests, to see if learning happens and how it evolves in time. Tests were freely translated to the English language, so cross-cultural adaptation and translation is recommended. Also, researchers could try to use situational judgment tests in video formats and compare its results with the paper-and-pencil format suggested in this paper.

Declaration of Conflicting Interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Funding

The author(s) received no financial support for the research, authorship, and/or publication of this article.

ORCID iD

Luciana Padovez Cualheta  <https://orcid.org/0000-0003-3893-6181>

References

- Abbad, G. S., & Carlotto, M. S. (2016). Analyzing challenges associated with the adoption of longitudinal studies in work and organizational psychology. *Revista Psicologia: Organizações e Trabalho, 16*(4), 340–348.
- Anderson, L. W., Krathwohl, D. R., Airasian, P. W., Cruikshank, K. A., Mayer, R. E., Pintirch, P. R., Raths, J., & Wittrock, M. C. (2001). *A taxonomy for learning, teaching and assessing: A revision of bloom's taxonomy of educational objectives*. Longman.
- Anderson, R., Thier, M., & Pitts, C. (2017). Interpersonal and intrapersonal skill assessment alternatives: Self-reports, situational-judgment tests, and discrete-choice experiments. *Learning and Individual Differences, 53*, 47–60. <https://doi.org/10.1016/j.lindif.2016.10.017>
- Baldwin, T. T., & Ford, J. K. (1988). Transfer of training: A review and directions for future research. *Personnel Psychology, 41*(1), 63–105. <https://doi.org/10.1111/j.1744-6570.1988.tb00632.x>
- Bardin, L. (1977). *Análise de conteúdo* [Content analysis]. Edições 70.
- Bauman, A., & Lucy, C. (2019). Enhancing entrepreneurial education: Developing competencies for success. *The International Journal of Management Education, 100293*. <https://doi.org/10.1016/j.ijme03.005>
- Bell, B. S., Tannenbaum, S. I., Ford, J. K., Noe, R. A., & Kraiger, K. (2017). 100 Years of training and development research: What we know and where we should go. *The Journal of Applied Psychology, 102*(3), 305–323. <https://doi.org/10.1037/apl0000142>
- Ben-Zvi, T., & Carton, T. C. (2008). Simulation gaming in technology management. *AMCIS 2008 Proceedings, 81*. <http://aisel.aisnet.org/amcis2008/81>
- Bergman, M. E., Drasgow, F., Donovan, M. A., Henning, J. B., & Juraska, S. E. (2006). Scoring situational judgment tests: Once you get the data, your troubles begin.

- International Journal of Selection and Assessment*, 14(3), 223–235. <https://doi.org/10.1111/j.1468-2389.2006.00345.x>
- Blank, S., & Dorf, B. (2012). *The startup owner's manual: The step-by-step guide for building a great company*. K&S Ranch Publishing.
- Campion, M. C., Ployhart, R. E., & MacKenzie, W. I. (2014). The state of research on situational judgment tests: A content analysis and directions for future research. *Human Performance*, 27(4), 283–310. <https://doi.org/10.1080/08959285.2014.929693>
- Christian, M. S., Edwards, B. D., & Bradley, J. C. (2010). Situational judgment tests: Constructs assessed and a meta-analysis of their criterion-related validities. *Personnel Psychology*, 63(1), 83–117. <https://doi.org/10.1111/j.1744-6570.2009.01163.x>
- Cullen, M. J., Sackett, P. R., & Lievens, F. (2006). Threats to the operational use of situational judgment tests in the college admission process. *International Journal of Selection and Assessment*, 14(2), 142–155. <https://doi.org/10.1111/j.1468-2389.2006.00340.x>
- Duval-Couetil, N. (2013). Assessing the impact of entrepreneurship education programs: Challenges and approaches. *Journal of Small Business Management*, 51(3), 394–409. <https://doi.org/10.1111/jsbm.12024>
- Fayolle, A. (2013). Personal views on the future of entrepreneurship education. *Entrepreneurship & Regional Development*, 25(7–8), 692–701. <https://doi.org/10.1080/08985626.2013.821318>
- Fayolle, A. (2018). Personal views on the future of entrepreneurship education. In A. Fayolle (Ed.), *A research agenda for entrepreneurship education* (pp. 127–138). Edward Elgar Publishing. <https://doi.org/10.4337/9781786432919>
- Fayolle, A., & Gailly, B. (2008). From craft to science: Teaching models and learning processes in entrepreneurship education. *Journal of European Industrial Training*, 32(7), 569–593. <https://doi.org/10.1108/03090590810899838>
- Fritzsche, B. A., Stagi, K. C., Salas, E., & Kurke, C. S. (2006). Enhancing the design, delivery and evaluation of Scenario-Based training: Can situational judgment tests contribute? In J. A. Weekley & R. E. Ployhart (Eds.), *Situational judgment tests* (pp. 301–318). Lawrence Erlbaum Associates.
- Gagné, R. M., & Medsker, K. L. (1995). *The conditions of learning—Training applications*. Wadsworth Group/Thomson Learning.
- Gessner, T. L., & Klimoski, R. J. (2006). Making sense of situations. In J. A. Weekley & R. E. Ployhart (Eds.), *Situational judgment tests* (pp. 13–38). Lawrence Erlbaum Associates.
- Henry, C., Hill, F., & Leitch, C. (2005). Entrepreneurship education and training: Can entrepreneurship be taught? Part I. *Education + Training*, 47(2), 98–111. <https://doi.org/10.1108/00400910510586524>
- Kirkpatrick, D. (1995). *Evaluating training programs*. Berrett-Koehler.
- Lackéus, M. (2015). Entrepreneurship in education: What, why, when, how. *Entrepreneurship 360 – Background Paper*. European Commission.
- Lans, T., Baggen, Y., & Ploum, L. (2018). Towards more synergy in entrepreneurial competence research in entrepreneurship education. In A. Fayolle (Ed.), *A research agenda for entrepreneurship education* (pp. 224–242). Edward Elgar Publishing. <https://doi.org/10.4337/9781786432919>

- Lievens, S., & de Soete, B. (2015). Situational judgment test. *International Encyclopedia of the Social & Behavioral Sciences*, 22, 13–18. <https://doi.org/10.1016/B978-0-08-097086-8.25092-7>
- Lievens, S., Peeters, H., & Schollaert, E. (2008). Situational judgment tests: A review of recent research. *Personnel Review*, 37(4), 426–441. <https://doi.org/10.1108/00483480810877598>
- Loi, M. (2018). Dealing with inconsistency of studies in entrepreneurship education effectiveness: A systemic approach to drive future research. In A. Fayolle (Ed.), *A research agenda for entrepreneurship education* (pp. 38–61). Edward Elgar Publishing. <https://doi.org/10.4337/9781786432919>
- Man, T. W. Y. (2012). Developing a behaviour-centred model of entrepreneurial learning. *Journal of Small Business and Enterprise Development*, 19(3), 549–566. <https://doi.org/10.1108/14626001211250289>
- Maritz, A., & Brown, C. R. (2013). Illuminating the black box of entrepreneurship education programs. *Education + Training*, 55(3), 234–252. <https://doi.org/10.1108/ET-020018>
- 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. <https://doi.org/10.1016/j.jbusvent.2012.03.002>
- Matlay, H. (2006). Researching entrepreneurship and education part 2: What is entrepreneurship education and why does it matter? *Education + Training*, 48(8/9), 704–718. <https://doi.org/10.1108/00400910610710119>
- McNally, J. J., Honig, B., & Martin, M. (2018). Does entrepreneurship education develop wisdom? An exploration. In A. Fayolle (Ed.), *A research agenda for entrepreneurship education* (pp. 81–103). Edward Elgar Publishing. <https://doi.org/10.4337/9781786432919>
- Monnier, M., Tschope, T., Srbeny, C., & Dietzen, A. (2016). Occupation-specific social competences in vocational education and training (VET): The example of a technology-based assessment. *Empirical Research in Vocational Education and Training*, 8(1), 10.
- Motowidlo, S. J., Hooper, A. C., & Jackson, H. L. (2006). A theoretical basis for situational judgment tests. In J. A. Weekley & R. E. Ployhart (Eds.), *Situational judgment tests* (pp. 57–81). Mahwah, NJ: Lawrence Erlbaum Associates.
- Mwasalwiba, E. S. (2011). Entrepreneurship education: A review of its objectives, teaching methods, and impact indicators. *Education + Training*, 52(1), 20–47. <https://doi.org/https://doi.org/10.1108/00400911011017663>
- Nabi, G., Liñán, F., Fayolle, A., Krueger, N., & Walmsley, A. (2017). The impact of entrepreneurship education in higher education: A systematic review and research agenda. *Academy of Management Learning & Education*, 16(2), 277–299. <https://doi.org/10.5465/amle.2015.0026>
- Neck, H. M., & Corbett, A. C. (2018). The scholarship of teaching and learning entrepreneurship. *Entrepreneurship Education and Pedagogy*, 1(1), 8–41. <https://doi.org/10.1177/2515127417737286>

- Neck, H. M., & Greene, P. G. (2011). Entrepreneurship education: Known worlds and new frontiers. *Journal of Small Business Management*, 49(1), 55–70. <https://doi.org/10.1111/j.1540-627X.2010.00314.x>
- Osterwalder, A., & Pigneur, Y. (2010). *Business model generation*. John Wiley & Sons, Inc.
- Patterson, F., Ashworth, V., Zibarras, L., Coan, P., Kerrin, M., & O'Neill, P. (2012). Evaluations of situational judgement tests to assess non-academic attributes in selection. *Medical Education*, 46(9), 850–868. <https://doi.org/10.1111/j.1365-2923.2012.04336.x>
- Pittaway, L., & Cope, J. (2007). Entrepreneurship education: A systematic review of the evidence. *International Small Business Journal*, 25(5), 479–510. <https://doi.org/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. <https://doi.org/10.1108/13552550910934468>
- Ramani, R. S., Solomon, G. T. & Alabduljader, (2018). Approaches to entrepreneurship education: A qualitative review and comparison of the US and Canada. In A. Fayolle (Ed.), *A research agenda for entrepreneurship education* (pp. 281–308). Edward Elgar Publishing. <https://doi.org/10.4337/9781786432919>
- 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. <https://doi.org/10.1111/jsbm.12021>
- Schelfhout, W., Bruggeman, K., & De Maeyer, S. (2016). Evaluation of entrepreneurial competence through scaled behavioral indicators: Validation of an instrument. *Studies in Educational Evaluation*, 51, 29–41. <https://doi.org/10.1016/j.stueduc.2016.09.001>
- Tabachnick, B. G., & Fidell, L. S. (2013). *Using multivariate statistics*. Pearson.
- Weekley, J. A., & Ployhart, R. E. (2006). An introduction to situational judgment training. In J. A. Weekley & R. E. Ployhart (Eds.), *Situational judgment tests* (pp. 1–10). Lawrence Erlbaum Associates.
- Weekley, J. A., Ployhart, R. E., & Holtz, B. C. (2006). On the development of situational judgment tests: Issues in item development, scaling and scoring. In J. A. Weekley & R. E. Ployhart (Eds.), *Situational judgment tests* (pp. 157–182). Lawrence Erlbaum Associates.
- Whetzel, D. L., & McDaniel, M. A. (2009). Situational judgment tests: An overview of current research. *Human Resource Management Review*, 19(3), 188–202. <https://doi.org/10.1016/j.hrmr.2009.03.007>