

SKILLS FOR TRANSMITTING CONCEPTS RELATED TO ENTREPRENEURSHIP: MEASUREMENT USING THE ITEM RESPONSE THEORY

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Abstract. This study aimed to develop a scale to develop the ability to transmit concepts related to entrepreneurship. An integrative review was performed that resulted in the conceptual model and item development. To test the validity and internal compatibility of the items, the Graded Response Model of Samejima's Item Response Theory was used. For the interpretation of the scale, six levels were defined: initial, basic, elementary, essential, stage, advanced. The results were validated for an instrument with 30 items, to help teaching institutions in the development of actions to characterize the teacher's profile.

Keywords: Entrepreneurship. Scale. Teaching

1 Introduction

Entrepreneurship education emerged in different educational contexts, mainly to develop an entrepreneurial culture, create businesses and foster entrepreneurial mindsets through education and learning (Kuratko, 2005). According to Redford (2015), given the relative novelty of the cycle of education for entrepreneurship, there is a clear need for a more systematic and longitudinal investigation to support teaching professionals in determining "guidelines and corrections" in entrepreneurship education.

Several authors highlight the importance of the learning process to expand and develop entrepreneurial skills and abilities. For Zampier and Takahashi (2011), entrepreneurial learning is an ongoing process that facilitates the development of the knowledge needed to start new ventures and manage them.

For Oikkonen and Pihkala (2013), research in entrepreneurial education has paid significant attention to learning outcomes and, consequently, the teaching perspective has been ignored. Fayolle (2013) reports that there is not much research on the combination of teaching models and learning processes that teachers use in entrepreneurial education. Research on who entrepreneurial educators are and what they really do remains scarce.

According to Moroz et al. (2010), academics who teach entrepreneurship must combine practical and academic skills. Sometimes academics from other fields of business management are recruited to fill the leadership roles of chairs in

entrepreneurial education, leading to programs that are called only "entrepreneur". According to Kuratko et al. (2005), entrepreneurship education programs are best led by scholars who have been specifically trained by academics who have researched and practiced entrepreneurship.

Therefore, there is an opportunity for educational institutions to take responsibility for educating entrepreneurship teachers, including entrepreneurship in their curriculum. According to TIERNAN (2016), the teacher manages the relationship between the learner and knowledge within the learning environment, allowing him the opportunity to think and act independently. Future teachers should be exposed to entrepreneurship education as part of their initial training to internalise entrepreneurship and incorporate it into their education in the future.

The development of an instrument in this area would allow identifying the skills of teachers to transmit concepts related to entrepreneurship. However, it would also provide parameters to work on the improvement, evaluating the perceived ability of teachers to teach a given course, thus improving their positive attitude towards this course and the effectiveness of teaching. Thus, this study aimed to develop a scale to measure teachers' skills for the transmission of concepts related to entrepreneurship.

2. SKILLS/CAPABILITIES/ATTITUDES NECESSARY FOR THE TEACHING OF ENTREPRENEURSHIP.

Teachers are not just knowledge providers; they are co-learners and facilitators who support student learning. They should provide freedom and create opportunities to improve students' creativity by allowing students to decide how they learn or act. They should also provide time for reflection and evaluation, which are an essential part of the learning process (TODING AND VENESAAR, 2018).

According to Libâneo et al., (2012), the professional development of a teacher is not only linked to his individual attributions, but extends to the collective. This is directly related to the current reality, in which socially imposed problems need to be addressed through a team bias, of joint work.

Many educators are in a position where they have responsibilities beyond the curriculum and pedagogical development within their own department. They are tasked with boosting entrepreneurial learning in all faculty departments and/or the institution as a whole. Success will depend on an educator's ability to understand the organization's strategy, and many educators will not feel comfortable making things happen. They may also not have the vast resources to change their institution. Therefore, considerable individual initiative, ingenuity and internal and external support networks built and/or strengthened may be necessary for things to happen (GIBB, 2011).

According to Pounder (2016), the teacher should try to instill a culture that allows entrepreneurship to learn without prejudice. The teacher's principles need to be in line with the teachings of the courses. Many of the characteristics of a good entrepreneur are necessary for a good entrepreneurship teacher: to be resilient, to add value, willing to explore, to seek opportunities, visionary planning, to easily adapt to change and to understand the client.

Both teachers and students should understand the learning process. The pedagogical objectives and expected results are complex and difficult to define

without a broad consensus on the nature of the phenomenon of entrepreneurship and its associated social skills (attitude, mentality, social skills, etc.). (Fayolle et al., 2016).

According to Sarfraz et al. (2018), the role of the teacher as transformational leader is of great importance to attract students destined for entrepreneurship. The authors conducted a study with entrepreneurship educators and concluded that entrepreneurship educators are well equipped with transformational leadership behavior. These aspects of the teacher's transformational behavior need to be improved through more effective education and training programs for entrepreneurship educators.

In the teaching aspect, the main point is what the educator does and what measurement tools the educator uses to recognize the achievement of the educational objectives of entrepreneurship. First, educators teach fundamental principles, decision-making, coexistence with uncertainties, social responsibility, among others. Thus, the success of an entrepreneurship program depends on the teaching aspect and the level of commitment of the teacher, the knowledge he has to provide freedom and create opportunities to improve the creativity of the student, allowing students to decide how to learn or act.

Lopes (2019), states that the great challenge is to make the educator use practices, methodologies, tools and pedagogical approaches different from those used today to develop entrepreneurial skills and skills.

Future teachers should be exposed to entrepreneurship education as part of their initial training to internalise entrepreneurship and incorporate it into their education in the future. This can lead to reflective, creative and innovative teachers with skills and knowledge in their fields. Teachers need the institution's support for initial education and complementary training. This aspect involves changing teacher education (LAURIKAINEN, 2018).

Both teachers and the direction of the educational institution should contribute to the following: using a systematic approach to teaching and learning, recognizing the importance of considering the relationships between the different components of teaching and learning; use modern teaching techniques that support the expected result: mentality and entrepreneurial skills of students; provide constant methodological support to educators during the planning of the discipline (TODING AND VENESAAR, 2018).

3. METHOD

This is a study with descriptive research approach carried out in three stages. The first stage refers to literature review, conceptual model elaboration, item construction, semantic and judge analysis, and pilot test.

The conceptual basis of the study was developed through an integrative review using the theme of entrepreneurial skill, analyzing the fundamental concepts and definitions of entrepreneurship and education. After understanding the constitutive definitions, a

conceptual model was elaborated that considers skills within the learning environment, observed by four aspects: teaching, professional development, institutional support and attitudes.

the content validation of the instrument was performed, with content and semantic analysis. The content analysis was performed by six teachers with experience in entrepreneurial education, research and publications on the subject, from three Brazilian states. Items with at least 80% of "very related" answers were kept in the criterion "relevance/relationship with latent trait", following the limit suggested by Pasquali (2010).

The second stage of the research consisted of data collection. The instrument was sent to the professors of the administration departments and the engineering course of public institutions of higher education in Brazil and to the main private higher education institutions of the country's capitals. A total of 710 responses were obtained, which were used to perform the analysis.

The third stage analyzed the psychometric properties of the instrument and created the scale using THET. At this stage, it was first verified whether the factor analysis model was adequate for data analysis, applying the Kaiser-Meyer-Olkin test (KMO) and the Bartlett's check. The KMO test checks the degree of partial correlation between the variables and ranges from 0 to 1. As indicated by Hair et al. (2009), the minimum value of 0.50 was considered adequate for the application of the factor analysis model. Bartlett's check, in turn, is a hypothesis test that verifies whether there is sufficient correlation between the variables to apply factor analysis, whose significance level was 0.05 (HAIR et al., 2009).

After verifying that the database with the responses of the 710 respondents is factorable, a dimensionality analysis was initiated, using the restricted information method, which consists of the inspection of the self-value of the polycoricacorrelation matrix, with oblimin rotation. These analyses were performed using the "psych" package of the R software.

4. FINDINGS

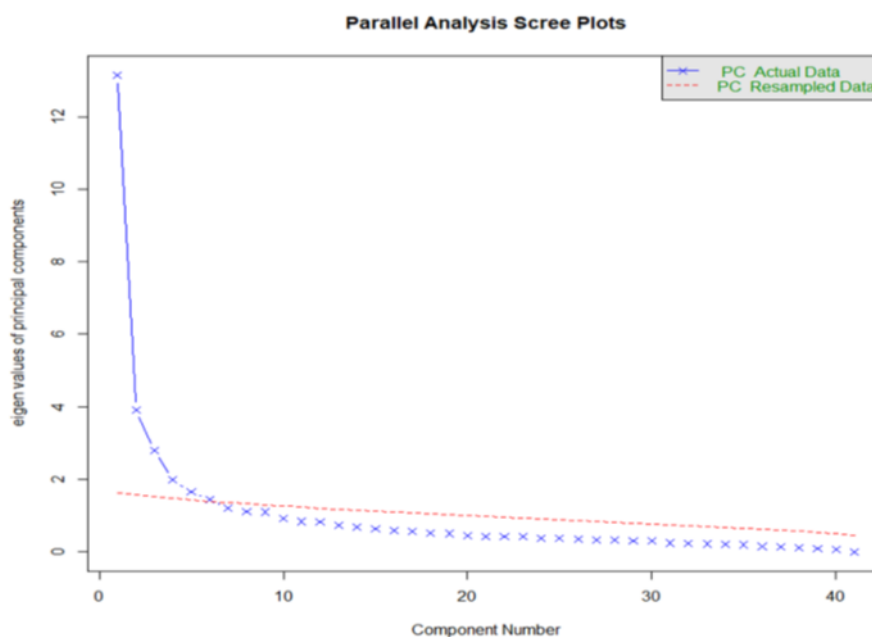
an instrument with 40 items was created, divided into aspects of the conceptual model: 10 items related to the teaching aspect, 4 items to the professional development aspect, 22 items to the attitudes aspect and 5 items to support the institution. Content validation revealed that all items presented at least 80% agreement among the judges.

It was verified that the database with the answers of the 710 respondents is factorable, because the Kaiser-Meyer-Olkin index (KMO) resulted in a value of 0.91. Bartlett's check showed a value of $\chi^2 = 2659.2$ with 40 degrees of freedom and p-value $2.2e-16$. The level of significance adopted was small enough, indicating that the null hypothesis should be rejected, because the variables are correlated. Therefore, the indexes were adequate to analyze the data using the factor analysis technique.

After dimensionality analysis, the restricted information method was used to inspect the eivalues of the polycoricacorrelation matrix.

the data showed that the first dimension explains 25.28% of the variability, while the second only 7.86%; the third 7.33%; and the fourth 4.86%. Thus, it is possible to conclude a dominant factor under the structure. To determine the existence of a dominant dimension in the instrument, the convention was adopted that a variance explained by the first factor greater than 20% indicates essential one-dimensionality, as proposed by Reckase (1979). Table I.

The dimensionality study showed a dominant dimension, explaining 25.28% of the variance of the answers of the items. Oquotient between the difference between the first and second self-value, and the second and third is 8.15 greater than 3. Therefore, the use of a one-dimensional model is adequate, considering the criteria recommended by Hattie (1985). Table I.



Source: prepared by the authors.

In addition, the first factor is responsible for 25.28% of the variance, thus meeting the criterion of at least 20% of the variance in the first factor, as proposed by Reckase (1979).

This reinforces that it is possible to assume the essential one-dimensionality of the structure.

Continuing with the analyses, the factor loadings and similarities of the items that make up the instrument were verified. Factor loadings indicate how much of the variation of each item is explained by the factor (dimension) and also which items relate to each factor. The higher the load, the better the item-factor ratio.

According to Pasquali (2010), factor loadings equal to or greater than 0.30 are considered as high factor loading. Item Q24 presented a value below (0.29) of this recommendation, and all other items presented factorial load above 0.30. The mean factor loadings were 0.54, and their values ranged from 0.29 (item 24) to 0.67 (item 29). The similarities indicate the amount of variance explained by the factorial solution for each variable and ranged from 0.13 (item 41) to 0.46 (item 29), with an average of 0.30.

Some items presented commonality of 0.15 (Q5, Q18, Q24, Q37, Q38, Q41). This result represents a low value for this statistic, indicating that these items contribute little to the measurement of the latent trait. Item Q24 was excluded from the other analyses due to its factorial load and communality.

The estimates of the parameters of the items and the calculation of the latent trait of the respondents were performed using the samejima gradual response model (1969). For the analysis of the discrimination parameter (a), we opted for a value of 0.90 as the value considered adequate.

Most items presented good discrimination (parameter $a > 1$), and items Q5, Q17, Q18, Q19, Q21, Q37, Q38, Q40, Q41 presented < 1 . Items Q5, Q37, Q38, Q40, Q41 presented lower standard errors than the other items for the discrimination parameter.

These items are not contributing to the evaluation of the construct. Therefore, we chose to exclude the items and, thus, verify the behavior of the other parameter estimates and standard errors.

Estimates for the difficulty parameter of all items resulted in negative values, which resulted in the configuration of the test information curve.

It is possible to identify for which latent trait bands the instrument is valid (PASQUALI, 2017) and in which regions there is greater information and accuracy. Thus, the line corresponding to the information (blue) is larger approximately in the range between (-2 to 2), region in which the default error is smaller (pink line). The instrument, therefore, has greater accuracy to make inferences about the scores placed in this range. Finally, the

skill scores were estimated to transmit concepts related to entrepreneurship (θ) to the 710 teachers. The parameters of the items were analyzed together with their respective characteristic curves (ICC).

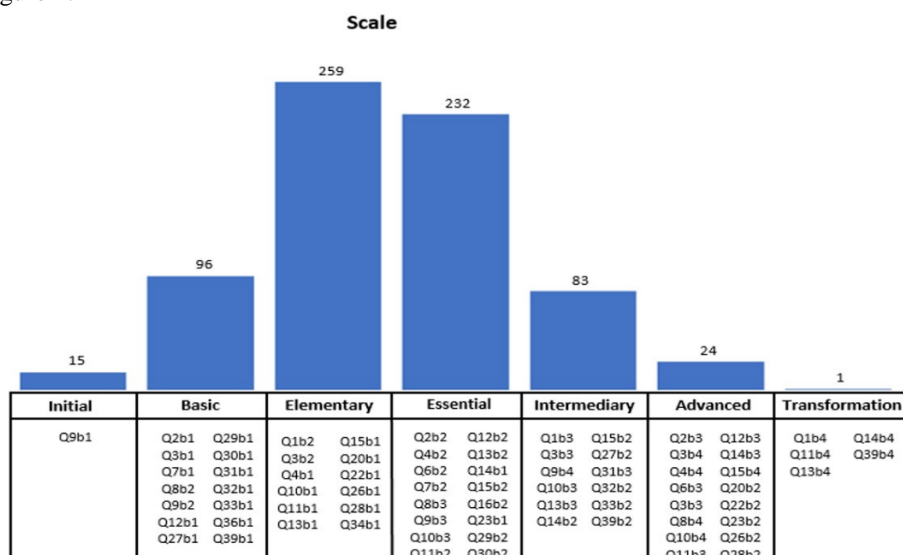
Having the parameters of discrimination (a) and the difficulty of the items, the items were placed on the scale of teaching skills to transmit concepts related to entrepreneurship.

The first procedure for scaling is to identify anchor levels characterized by sets of anchor items. Cumulative probabilities and placement of item categories. The differences between the probabilities in the anchor and the previous levels are close to 0.30, as an example in item Q1. The difference between the cumulative probabilities at the four levels (30, 40, 60, 80) and their previous levels is greater than 0.30. With the anchor level criteria, it was possible to build the scale, where it is possible to identify the items belonging to each level and its response categories.

The categories of these items are positioned on the scale (50, 10). Category placement occurred at the point of the scale where there is a probability above 0.50 of respondents of that skill level by choosing/endorsing the category (or higher category).

From the interpretative point of view, each item, together with its response categories, which represent the theoretical concepts, carries information to interpret the latent trait. To interpret the scale, the level above 30 was considered as an ability to convey concepts related to entrepreneurship. Thus, it was considered that less than 30 would be a level of skill in which respondents never use the tools and methodology

of entrepreneurial education considered in the construction of the latent trait. Look at Figure 1.



Source: prepared by the authors (2023)

The first skill level, greater than or equal to 30 and less than 40, is interpreted as the basic skill level. At this level, the scale identifies respondents who rarely: make use of practical-operational teaching-learning methods; At this level of the scale are also identified respondents who sometimes use interactive teaching-learning methods. At this level it is also possible to identify respondents who often: have the ability to build relationships with people; often reflect on their practices for learning from experience; they have love and enthusiasm to work with students.

The second level, greater than or equal to 40 and less than 50, is interpreted as an elementary skill level. At this level, sometimes respondents: use direct teaching-learning methods; sometimes make use of practical-operational teaching-learning methods. This level also represents respondents who rarely: select teaching strategies aligned with entrepreneurial education; rarely make use of their experience with business creation in the teaching environment; rarely participate in training courses related to business education;

the third level of the scale is interpreted as essential, greater than or equal to 50 and less than 60. At this level, respondents rarely participate in congresses related to entrepreneurial education and rarely develop relationships with entrepreneurs. This level also represents the interviewees who sometimes practice the following actions: using their experience with business creation in the teaching environment; participate in training courses related to entrepreneurial education; are able to use the knowledge acquired in a vocational training course; participate in events related to education and entrepreneurship; seek new knowledge related to entrepreneurial education; make selection of teaching strategies aligned with the teaching of entrepreneurship.

The level of the fourth scale is interpreted as Intermediate, greater than or equal to 60 and less than 70. Most responses have the categories "often" and "very often" at

this level. Respondents at this level usually use: the direct teaching-learning method; practical-operational learning teaching methods; teaching strategies aligned with teacher entrepreneurship; experience with business creation in the teaching environment. He frequently participates in events related to education and entrepreneurship and regularly seeks new knowledge related to entrepreneurial education.

In the fifth level, interpreted as advanced, greater than or equal to 60 and less than 70. Respondents often take part in training courses related to business education. At this level, the interviewees often: they use interactive teaching-learning methods, stimulating and guiding learning situations through dialogue and debate; use practical-operational

teaching-learning methods; select teaching strategies aligned with entrepreneurship education; apply strategies for discovery, research and active learning that encourage thought and creativity; use assessment tools that allow the student to develop a reflective exercise in their learning process; apply collaborative learning strategies, in which students, through peer-to-peer exchange, teach each other; use the experience with business creation in the teaching environment; knowledge acquired in vocational training courses.

The sixth level, called transformation, greater than or equal to 80, respondents at this level of the scale very often: they use the direct teaching-learning method; participate in training courses related to entrepreneurial education; participate in events related to education and entrepreneurship. In addition, they often have access to partnerships with companies and the community in general offered by the educational institution.

Conclusion

The TRI estimates the parameters of the items, enabling the creation of an interpretable scale, one of the advantages of THE In relation to the traditional approach. Thus, the level of skills of teachers can be compared with the level of difficulty required by the item, exposing items that are more or less likely to be answered voluntarily. As a result, six interpretable levels were identified in the constructed scale: initial, basic, elementary, essential, intermediate and advanced.

The answers analyzed are concentrated up to the fundamental level, indicating that teachers know some tools and methodology of entrepreneurial education. However, its use is not an integral part of its teaching and learning process. Reaffirming the need for educational institutions to analyze existing curricula and determine to what extent entrepreneurship education is inserted. This information is essential to understand the skills that need to be worked on in teacher training and professional development.

The visualization of the parameters of the items and their individual contributions in the measurement of the latent trait allowed the construction of a scale with an interpretative model that essentially shows which skills are used in the process of teaching and learning concepts related to entrepreneurship. The construction of the scale and the interpretation for each

it is configured as filling a gap in the measurement of skills studies, going beyond the answers provided by such tools.

TRI allows new items to be calibrated to measure skill levels. Thus, if, in the future, a new item is added to the tool, it is possible to maintain the same scale, ensuring a comparison with the original values.

The use of the tool will enable new interpretative perspectives, contributing to the process of education for entrepreneurship, with regard to skills and characteristics in a combination of knowledge and personality described in behavioral terms of the individuals involved in the entrepreneurial process. It is expected that the use of the tool can support actions that can contribute to the development of strategies related to the process of teaching and learning entrepreneurial skills.

Subsequent paragraphs, however, are indented.

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