PROFESSIONAL EDUCATION & TRAINING | REVIEW ARTICLE

Pedagogical models and ICT integration in entrepreneurship education: Literature review

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Abstract: Entrepreneurial education in different contexts has gained relevance in educational institutions, incorporating various models to enhance the development of competencies in students. This literature review aimed to analyze publications from 2014–2021 to identify the models, methods, strategies, and resources used in entrepreneurship education and to recognize the elements of Education 4.0 that were incorporated. The systematic literature review (SLR) was the method used to carry out this study, with a sample of 37 articles in the Web of Science (WoS) and Scopus databases. The search for articles was limited to those exclusively in English and in the two databases named above. The results show a diversity of models and methods used in the educational and social spheres to train entrepreneurs, mainly focused on practice. This literature review is relevant for educational institutions interested in supporting the training of entrepreneurs. It raises the desirability of Education 4.0 elements in the forefront of a student-centered education fully connected to the needs of society. It also provides value for researchers, identifying the educational gaps, the topics emphasized, and the areas necessary to deepen future research.

Subjects: Information & Communication Technology (ICT); Higher Education; Education & Training

Keywords: educational innovation; entrepreneurship; innovative models; information and communication technologies; higher education

1. Introduction

Entrepreneurship education has been introduced in the academic environment for several decades to foster an entrepreneurial spirit in students and verify their entrepreneurial intention during their education and when they graduate from university. It has been assumed that through entrepreneurship education, students can be trained to be entrepreneurial and thus contribute to achieving goals aimed at economic growth. However, the needs of a changing world require reconceptualizing this approach and leaving students free to pursue their opportunities through guided learning that leads to entrepreneurial initiatives in society (Thrane et al., 2016), ventures to create social value (López-Rodríguez, 2017), and the achievement of the Sustainable Development Goals (United Nations. General Assembly, 2015). Education for entrepreneurship plays a substantial role in the training of entrepreneurs. This study aimed to contribute to the generation of knowl-edge about the innovative models implemented during this training process.
Entrepreneurship education is relevant for developing new entrepreneurs and understanding the economic, educational, and social implications. According to researchers in recent years, entrepreneurship education has focused on: 1) teaching about entrepreneurship, 2) the why of entrepreneurship, 3) the means to achieve it, and 4) an immersion in the process (Kumar & Kumar, 2015; Nielsen & Stovang, 2015). This training process uses models and methods that contribute to achieving objectives to develop entrepreneurial skills. On the other hand, incorporating information and communication technologies has made an exciting contribution to educational innovations (González-Pérez et al., 2019). Technological advances, access to multiple sources of information, and new forms of social interaction imply transformations in the educational environment that are favorable for recognizing students’ entrepreneurial intentions and creating new ventures.

Another important element in the formation of entrepreneurs is the context, which plays a key role because it provides information that determines the feasibility of replicating the models used in other environments. The context itself shows the contributions of individuals and the resources they use (Coll et al., 2014) in the academic (Dal et al., 2016), social, business, or temporal-historical environment where an event takes place (Afreh et al., 2019). To analyze the process of entrepreneurship education in the educational environment, one must recognize the educational level where it occurs (Núñez & Núñez, 2018) (preschool, primary, secondary, high school, or university) to know the pedagogical elements that can be incorporated.

Education must be adapted to the needs and characteristics of students with a clear objective to develop useful competencies. “Models, methods, techniques, and strategies must be combined and integrated into a learning environment with various disciplines, levels, and scopes” (Ramírez-Montoya, 2012). Research shows that business models (Cruz-Amarán et al., 2020), pedagogical models, teaching-learning methods, social models, and didactic strategies emphasizing active learning, experiential, learning by doing, and learning from the real world are employed in the process of entrepreneurship education (Anwar & Abdullah, 2021; Castaldi et al., 2020; de Villiers Scheepers et al., 2018). This shows that numerous methodologies coexist that focus on the students and their learning (López-Rodríguez, 2017). The selection of the most appropriate method or model for entrepreneurial training in any of its modalities depends on the context, tools, resources, and students’ needs.

In the entrepreneurial training process, educational systems have gradually adapted to contextual needs and therefore have incorporated Information and Communication Technologies in their pedagogical practices. The specific categories of the use and development of technology in the educational field that have been cited in recent research show that digital pedagogies, adaptive technologies, open technologies, intelligent technologies, and disruptive technologies (González-Pérez et al., 2019) have brought new conceptions of achieving formative training (Gómez-Zermeño et al., 2019).

In the last decade, technological advances, and the demands for solutions to social problems have become a constant, and educational institutions play a preponderant role in impulsing new educational practices and implementing alternative pedagogies. In our world of constant transformations, the role of teaching changes because it is influenced by external factors (Ramírez-Montoya et al., 2021). Transforming educational practice to develop Education 4.0 competencies also boosts new entrepreneurs who can detect opportunities and bring creativity into play, breaking with previous ideas about how to do things (Briasco, 2016). An education that links students with real problems and allows them to learn by doing, focused on applying new learning methods, didactic tools, innovative management, and incorporating intelligent infrastructures and emerging technologies contributes to developing competencies (López et al., 2021). Entrepreneurship training nowadays entails a change of paradigms in being and doing to innovate and create new educational practices.

Educational and social institutions aiming at training for sustainable educational and social entrepreneurship be innovative in their educational processes to include practices that encourage lifelong
learning by students. Hong and Ma (2020) mention that “Education 4.0 and the future of work are based much less on what is known (in conceptual and theoretical terms) and much more on how one can demonstrate not only the synthesis and application of knowledge and skills but also interoperability concerning new technologies relevant to the field.” Miranda et al. (2021) proposes four essential components of Education 4.0: 1) Competencies (training and development of critical competencies desirable in today's students), 2) Learning methods (incorporation of new learning methods), 3) Information and Communication Technologies (ICT) (implementation of current and emerging ICT), and 4) Infrastructure (use of innovative facilities, services, and systems to enhance learning processes).

In Education 4.0, the teacher is a mentor, coach, and collaborator, who knows how to channel the student towards active practices and a high level of independence (Ramírez-Montoya et al., 2021). In this type of education, technological tools and platforms driven by the connectivity of the Internet of Things (IoT) are used to facilitate learning; digital resources are also used as sources of information and shared or individual cyber and physical spaces are employed; thus, connectivity, digitalization, and virtuality are substantial (Miranda et al., 2021). The soft and hard skills visualized in Education 4.0 (Miranda et al., 2021; Ramírez-Montoya et al., 2021) coincide with the competencies essential to foster educational and social entrepreneurship in students.

In this digital age, entrepreneurship training must continue to evolve along with the changing world to respond to major social demands. Children and young people must be trained for full development in society, with the necessary skills to enable them to access employment or take the initiative to become entrepreneurs regardless of the context in which they find themselves. The training of entrepreneurs is not a simple task when there is no single model that guarantees the success of the process. In the literature review articles or empirical research concentrated in the different databases, it is possible to find publications that mention a model, a method, a strategy, or pedagogical suggestions on how to teach entrepreneurship; in some of them the use of information and communication technologies is also integrated, each of these articles is exposed from a specific context. This can become an arduous task for researchers and entrepreneurship trainers interested in identifying the different models, methods or techniques used for entrepreneurship training. For this reason, we have considered it important to concentrate in this literature review the models, methods or strategies presented in the articles found in various sources to inform other researchers and trainers of the multiple options that exist for entrepreneurship training.

Under this premise, this literature review focuses on the following objectives: A) To identify the context emphasized in the research that studies entrepreneurship training. B) To analyze the proposals for entrepreneurial training, recognizing the business models, pedagogical models, teaching-learning methods, social models, didactic strategies or techniques, and resources implemented. C) To identify the innovative technological resources implemented during the training process for entrepreneurship, and D) To identify the components of Education 4.0 that have been incorporated in training for entrepreneurship. To achieve these objectives, we reviewed 37 empirical research articles and systematic reviews on innovative teaching models or methods for entrepreneurship found in the WoS and Scopus databases. Analyzing the existing research on entrepreneurship training allows us to present in this literature review the most frequently used models or methods and the technological innovations for its implementation in education.

The following section discusses the method used for analyzing and systematizing the data. Then the results are presented to answer each of the questions raised. The article closes with conclusions to explain the practical usefulness of the main findings about the innovative models used in entrepreneurship training, the management gaps in the process of entrepreneurship training, the implications for future research, and the limitations presented in this literature review.

2. Methodology
The systematic literature review (SLR) was the method used to carry out this study. The procedure was carried out by determining the phases for conducting the SLR: defining the research questions,
conducting the research process, establishing the inclusion and exclusion criteria, the data selection and extraction process, and data synthesis (Kitchenham & Charters, 2007; Kitchenham et al., 2009; Ramírez-Montoya, 2020).

2.1. Phase 1: Research questions
To start with the literature review, we defined the questions guiding the process:

Q1a. What is the context in which the research on entrepreneurship training takes place?
Q1b. At what academic level does the training of entrepreneurs described in the articles take place?
Q2a. What orientations to the pedagogical process are provided in the training of entrepreneurs?
Q2b. What model, method, strategy, or technique does the article describe?
Q3a. What technological resources does the research cite for applying entrepreneurial training models?
Q3b. What are the specific emerging themes of ICT use?
Q4. What components of Education 4.0 were incorporated in recent research on entrepreneurship training models?

2.2. Phase 2: Search process
The systematic literature review performed in this study comprised an advanced search of published articles in the Scopus and Web of Science (WoS) databases considering those published from 2014 to 2021. The search was delimited to “articles” in the “English” language. The database search string was “innovative AND teaching AND models AND entrepreneurship.” Scopus and WoS were selected because they are considered the two main and most complete databases of publications and impact indicators (Aghaei Chadegani et al., 2013; Pranckutė, 2021). We selected the English language since most of the articles in these databases are in this language. Also, because it is considered the language of science (Drubin & Kellogg, 2012). In addition, in previous reviews on the topic of entrepreneurship we have found that most of the articles published in high impact journals use this language.

2.3. Phase 3: Inclusion and exclusion criteria
The initial inclusion criteria proposed for the database search were: - Articles whose content referred to innovative models of entrepreneurship education, in their title, abstract or keywords.

(1) Articles published in the Web of Science and Scopus databases.
(2) Articles published from 2014 to 2021.
(3) Limited to the English language.

Exclusion criteria were:

(1) Books or book chapters.
(2) Articles that are not in the English language.

2.4. Phase 4: Selection and data extraction process
The number of articles located in the Scopus database was 55 and in the WoS database was 46, giving a total of 101 articles located in both databases. The total number of articles from the two databases was downloaded and concentrated in an Excel spreadsheet. Subsequently,
a conditional formatting was applied in the excel sheet to check if the articles were duplicated. We found that of the total number of articles (101), 18 of them were in both Scopus and WoS (this was verified by comparing the articles based on the title, authors’ names and year), so it was decided to consider for the review all the articles selected from the Scopus database and also the articles from the WoS database that were not duplicated, leaving a total of 83 articles. Subsequently, in a first review, it was found that 4 of the articles were book chapters and for 3 other articles it was only possible to find their abstract, so the decision was also made not to consider them for the review process, leaving a total of 76 articles prior to the application of the quality criteria for the final selection of the research to be considered in the literature review. To select the definitive articles for SLR, we established three quality questions to be scored with 0 (no) or 1 (Yes) if the article met the following criteria: 1. Does it contain empirical research or a literature review? 2. Does it refer to a model, method, or strategy for entrepreneurship training? 3. Does it refer to an innovation in teaching processes? The articles that scored 2 points were considered viable for the SLR analysis presented in this document. Therefore, from the database of 76 articles, 37 were finally considered for the analysis (Figure 1).

2.5. Phase 5: Data synthesis and analysis
For data synthesis, we used a form related to the four SLR study questions. We also elaborated classifications of possible answers so that graphical representations could be obtained at the conclusion of the process. The content analysis in this literature review was carried out according to Bauer (2000) and Brewerton and Millward (2001) in reference to qualitative techniques that allow inferences to be drawn. First, we organized the data by study themes and then, based on the interpretation, we determined the most significant data to answer the research questions. In addition, source triangulation was used to validate the data and to identify the answers to the different questions. To achieve reliability and avoid bias, three people were involved in reading the abstracts and identifying appropriate articles. The data from the synthesis are presented in the following excel table:

Figure 1. Selection and extraction of data for SLR.
3. Results

3.1. Q1a. What is the context in which research on entrepreneurship training is developed?
From the analysis of the articles, we found that 35 of the selected articles refer to the academic context; one refers to an innovation model for teaching developed in the social context, and another one is carried out in both, the academic and the business context. In this article, research was conducted on the experience of course leaders in colleges and universities and successful entrepreneurs in the industry. Two inferences can be drawn from this information: 1) Training for entrepreneurship is mainly carried out in educational institutions, 2) this establishes a guideline for both, entrepreneurship training and educational or social researchers, because this training process cannot be left out of the collaboration between educational, business, governmental and societal institutions.

3.2. Q1b. At what academic level does the entrepreneurship training described in the articles take place?
Determining the academic level at which entrepreneurship training takes place is relevant as it allows us to define whether there is a gap in the implementation and management of entrepreneurship. We found that of the 37 investigations analyzed, 36 have been developed in the academic environment at the university level, one of them corresponds to social entrepreneurship and has been carried out in the same context. Thus, we can affirm that it is in higher education institutions where more attention has been paid to entrepreneurship training. (Figure 2).

However, it should be noted that, in one article, the authors Rudenko et al. (2018) propose in the conclusions section the introduction of formative models that lead to the development of digital competence, initiative and entrepreneurship, soft skills, and professional competence from high school, as they consider that this will prepare a new generation of university students.

On the other hand, with the search string established, only one article that develops research outside the academic context was found. The article refers to a social model in which the initial intention was to care for street children, later incorporating a training program for the children to develop competencies. Authors Kaimé-Attermö and von Friedrichs (2017) mention that the House of Plenty has provided participating children with English, computer and entrepreneurship skills, areas that enable them to understand how to run a business. The above examples in relation to the training of entrepreneurs and the development of skills for that purpose allow us to ensure that the process of training new entrepreneurs does not have to wait until students are university students, it is important to give young people the opportunity to start with the development of skills for entrepreneurship, from the academic levels prior to university, in such a way that they are prepared to do well in society.

Long description for Figure 2. The largest circle corresponds to 35 research articles related to entrepreneurship training from the academic context. One of the small circles corresponds to research carried out in both academic and business contexts. The other small circle corresponds to research conducted in the social context, outside of academia.

3.3. Q2a. What orientations to the pedagogical process are provided in the training of entrepreneurs?
In the articles analyzed, we found that entrepreneurship training, business models, didactic strategies, pedagogical models, teaching-learning methods, and social models have been used in recent years to foster entrepreneurship in students and contribute to developing their competencies.
3.4. Q2b. What model, method, strategy, or technique does the article describe?

Innovative business model applied to universities: Cruz-Amarán et al. (2020) refer to a conceptual model to understand the transition from socialist universities to social, innovative, and entrepreneurial organizations. They identify three elements: First: state regulation that legitimizes innovative identity and entrepreneurial identity with a self-financing scheme. Second: Integration and complete cycle of teaching, research, knowledge production and technological commercialization. Collaboration networks with the productive sectors, seeking an adaptation process focused on sustainable results with practical applications and social impact. Third: Hybrid infrastructure to manage knowledge, inclusion of students in university-business processes oriented to the generation and transfer of knowledge, as well as in the development of technological projects.

Didactic strategies: Qin et al. (2020) mention that the application of the inverted classroom combined with locus of control analysis in entrepreneurship education for university students makes it possible to achieve in-depth learning objectives. Ivanov et al. (2015) refer that the effectiveness of training students for the implementation of innovative and entrepreneurial activities depends on the creative interaction between teachers and students in design and entrepreneurial activity, forming in students the motivation for constructive managerial actions. Cincera et al. (2018) study social learning processes in the construction of a program on sustainability-driven entrepreneurship; they conclude with recommendations to promote social learning processes: promoting a culture of dialogue, helping group members to share their goals, facilitating group dynamics, and encouraging the treatment of ongoing learning experiences to learn from them.

Pedagogical models: there are multiple authors who address in their research models for the training of entrepreneurs (see Table 1), among their proposals are: Internet + maker education, entrepreneurial know-how, virtual retail, social innovation, problem based learning, practical
teaching, individual-opportunity nexus, DesUni model (involves a change in the curriculum, teaching methods, use of knowledge, teaching style, teacher-student relationships, culture, habitat and evaluation). In addition, within this category of models focused on teaching for entrepreneurship, the authors integrate from conceptual, intelligent information gathering and traditional models (which refer to sustaining a culture) that have been successful in the contexts where they are implemented, to critical-experiential teaching models, entrepreneur incubation, service-learning and experiential teaching models. Of the latter, experiential teaching models, we have made a broader description because it is the most recurrent in the articles located in the databases mentioned above. (Table 1).

In the literature analysis, the pedagogical models that refer to experiential learning stand out, so it is convenient to show the focus points of these articles. Maxwell et al. (2019) mention that entrepreneurship education in engineering has been little analyzed from the pedagogy for entrepreneurship, they propose a conceptual model that emphasizes university entrepreneurship education and the creation of companies by engineering students, suggesting for this purpose an experiential learning model that contemplates the invitation of guest speakers, individual and group projects, business simulation activities and role-playing games. Kummita and Majumdar (2015) refer to a model that holds a balance between theory and practice, classroom learning and learning in real contexts and focus on reflective and experiential learning methods, they mention that graduates under this model not only undertake innovative ventures to address challenging social problems, but also undertake activities to bridge gaps in the implementation of government programs.

On the other hand, Grega and Pikon (2018) describe a new mechanism for developing a learning environment that creates strong links between education, technology, business, and entrepreneurship. The model presented by these authors highlights the multidisciplinary learning experience that aims to find sustainable collaborative solutions to environmental, social, and economic issues. The methodology is based on active learning using challenge solving and case studies. The study by Lv et al. (2021) mentions that entrepreneurship education promotes students’ entrepreneurial intention with practical experience. Their results show that through business plan competitions, students learn entrepreneurial knowledge, gain entrepreneurial practice, increase entrepreneurial confidence, and strengthen entrepreneurship. In the same vein of practical experience, Yen and Lin (2020) mention business simulation-based learning environments that lead to flow experience by students, the authors refer that this can help improve students’ entrepreneurial self-efficacy.

The above shows some options of experiential learning models in which the immersion of students in real contexts is outstanding to provide solutions to problems in which it is required to put into practice their critical thinking skills, risk taking, communication, leadership, entrepreneurship, to name a few.

Social model: Kaimre-Atterhög and von Friedrichs (2017) refer to "The House of Plenty Social Innovation Model", which promotes the development of solutions by the people affected by a social problem, to generate structural changes. The intention is to develop the capabilities of the group of people affected by a problem. The house of Plenty has provided street children and youth with English, computer and entrepreneurship skills, areas that give them a taste of what it is like to run a business.

Teaching learning method: In this area of teaching learning methods, we find several articles related to the training of entrepreneurs, which are summarized below: Pashkov et al. (2020) analyze the application of various methods: case studies, brainstorming method, gamification, mass open online courses in Russia. Van Horne et al. (2017) present a method in which they work together to teach entrepreneurship and interior design. Students create a model and teachers act as clients. Beiping et al. (2019) Analyzes the application of methods for teaching entrepreneurship such as discussion, interaction, heuristic, problem-oriented, case-based, and research-based
Table 1. Synthesis of pedagogical models for entrepreneurship proposed by various authors

<table>
<thead>
<tr>
<th>Article number according to database</th>
<th>Authors (narrative citation)</th>
<th>Description of proposed model</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>Sun (2020)</td>
<td>He posits that the Internet + Maker Education model in universities can reform traditional university teaching methods and promote the cultivation of entrepreneurship, innovative thinking, and creative skills.</td>
</tr>
<tr>
<td>6</td>
<td>Middleton and Donnellon (2014)</td>
<td>Pedagogical model that focuses on facilitated the knowing why in relation to entrepreneurship.</td>
</tr>
<tr>
<td>7</td>
<td>Yen and Lin (2020)</td>
<td>It proposes a model based on the &quot;flow experience&quot; theory, using a business simulator for students to develop their projects as real ones.</td>
</tr>
<tr>
<td>10</td>
<td>Amundam (2019)</td>
<td>Proposes a model of curriculum content/teaching method in the education of innovative thinking, responsible and socially responsible potential social entrepreneurs.</td>
</tr>
<tr>
<td>13</td>
<td>Castelan and Bard (2018)</td>
<td>Proposes the application of the PBL model in various disciplines.</td>
</tr>
<tr>
<td>16</td>
<td>Qu et al. (2017)</td>
<td>Practical teaching with the use of multifunctional experimental equipment for engineering mechanics.</td>
</tr>
<tr>
<td>17</td>
<td>Thrane et al. (2016)</td>
<td>Model that reconceptualizes the individual-opportunity nexus as a conceptual framework for theentrepreneurial educación.</td>
</tr>
<tr>
<td>23</td>
<td>Kakouris (2015)</td>
<td>It combines critical thinking with experiential learning in a common framework capable of facilitating entrepreneurial education for diverse heterogeneous populations through lifelong learning or vocational training. Training of trainers.</td>
</tr>
<tr>
<td>26</td>
<td>Rudenko et al. (2018)</td>
<td>It exposes multiple models for the formation of digital competencies, professional, initiative and entrepreneurship, soft skills of undergraduate students. It is based on the modeling method.</td>
</tr>
</tbody>
</table>

(Continued)
Table 1. (Continued)

<table>
<thead>
<tr>
<th>Article number according to database</th>
<th>Authors (narrative citation)</th>
<th>Description of proposed model</th>
</tr>
</thead>
<tbody>
<tr>
<td>33</td>
<td>Mungaray-Lagarda et al. (2021)</td>
<td>Microenterprise support program by a university. Service learning is employed, students participate. Students are prepared to be generous, selfless, problem solvers and job creators.</td>
</tr>
<tr>
<td>34</td>
<td>Geng et al. (2021)</td>
<td>Analyze the entrepreneurial and innovative intention of students. College students have a certain demand for entrepreneurial training and guidance from the school, especially in the environment of business incubation park and resource pool; the characteristics of entrepreneurship, professional skills and interpersonal resources are more crucial for college students; most college students have a positive understanding of the excellent traditional Chinese teaching concepts.</td>
</tr>
<tr>
<td>35</td>
<td>Yu and Jiang (2021)</td>
<td>The theoretical model indicates five main mechanisms-professional staff training, curriculum integration, teacher team building, resource support, and school-enterprise cooperation that work together to build a reform pathway for professional innovation and entrepreneurial education in the field of digital media art design.</td>
</tr>
<tr>
<td>36</td>
<td>Liu et al. (2021)</td>
<td>It mainly presents the research on the education model of innovative and entrepreneurial practice of animation digital media specialty based on intelligent information gathering and aims to provide some ideas and directions for the reform of the education model of innovative and entrepreneurial practice of animation digital media specialty.</td>
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methods. Sukavejworakit et al. (2018b) and Sukavejworakit et al. (2018a) recommend experiential learning to increase students’ entrepreneurial intention. Using a combination of school-based activities with experiential ones. Abdullah et al. (2017) analyzes the methods used by various universities for entrepreneurship training. They agree with combining theory and practice.

Under the same heading of methods for teaching learning around entrepreneurship, Iborra et al. (2016) mention the creation of a HUB program with a framework with a high level of technology, where cooperation and networking initiatives are preponderant, suggesting a wide range of topics among engineering students’ mentors, coaches, investors, researchers, and experts. Wijnker et al. (2015) refer to a program called Business Oriented Technological System Analysis (BOTSA) aimed at stimulating sustainable entrepreneurship among engineering students in this field. The program combines placement of students in companies to study and
contribute to the development and incubation of sustainable energy innovations. It is used to guide students in their analysis of a technological innovation and towards the development of a business plan for this innovation. Portugal Castro and Gómez Zermeño (2020) show the results of the implementation of an online course on entrepreneurship that used Challenge Based Learning with a group of 20 undergraduate students from various disciplines ata university in Mexico. Challenges related to the Sustainable Development Goals were posed during the course. Lloyd et al. (2019) used the Work-based learning method. They expound that the benefits of work-based learning are the connection between the classroom and real-world learning, a high completion rate, ownership by students, and the development of critical skills. Hu et al. (2020) propose that universities should create the enabling environment for innovation and entrepreneurship. The quality of teaching should be improved. Actively cultivate the elite teacher. Actively encourage all students to participate in entrepreneurship activities. Horng et al. (2020) propose mentoring and creative problem solving as a method for entrepreneurship training.

Long description for Figure 3. The first column of the graph describes the types of pedagogical orientations for entrepreneurship training, the second column describes the methods, strategies, and techniques, and the third column shows the number of articles for each of the methods, strategies, or techniques, five of which stand out as corresponding to an experiential teaching model.

Figure 3. Models, methods, strategies, and techniques for entrepreneurship training.
3.5. Q3a. What technological resources does the research cite for applying entrepreneurial training models?

The technological resources shown in Figure 4 that emerge from the literature review regarding entrepreneurship training are diverse, with the category of digital pedagogies and disruptive technologies standing out. In accordance with the above mentioned, regarding the importance of confronting students with experiential learning, it is convenient that the integration of ICT emphasizes resources or software that problematize real practice for entrepreneurship, leading students to seek effective solutions.

3.6. Q3b: What are the specific emerging topics of ICT use?

We have considered it essential to relate the types of technological resources cited in the research and the concrete themes of incorporating Information and Communication Technologies from the classification of González-Pérez et al. (2019). This classification found that digital pedagogies and disruptive technologies were relevant in entrepreneurship training articles. ICT, multimedia elements, instructional design, simulators, and 3D experiences have been used in innovative business models (Cruz-Amarán et al., 2020) and studies that analyze the “why?” of entrepreneurship (Middleton & Donnellon, 2014). Likewise, ICTs have been associated with experiential teaching models to foster social entrepreneurship and realize innovative and creative activities between teachers and students (Ivanov et al., 2015; Kaiman-Atterhög & von Friedrichs, 2017; Kummittha & Majumdar, 2015). We also found that the design and implementation of simulators and social networks emerge as tools used in entrepreneurship training. (Figure 5).

Long description for Figure 5. The graph shows three large circles that refer to the most outstanding topics in reference to technology for entrepreneurship training. The largest circle shows that in seven of the articles analyzed, technology was not used in the training of entrepreneurs. A second circle shows six articles that refer to digital pedagogies in which technology is used in the training process. And a third large circle refers to five articles within the classification of disruptive technologies with the use of simulators for learning.

3.7. Q4. What components of education 4.0 were incorporated in recent research on entrepreneurship training models?

Education 4.0 introduces four essential components that constitute this concept for learning (competencies, information and communication technologies, learning methods and infrastructure). The review of articles found that these components have been integrated, but not together. Figure 6 shows how one or other element has been integrated in the articles analyzed in this literature review. Thus, 18 articles refer to the incorporation of information and communication technologies. Only 3 integrate competencies related to education 4.0 and 16 of the articles analyzed deal with learning methods.

Long description for Figure 6. The trends in the area graph are differentiated by the number of items per year and colors. The orange color shows the articles that refer to information and communication technologies (ICTs), the red color shows the articles that refer to learning methods, and the blue color shows the articles that refer to competencies.

Currently, educational systems have had to face several challenges, since 2019 the COVID-19 pandemic brought about the adaptation of educational practices to the need for teacher-student and pupil-student interconnection. Digitalization, networking and artificial intelligence, pillars of
education 4.0 (Haderer & Ciolacu, 2022) facilitated the learning process to continue its course. However, the incorporation of elements of education 4.0 in training processes is still incipient. It is necessary to develop a curriculum that prioritizes the development of critical competencies over the memorization of content, the management by education administrators and managers of infrastructure in line with the needs of educational innovation to keep pace with industrial growth and technological progress, and the incorporation of learning methods that integrate the implementation of emerging ICTs.

4. Discussion
Entrepreneurship education is an important area in higher education institutions and contributes to economic, social, and educational development. Based on the literature review, this paper gives an account of the pedagogy for entrepreneurship education that has been put into practice mainly in higher education. We have identified the context in which research is developed, the training
proposals for entrepreneurship based on the models, methods, strategies, and technological resources used, and the elements of Education 4.0 that have gradually been incorporated in this training process, with the following findings:

Educational institutions are where entrepreneurship training is primarily promoted, referring to entrepreneurial education in the first term, social entrepreneurship, and in some cases, sustainable entrepreneurship. The impulse for developing an entrepreneurial spirit, training entrepreneurial skills, and implementing innovative methodologies has arisen mainly in universities, leaving aside the pedagogical action for training entrepreneurial competencies at the basic and intermediate education levels (primary, secondary, and high school) (Figure 2). There has been a continuous growth in the number of universities that offer entrepreneurship courses, and, at the same time, questions have been raised as to whether entrepreneurial goals can be achieved and improved through education and training or whether certain people are born with entrepreneurial characteristics or skills (Kumar & Kumar, 2015). What is certain is that regardless of the level of schooling, all students could have the opportunity of an education in which they develop competencies or skills for entrepreneurship. For this, educational institutions could opt for the most appropriate models according to the level of the learner and the training goals established.

At this point, we consider it important to take up what Kolb (2015) states: learning means learning something that exists somewhere. While, for most, the idea of a learning space evokes the image of the physical environment of the classroom, the concept of learning space is much broader and multidimensional. The dimensions of learning space include physical, cultural, institutional, social and psychological aspects. Therefore, the models, methods and strategies used for the training of entrepreneurs can consider the previously mentioned dimensions, so that the development of entrepreneurship competencies is effective.

The models and methods in entrepreneurship education are multiple and can be used according to the training goals and the context. Recent research highlights pedagogical models and methods for entrepreneurship education that focus on the learner. Their conceptual bases reveal the importance of learning by doing or experience (Figure 3). The systematic use of active methodologies is essential in developing competency, including service learning, project-based learning, problem-based learning, and cooperative learning (López-Rodríguez, 2017). There is an association between elements of experiential learning and the development of entrepreneurial intention in students (Anwar & Abdullah, 2021). Jones et al. (2021) explains that experience-based learning encourages students to apply classroom concepts cognitively in real-world scenarios, further concluding that experience-based, hands-on learning will create more highly qualified graduate students. In the articles analyzed in this literature review, there is no single model for teaching, motivating and inspiring future entrepreneurs. Although this may seem a disadvantage, it is an opportunity because it allows entrepreneurial trainers to consider the wide range of models and their contextual adaptation, the established goals, and the specific training needs to solve the problems of the environment.

Another relevant aspect is incorporating information and communication technologies in training entrepreneurs. Based on the analysis, the articles that refer to digital pedagogies were the highest in number, followed by disruptive technologies and adaptive technologies; the studies mentioning open technologies were scarce (Figures 4 y 5). In a global and interconnected world, incorporating information and communication technologies requires updating the practices and contents of the educational system for the new information society (Gómez-Zermeño et al., 2019). Entrepreneurial trainers can resort to digital pedagogies, technological models, adaptive technologies, intelligent technologies, disruptive technologies, and open technologies that enable a broader scope of knowledge dissemination.

Scientific and technological transformations in the field of education facilitate the integration of innovative elements. In reviewing recent research articles, we found that of the four components
of Education 4.0 proposed by Miranda et al. (2021), new learning methods and information and communication technologies were incorporated in entrepreneurial training (Figure 6); however, the use of innovative infrastructures to improve teaching-learning and the full development of transversal and disciplinary competencies are necessary. “Education 4.0 is the current period in which higher education institutions apply new learning methods, innovative didactic and management tools, and smart and sustainable infrastructures complemented mainly by new and emerging ICTs to improve the processes of knowledge generation and information transfer” (Miranda et al., 2021, p. 4). The sum of all the elements contributes to developing competencies for entrepreneurship as these have a broad association with the transversal competencies promoted through Education 4.0, such as critical thinking, cooperation, collaboration, communication, and creativity.

The findings of this literature review show gaps in the management of entrepreneurship and research:

1. First, the training of entrepreneurs should be developed beginning in the initial levels of education. Students would have the opportunity to gradually develop competencies related to entrepreneurship, including leadership, creativity, development of critical thinking, problem-solving, and decision-making, to name a few.

2. This implies a challenge for educational institutions and social, governmental, and business organizations; the responsibility must be shared. Entrepreneurship training can be carried out contextually if we consider that theory must be applied with practice.

3. In addition to the above, from recent studies, we visualize the need to train entrepreneurial trainers, which requires promoting and funding educational undertakings.

The identification of management gaps in entrepreneurship training opens the door to new research in which it is possible to use action research methods, mixed or quantitative approaches with quasi-experimental designs whose scope is explanatory, to answer some questions: how entrepreneurial competencies are developed at initial training levels, how to train entrepreneurship trainers, the impact of incorporating different types of technologies on developing entrepreneurial competencies, how to promote educational entrepreneurs who also train for social and sustainable entrepreneurship and, therefore, to the solution of major social problems.

5. Conclusions and recommendations

Based on the results, we conclude that there is a diversity of models and methods that have been used in different contexts in entrepreneurship training. Most of these models and methods focus on experiential learning, and in this type of learning, experimentation plays a relevant role to train new entrepreneurs or to increase entrepreneurial intention. We agree that it is important that the programs to train entrepreneurs are through practical experiences to facilitate the development or increase of entrepreneurial skills. Based on the results, we make the following practical recommendations for those interested in the process of training entrepreneurs:

- Conceptually define the model on which the entrepreneurship training program will be based.
  Select the most convenient method or methods according to the context in which the program will be implemented.
- Encourage those who participate in entrepreneurial programs to be agents of change that contribute social value through their ventures and provide solutions to regional, national and global problems.
  Integrate elements of education 4.0 to provide the opportunity to have a program with well-defined competencies, new learning methods, information and communication technologies and an adequate infrastructure that facilitates the improvement of learning processes and innovation.
- To have teachers who act as mentors, coaches, and collaborators for those who are learning entrepreneurship.
Establish collaboration networks with the productive sectors. We believe that the responsibility for entrepreneurial training should be shared by all actors (governmental, social, business, and educational).

The development of entrepreneurial skills can be carried out from the basic levels of schooling or in contexts outside the academic environment, it does not have to be promoted exclusively by or through universities.

The major social problems exposed by the COVID-19 pandemic require shared and collaborative actions in education that open the door to new entrepreneurs. This literature review focuses on some of the innovative models that have been analyzed by researchers and becomes a starting point for future research on this topic or research using one or more methodologies for entrepreneurship training. It is important to mention that this study exclusively analyzed articles found in the WoS and Scopus databases and that they were published in English; this may be a limitation in the inclusion of articles from other databases. However, it is worth mentioning that the research questions we posed for this literature review were answered and provide relevant knowledge for entrepreneurship training and in the field of educational research. For future research, it is recommended to include articles found in other databases and in other languages, to analyze the models, methods and techniques for entrepreneurship education that have been used in other academic and scientific contexts.

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