



# Twenty years of entrepreneurship education: a bibliometric analysis

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## Abstract

The study aims to identify the trends in entrepreneurship education in prominent journals. A total of 2185 indexed research publications made up the studied data. The R bibliometric tool is then used to analyze the data to determine the bibliometric map of the evolution of entrepreneurship education. According to the findings, there have been a substantial number of publications on the growth of entrepreneurial education research. Wibowo A, Huang-Saad A, and Narmaditya BS are the authors who frequently do study on this topic during the research time. The co-occurrence network was also developed and was divided into three clusters. The major themes developed out of the co-occurrence network are *determinants of entrepreneurship education for building an entrepreneurial intention among students in higher education, entrepreneurship in the classroom, and innovation and entrepreneurship education*. This study has also brought in future research topics based on prominence percentile using SciVal. This study's originality is from presenting a structured and in-depth literature review that describes the current state of the art for entrepreneurship education. A complete analysis of the knowledge acquired about its entrepreneurship education is offered to enhance the further research.

**Keywords** Entrepreneurship education · Entrepreneurial intention · Innovation · Self-efficacy · Education · Bibliometrics · SciVal

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## Introduction

Due to its ability to connect contemporary business operations with academic theory, entrepreneurship education is one of the fields with the fastest growth rates worldwide. A surge in research interest in the subject has coincided with a focus on entrepreneurship education in the classroom (Ratten and Usmanji, 2021). Interesting difficulties have arisen for institutions delivering entrepreneurship education and assisting organizations due to the expansion of study on entrepreneurship education and the related study on the impact of entrepreneurship education (Aparicio et al., 2019). The slogan “teach and perish” is not tossed about in the same way “publish or perish” (Snuggs & Jevons, 2018). As a result, even if major advances have been made in entrepreneurship education, there is still great potential for development in the field of study about instructional methods. Turner and Gianiodis (2018) states “whereas the scholarship and pedagogy within the field of entrepreneurship education has matured considerably over the last 20 years.”

Entrepreneurship education research has expanded quickly and garnered the interest of many notable scientists. Several authors have contributed to advancing entrepreneurship education knowledge by publishing literature evaluations in scholarly publications. A literature review involves researchers and practitioners by emphasizing and upgrading the entrepreneurship education landscape and offering a visible auditing trail to validate publications’ sequence and flow (Kas-sean et al., 2015). Due to their worldwide viewpoint on entrepreneurship education research and practice, Mwasalwiba’s (2010) and Nabi et al. (2017)’s articles are particularly intriguing. Other studies that have examined the state of the field in particular contexts include those that focus on entrepreneurship in engineering education (Da Silva et al., 2015) and the role of coaching and entrepreneurship education as catalysts for territorial advancement, in addition to the works mentioned above that offered a global perspective on entrepreneurship education research (Galvão et al., 2017).

Although each article has contributed significantly, the current study provides a birds-eye-view of entrepreneurship education research for the past twenty years using bibliometric analysis. To trace the development of entrepreneurship education research, a bibliometric study can provide a comprehensive overview of the existing literature and indicate trending subjects and research approaches. Zupic and Čater (2015) assert that the rigorous, open, and repeatable review process introduced by bibliometrics enables a more accurate description, assessment, and oversight of scientific literature. As a result, bibliometric analyses add new insight to the field of entrepreneurship education.

Numerous research fields have undergone bibliometric reviews, including entrepreneurship, management, innovation, economics, wine tourism, and international business (Albort-Morant et al., 2018; Baier-Fuentes et al., 2019; Bonilla et al., 2015; Durán Sánchez et al., 2017; Ferreira et al., 2014; Merigó et al., 2016). Therefore, this work aims to offer a retrospective bibliometric examination of the 20-year development of entrepreneurship education’s context and subject matter.

First by identifying trends in journals, publications, and authors, performance analysis—which includes a few productivity and impact indicators—is used in this study to highlight and present an updated overview of entrepreneurship education research. In order to graphically represent the themes of current research, developing themes, and potential trends for future study, a strategic diagram is created by mapping a co-word analysis. The results thus offer a direction for additional research in this area.

The remainder of this article is organized as follows. The theoretical background is provided in the next section. The technique used in this study is described in the next section, followed by a discussion of the findings for the activity indicator and the science mapping analysis. The study’s conclusion, restrictions, and suggestions for additional research are covered in the last part.

## Theoretical background

Entrepreneurship education aims to alter students’ perceptions of risk-taking and innovative business practices (Jones & English, 2004). Entrepreneurship education has advanced from instructing students on launching a new firm to identifying business prospects and launching digital ventures (Ferreira et al., 2018). As entrepreneurship education can relate to both “entrepreneurship” and “enterprise” education and, as is frequently the case, both categories seem to be used simultaneously, defining what is intended by the phrase is one of the issues with entrepreneurship education research. Despite the widespread belief that entrepreneurship education is as much about cultivating inventive and enterprising skills to improve employability as it is about genuinely opening a company, a quick scan of the literature reveals a marginally stronger focus on the “entrepreneurship” and “new venture creation” dimensions. The following are the definition provided by different authors (Table 1):

More study is being done on the subject, which has led to a rapid expansion of the entrepreneurship education field. In addition to expanding its exposure in general

**Table 1** Definition of entrepreneurship education

References	Definition
Alberti et al. (2004)	“The structured formal conveyance of entrepreneurial competencies”
Jones and English (2004)	“The process of providing individuals with the ability to recognize commercial opportunities and the insight, self-esteem, knowledge, and skills to act on them”
Engle et al. (2010)	“To let students know the skills necessary to successfully start a business and help build their confidence in performing those activities”
Rae (2005)	“Learning to recognize and act on opportunities and interacting socially to initiate, organize, and manage new ventures”
Henry and Lewis (2018)	“Learners developing the skills and mindset to turn creative ideas into entrepreneurial action”
Boon et al. (2013)	“Entrepreneurship education is characterized by interactive learning linked to business and community initiatives”

education, this has strengthened theoretical and methodological rigor. Although there are numerous contexts and locations where entrepreneurship education can be implemented, there are also present issues that must be addressed. While ignoring other theoretical frameworks, much of the study on entrepreneurship has evolved to be centered on social psychology in terms of “attitudes,” “actions,” “beliefs,” and “behaviors” (Liñán & Fayolle, 2015). Many entrepreneurship instructors build curricula around Jamieson’s (1984) now-famous paradigm. His three-category concept, which distinguishes between learning “about,” “for,” and “in” business, incorporates what modern researchers could refer to as “entrepreneurship education and training.” The first category focuses on creating awareness; students are usually the intended audience, and the emphasis is on motivating people to understand the value of developing entrepreneurial abilities and skills and improving their employability (Henry & Lewis, 2018). The second category focuses on preparing people for entrepreneurship-related tasks, including starting new businesses and working for themselves. As a result, the information frequently focuses on finding business possibilities and showing readers how to launch a new company. Aspiring business owners are often the target market (Henry & Lewis, 2018). The third category focuses on the knowledge and skills required to run and expand an existing firm; its target market is typically aspiring or seasoned business owners, and its content is invariably growth- and new-product-focused. The following critics could distinguish between the intended audience’s developmental stages by using Jamieson’s model as a foundation, stating that educational demands would differ correspondingly (Henry & Lewis, 2018).

## Methodology

Document source selection and bibliometric analysis are the two stages of the methodological design for this study. The next sections go over each stage in depth.

### Document source selection

Data for this study were gathered from the Scopus database, which includes thousands of scholarly articles and bibliographic data about authors, affiliations, and quotes. Due to database duplication, prior research has demonstrated that using additional relevant databases concurrently does not enhance the number of relevant documents gathered (Harzing & Alakangas, 2016). So, the Scopus database was the sole one used to conduct the literature review for this study. For this literature, we accumulated 2185 documents. We have excluded articles that were retracted and articles in the press. The following were used for extracting the articles: TITLE-ABS-KEY (“Entrepreneurship Education”) AND [LIMIT-TO (EXACTKEYWORD, “Entrepreneurship Education”)] AND [EXCLUDE (PUBSTAGE, “aip”)] AND [EXCLUDE (DOCTYPE, “tb”)]. The data information is shown in Table 2.

**Table 2** Main information of data

Description	Results
<i>Main information</i>	
Timespan	2002:2023
Article	1432
Conference paper	631
Book chapter	65
Review	40
Editorial	9
Data paper	4
Note	3
Short survey	1
<i>Document content</i>	
Keyword plus	3208
Authors keywords	3946
<i>Authors</i>	
Authors	4175
Author appearances	5630
Authors of single-authored documents	352
Authors of multi-authored documents	3823
<i>Authors collaboration</i>	
Single-authored documents	398
Documents per author	0.479
Authors per document	2.09
Co-authors per documents	2.81
Collaboration index	2.39

## Bibliometric analysis

In order to provide a quantitative examination of textual publications, bibliometric methodologies have been used. Bibliometric analysis is a subset of scientometrics, which uses statistical and mathematical techniques to examine scientific activity in a certain study topic (Callon et al., 1991). It gives a broad view of a field of study that can be categorized by articles, authors, and journals (Merigó & Yang, 2017). Performance analysis and bibliometric mapping, a visual representation of science, are the two basic ways used in bibliometric methods (Noyons et al., 1999). On the one hand, performance analysis measures the influence of citations of scientific work made by the various players who engage in conversation within the research field. These actors can include nations, colleges, departments, and scientists. The measures that consider the number of publications and citations are the most widely used (Yu & Shi, 2015). The author's productivity is connected with their output in publications, whereas their impact on the scientific community is linked with their output in terms of citations (Merigó & Yang, 2017). This kind of study is based on identifying the body of literature,

or publications in the broadest sense, that pertains to a particular topic area. The analysis workset quickly made use of statistical methods. Initially, it mostly comprised of selections of highly referenced works or bibliographic summaries of scientific productions. These overviews were further separated into national or subject bibliographies, as well as lists of author productions. For conducting this study, Biblioshiny package in R programming and VOS viewer is used.

Many scientific domains have a need to get a broad overview of the literature, which is one of the key motivations for conducting this kind of analysis. This has typically been offered by review articles or surveys. A review article condenses well-chosen scientific material. This information is typically dispersed throughout the literature along with a broad field bibliography. A bibliometric analysis, on the other hand, focuses on statistically relevant data but is rarely utilized in conjunction with a bibliography of the field. The review material and the reports were written by experts who had a practical understanding of the subject matter and were well versed in their respective fields. These publications are meant for audiences within related scientific subjects. However, information experts with specialized abilities frequently use bibliometric techniques. Reports or articles are ordered by external clients, and the scientific team may occasionally work with them to produce these reports. Governmental or institutional organizations frequently request productivity reports or high-quality evaluations of employee performance. Readers of this kind of analysis learn about emerging trends, rival groups, and potential areas of collaboration. In all situations, one can benefit from bibliometric techniques.

### **SPAR-4-SLR**

A procedure must be established to conduct a systematic literature review because it encourages meticulous planning, consistent execution, and openness that permits replication. To put it another way, a protocol enables researchers to anticipate problems, reduce ambiguity, promote responsibility, and uphold the integrity of their research. We preferred the SPAR-4-SLR review process over the PRISMA protocol, which was created in the realm of pure science because of its rigor. The three steps of SPAR-4-SLR are assembly (which includes “identifying” and “acquisition”), arrangement (which includes “organization” and “purification”), and assessment (which includes “evaluation” and “reporting”) (Fig. 1) (Raman et al., 2022).

### **Biblioshiny**

This investigation made use of Biblioshiny. The java software Biblioshiny for bibliometrics was developed by Massimo Aria from the University of Naples Federico. Biblioshiny uses the Shiny package environment in R programming to combine the bibliometrics package’s functionality with the web app’s usability (Srisusilawati et al., 2021). Use the Bibliometrix software to combine bibliographic data, perform “bibliometric analysis,” and produce a data matrix for “co-citation,” “coupling,” “scientific collaboration analysis,” and “co-word analysis.” Additionally, in disciplines like “network analysis,” “factorial analysis,” and “thematic mapping,”

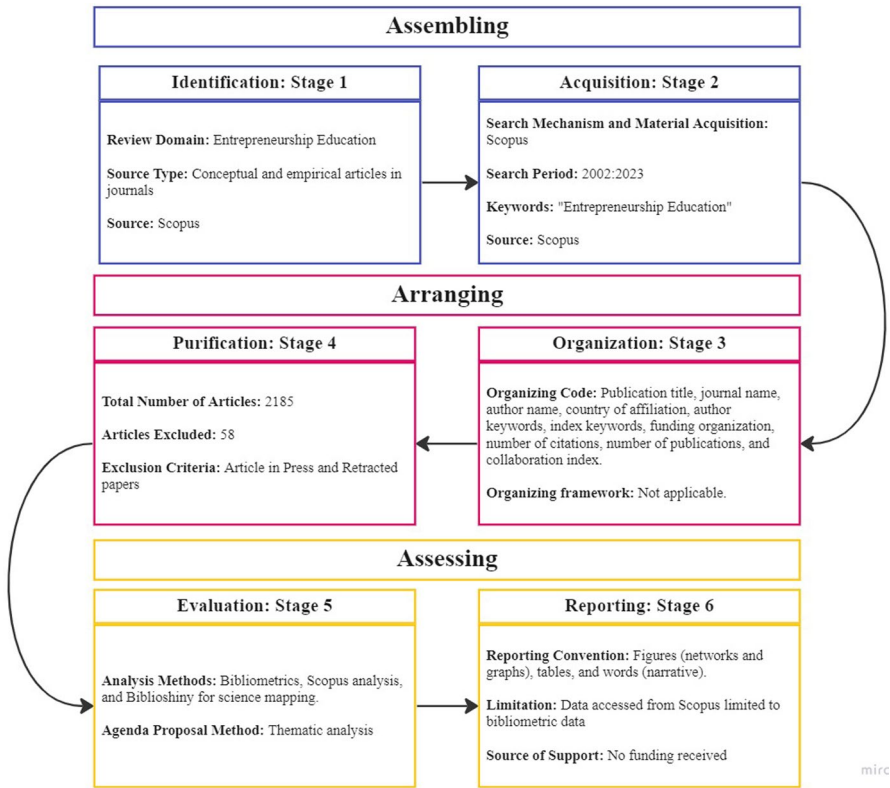


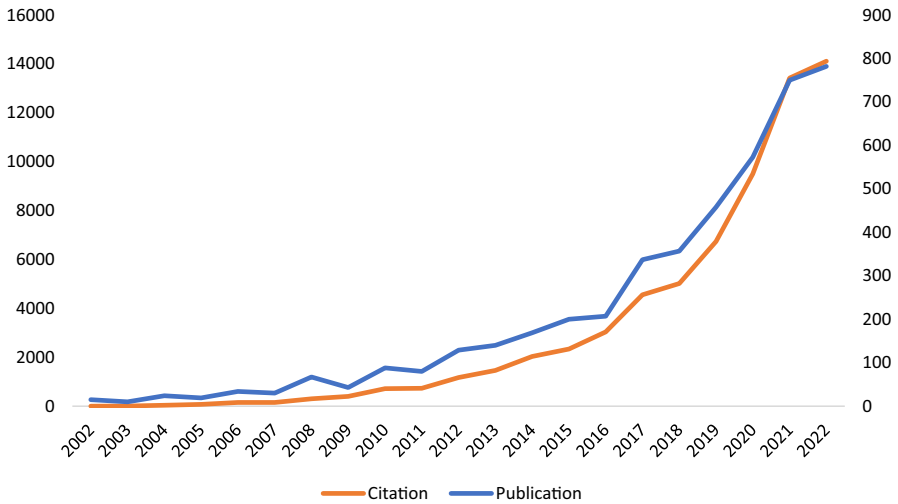
Fig. 1 Flowchart of methodology (SPAR-4-SLR)

new information frequently emerges at the intersections of structural and temporal evolution.

## Results

### Evolution of entrepreneurship education based on publication and citation

Based on the total number of publications and citations gathered for publication from 2002 to 2022, the publication patterns in the literature on entrepreneurship education are identified. It is evident from Fig. 2 that the highest publication, as well as the citation, is in the year 2022 with a total publication of 782 and a total citation of 14,111. The publication growth from year to year demonstrated the field’s dynamic nature. More crucially, the rising publications are the result of the field’s growing recognition and interdisciplinary nature. It is also evident that the study on entrepreneurship education has steeply increased from the year 2017 to till date. Notably, these were the most fruitful years for research on entrepreneurship education.



**Fig. 2** Evolution of entrepreneurship education based on publication and citation

### Top contributing countries

The top contributing country is China with the highest publication of 443, followed by the USA with 288 publications. In China, the highest cited article is an article written by Cui et al. (2021) titled “The impact of entrepreneurship education on the entrepreneurial mindset of college students in China: The mediating role of inspiration and the role of educational attributes.” The article discussed the paucity of research on the connection between entrepreneurship education and entrepreneurial mindset, highlighting it as a novel effect of entrepreneurship education. The findings showed that the relationship between entrepreneurship education and an entrepreneurial mindset is intricate. Entrepreneurship education greatly increased students’ motivation to start their businesses, encouraging the development of students’ entrepreneurial mindset. In a substantial way, entrepreneurial inspiration also moderated the effect of entrepreneurial education on an entrepreneurial mindset. The importance of educational features, such as the kind of learning experience, the kind of course, and the kind of activity, was also emphasized. Finally, it was discovered that participation in extracurricular activities had a significantly favorable direct effect, whereas curriculum attendance had a significantly negative direct effect (Fig. 3).

The overlay representation resulting from the bibliographic coupling countries is shown in Fig. 4. In 2017 and 2018, the USA, UK, Germany, Australia, Spain, Finland, India, and Netherlands made a considerable contribution. China and Indonesia made an important contribution to the study of entrepreneurial education in 2019. By 2022, we may expect a rise in publication and a shift toward Southeast Asia regions like Bangladesh, India, Indonesia, etc.



Compare the document counts for up to 15 countries/territories.

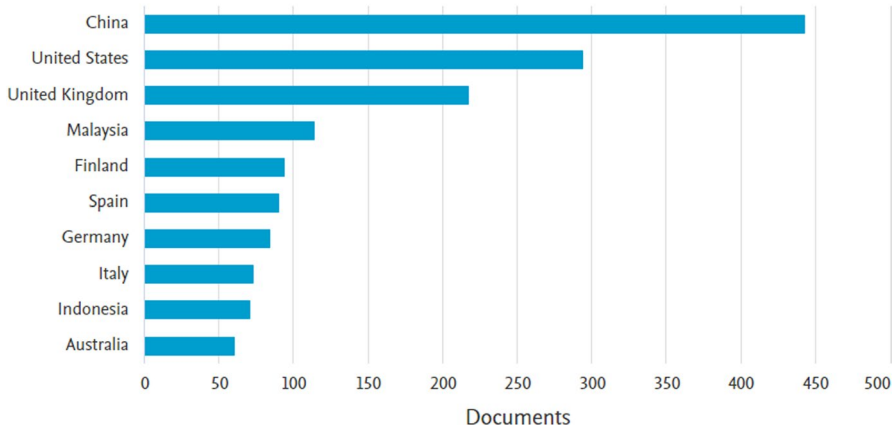


Fig. 3 Documents by country or territory

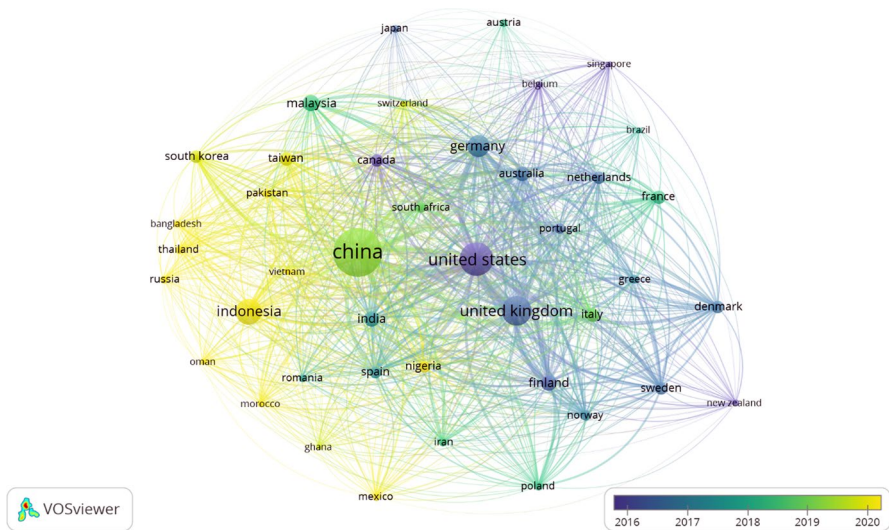


Fig. 4 Bibliographic overlay of top contributing countries/territories

### Sources

Figure 5 shows the most relevant sources where the highest publication was made. The highest publication was made in Education and Training (110 articles), followed by Proceedings of the European Conference on Innovation (83 documents), Journal of Entrepreneurship Education (78 documents), and Industry and Higher Education (71 documents). Figure 6 shows the H index. A researcher or scholar’s

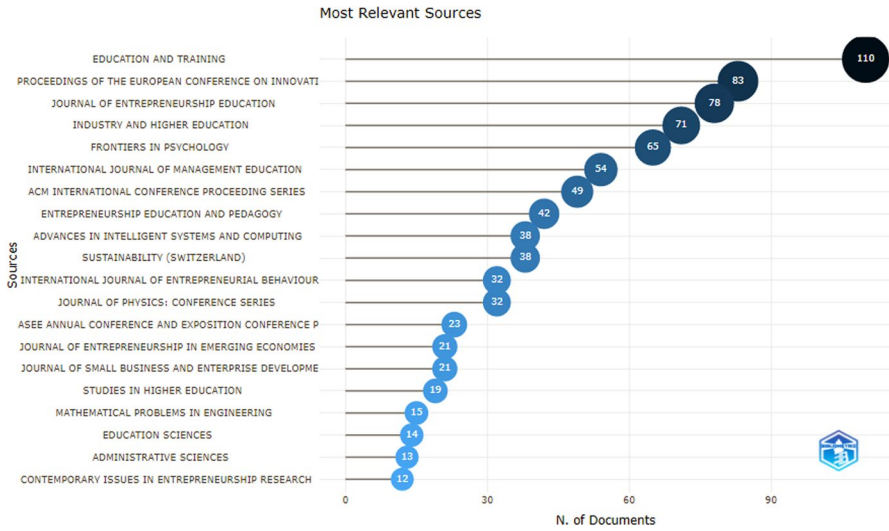


Fig. 5 Most relevant sources

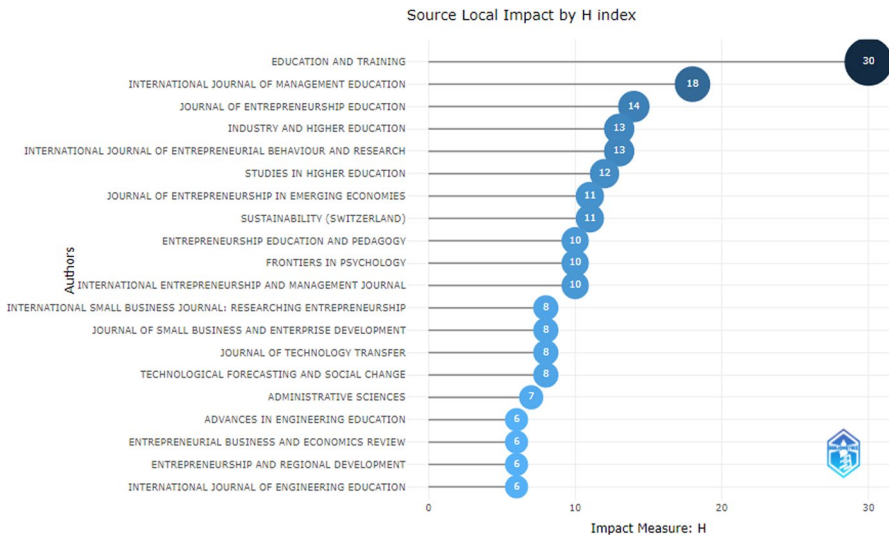


Fig. 6 Source local impact by H index

productivity and the effect of their publications on citations are both intended to be gauged by the author-level indicator known as the h index. The highest h index is for Education and Training (30), followed by the International Journal of Management and Education (18) and Journal of Entrepreneurship Education (14).

### Open-access publications

In total, there are 663 open-access publications. It is evident from Fig. 7 that the publications in open access are increasing year by year. There are 167 open-access documents published in the year 2022, which is the highest compared to previous years. Regarding citations, the highest citation was in 2018, with a total citation of 1346. The top cited open-access article was titled “Examining the formation of human capital in entrepreneurship: A meta-analysis of entrepreneurship education outcomes,” with a citation of 720. This was authored by Martin et al. (2013). Governments are becoming increasingly concerned about how to effectively develop human capital through entrepreneurship education and training (EET), as EET is expanding quickly around the globe. Unfortunately, there is not enough solid data to support the claim that EET promotes the development of new or better entrepreneurs. They conduct the first quantitative analysis of the literature and discover that the value of EET is in fact supported within the framework of the human capital theory.

### Three-field plot

Three-field plot creates a Sankey diagram to show the key components of three fields (such as authors, keywords, and sources) and their relationship. The sources, a list of authors, and the keywords covered are the three elements that make up the three-field plot (Fig. 8). A gray plot that is related to the three components links them together. The journals’ names are followed by a list of the regular contributors to each, followed by a list of the subjects on which each contributor frequently conducts research with an entrepreneurship education theme. The rectangle’s size demonstrates the significant number of publications linked

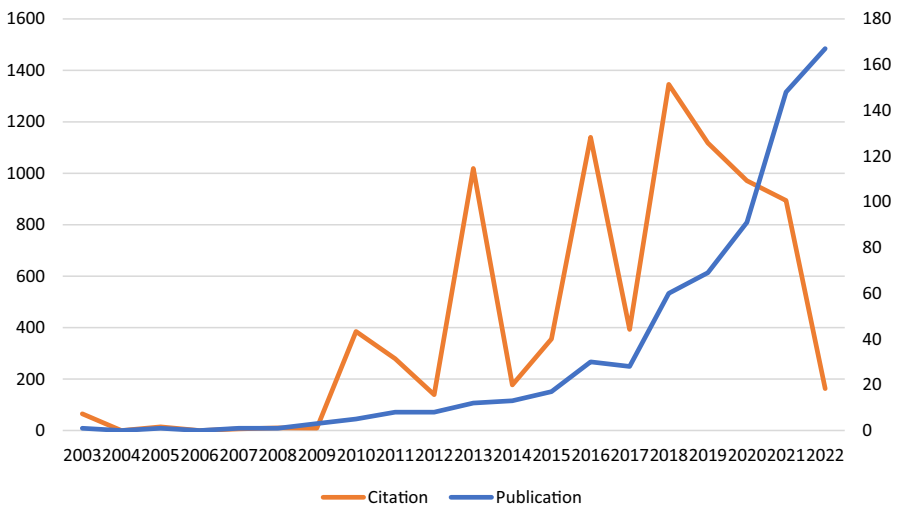
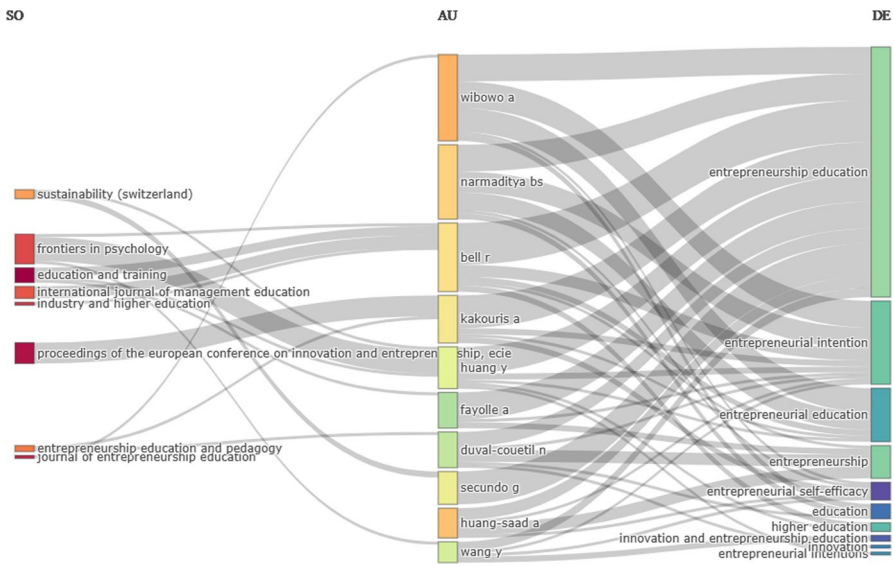


Fig. 7 Open-access publications



**Fig. 8** Three-field plot of entrepreneurship education research

to these components. According to the figure, there are 11 journals included in the three-field plot that publish papers on entrepreneurship education in the first element. The three-field plot gives us a picture that “entrepreneurship education” was having the biggest node followed by “entrepreneurial intention” which is followed by “entrepreneurial education,” and “entrepreneurial self-efficacy.” From the middle field, it is noticed that Wibowo A is the most compelling author who examined the important keyword such as “entrepreneurship education,” “entrepreneurial intention,” “entrepreneurial education,” and “entrepreneurial self-efficacy” and was published mostly in the *Journal of Entrepreneurship Education*.

**Prolific authors**

Figure 9 shows the most relevant authors. The figure shows that the highest publication was done by Wibowo A with 17 articles, followed by Huang-Saad A and Narmaditya BS with 15 documents each. The highest cited article of Wibowo A is the article titled “The impact of entrepreneurship education and students’ entrepreneurial mindset: the mediating role of attitude and self-efficacy,” with 73 citations. The study’s primary goals were to examine the connection between students’ entrepreneurship education and entrepreneurial mentality and to comprehend the mediating roles that attitude and self-efficacy play in this relationship. The results show that entrepreneurship education has a positive impact on entrepreneurs’ sense of self-efficacy, their attitudes toward starting a business, and their mindset. Instead of encouraging the entrepreneurial mindset, entrepreneurial

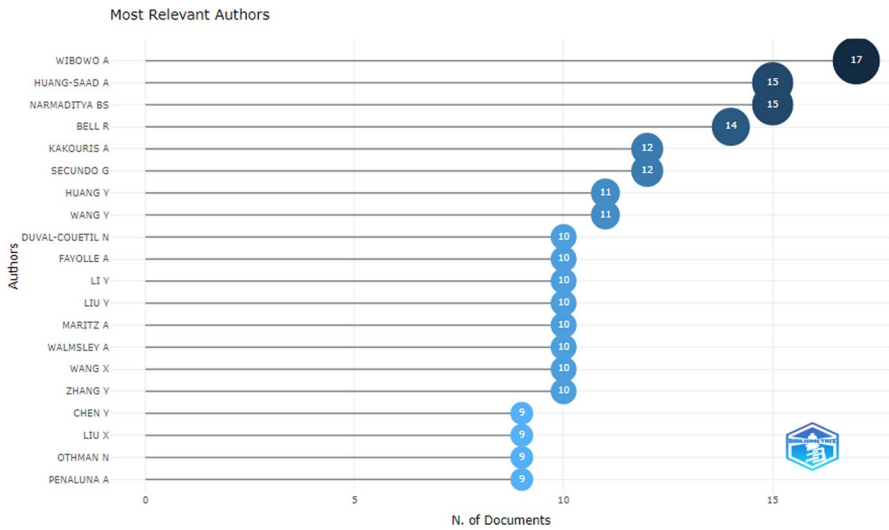


Fig. 9 Most relevant authors

self-efficacy does the opposite. Additionally, entrepreneurial attitude is crucial in modulating the effects of self-efficacy and entrepreneurship education on students’ entrepreneurial mindsets.

**Documents**

Figure 10 shows the trend topic. Topic trends are a component of this study, and the figure summarizes how the topic has changed over time concerning the divisions per year. Such that it is clear which topics have been utilized recently and which ones have been used for a long period. The most emerging topics are “innovation and entrepreneurship,” “education computing,” “curricula,” “social entrepreneurship,” etc.

**Conceptual structure**

Figure 11 shows the co-occurrence network, which is divided into three clusters. The cluster detail is shown in Table 4. The *first cluster* is the red area where this cluster can be themed as *determinants of entrepreneurship education for building an entrepreneurial intention among students in higher education*. This includes entrepreneurship intention, self-efficacy, entrepreneurial mindset, entrepreneurship learning, etc. The rise in employment rates, as well as the economic and social growth of various nations, is now largely attributed to entrepreneurial activity. This activity has inspired the development of entrepreneurial environments for college students, turning entrepreneurial education into a tactical choice to enhance abilities, attitudes, and emotional intelligence (Cassol et al., 2022). Self-efficacy is defined

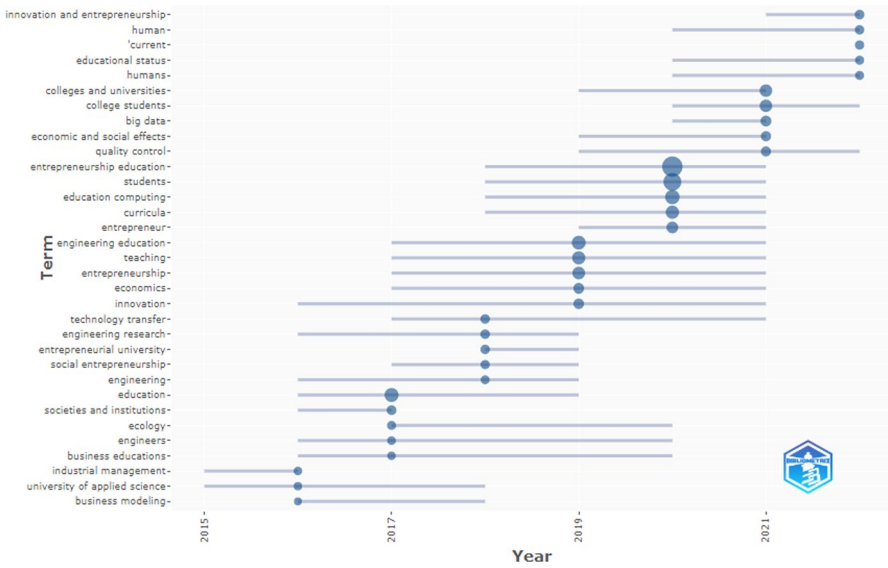


Fig. 10 Trend topics of entrepreneurship research

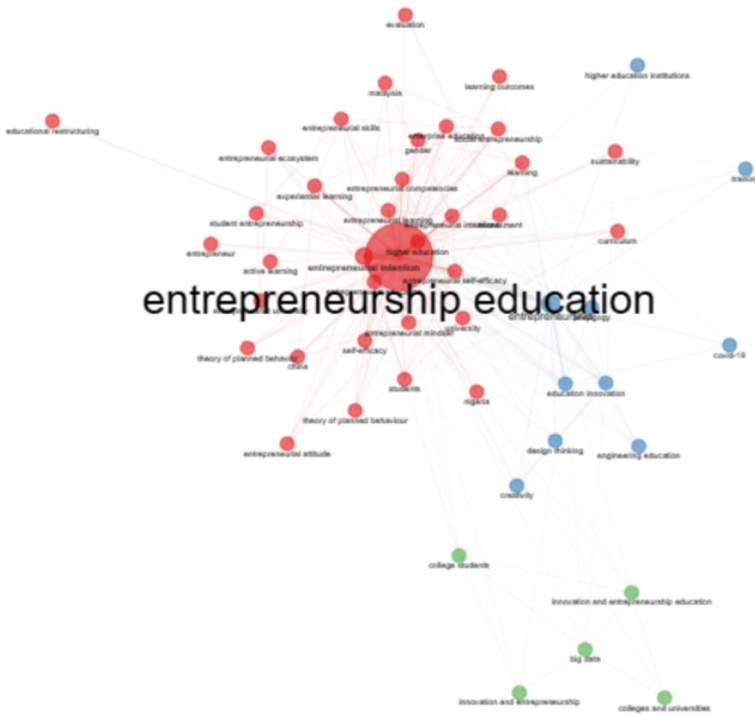


Fig. 11 Co-occurrence network

as confidence in one's ability to plan and carry out actions that will result in a specific level of achievement. It is possible to undertake specific activities, according to the definition of perceived behavioral control from the theory of planned behavior, which is congruent with the idea of perceived feasibility from the model of the entrepreneurial event (Zovko et al., 2020). In other words, both models have a component that has a conceptual connection to self-efficacy. Governments have been encouraging the development of entrepreneurship programs because entrepreneurship education has become an essential instrument in the development of the skills required for starting enterprises. The alleged relationship between competencies and the emergence, continuation, and expansion of a company initiative is what sparks interest in entrepreneurial competencies. However, despite the alleged significance of entrepreneurial competencies, the literature on this topic is still in its infancy, in part because the term competency has been interpreted from many perspectives and as a result, has multiple meanings (Sánchez, 2013).

The *second cluster* is the blue area which can be themed as *entrepreneurship in the classroom*. This cluster includes the keywords such as entrepreneurship, innovation, pedagogy, creativity, and design thinking. Working implementation models and practices for entrepreneurial education are necessary to meet both national and European Union goals, especially in primary and upper secondary education. Teachers are mostly responsible for integrating entrepreneurship education into their classroom and identifying the finest and most practical approaches because there are no precise pedagogical rules for this field (Ruskovaara & Pihkala, 2013).

The *third cluster* is the green area which can be themed as *innovation and entrepreneurship education*. While innovation refers to the act of materializing that opportunity in a change of some sort, such as a product, a service, an organizational shift, or a new process, entrepreneurship has to do with the entrepreneur's capacity to perceive opportunities and transform them into an interesting offer. Given the significance of both phenomena, there is a lot of work being done to integrate entrepreneurship and innovation into the curricula at institutions of all kinds. The goal is to inspire pupils to launch their own (Harkema & Schout, 2008) (Table 3).

Figure 12 shows the thematic map. In this study, the density and centrality of thematic maps were separated into four theme quadrants, as indicated in the figure. With the addition of pertinent keywords other than the author's keywords, a semi-automatic system that reviewed the titles of all references to the study object produced these findings, so the outcomes could capture that deeper variance. As a driving topic with high density and centrality in the upper right quadrant, it has to be developed and is crucial to be researched further. A distinct and uncommon theme is present in the upper left quadrant, which also has a high degree of development, as seen by its high density but low centrality. Additionally, themes that have been employed for a long time but have seen a decreasing trend and pronounced low centrality may be seen in the lower left quadrant. Finally, the lower right quadrant has a fundamental theme with high centrality but low density.

Figure 13 shows the conceptual structure map. The red and blue sections, the two halves of the area divided into this data, each contain terms that are connected to the other. The red area in the figure has more and different words, meaning that more research publications have made connections between the

**Table 3** Co-occurrence network (cluster details)

Nodes	Clusters
Entrepreneurship education	1
Entrepreneurial intention	
Higher education	
Entrepreneurial intentions	
Entrepreneurial self-efficacy	
Experiential learning	
Entrepreneurial learning	
Social entrepreneurship	
Entrepreneurial mindset	
Gender	
Enterprise education	
Learning	
University	
Theory of planned behavior	
Assessment	
Students	
Curriculum	
Entrepreneurial competencies	2
Entrepreneurship	
Innovation	
Education	
Pedagogy	
Creativity	
Design thinking	
Engineering education	3
Higher education institutions	
covid-19	
Innovation and entrepreneurship education	
Innovation and entrepreneurship	
College students	
Big data	
Colleges and universities	

words mentioned. The most popular topics, their relationships to other topics, and a taxonomy of these topics are displayed in a dendrogram tree diagram that follows. These topics are depicted in various colors. The dendrogram diagram's representation is frequently employed in various contexts, such as the hierarchy of grouping, where it illustrates the prevalence of connections between items in groups as a consequence of software analysis. The height of the coordination between themes and clusters is considered when structuring this grouping (Fig. 14). This diagram illustrates the connection between the deep blue categorization and the themes in red, divided into two categories: themes in red and themes in blue. In research articles on the issue of entrepreneurship education in recent years, each of them is split into several clusters, each cluster into multiple sub-clusters, and so on until the topic employed, numerous topics are part of one cluster, suggesting that there is a connection between the two.



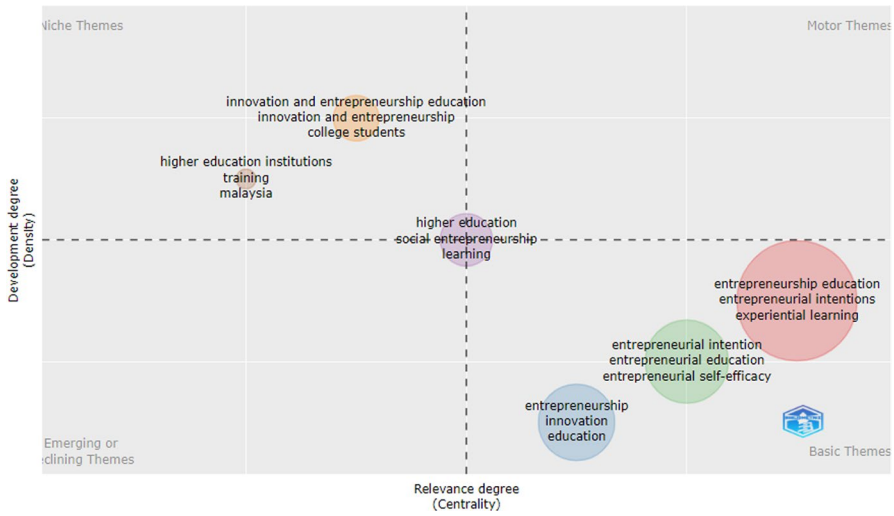


Fig. 12 Thematic map

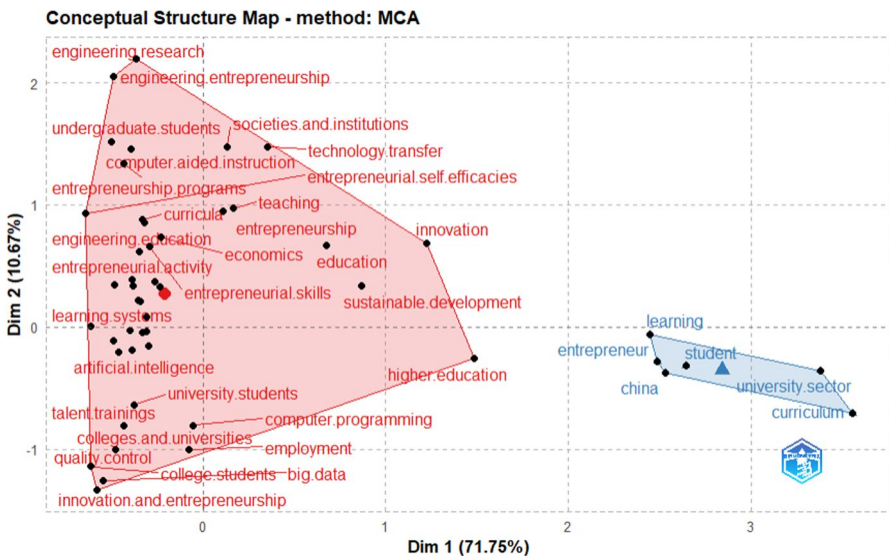


Fig. 13 Conceptual structure map

### Country collaboration map

Country collaboration map is shown in Fig. 15. The blue tint of the map represents global research collaboration. The pink line dividing the states denotes the extent of the author’s participation. It is fascinating to observe how these

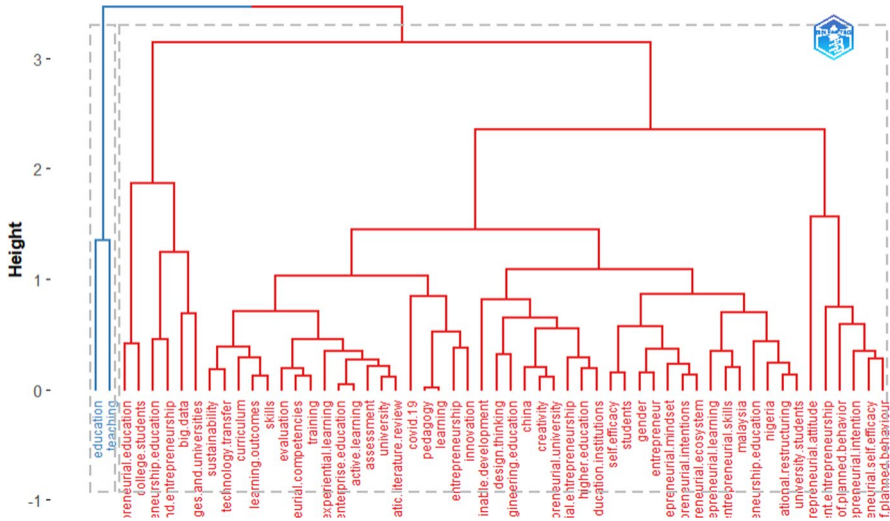


Fig. 14 Topic dendrogram

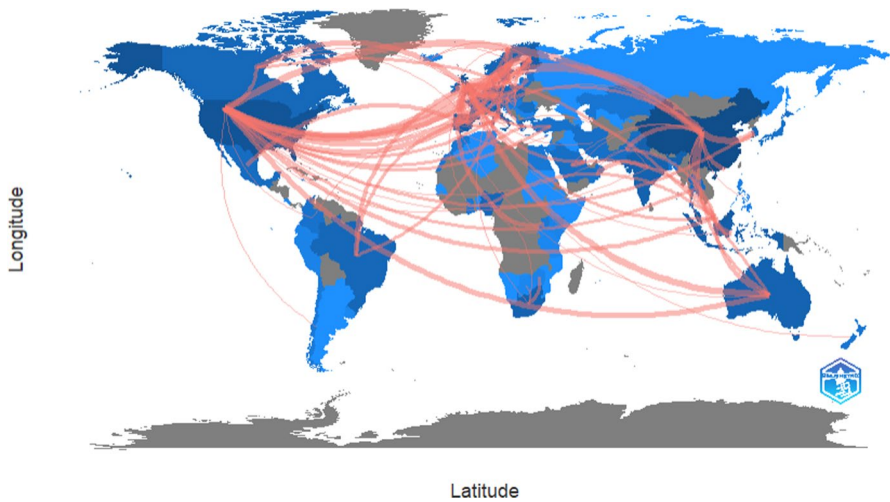


Fig. 15 Country collaboration map

alliances have grown in the countries with the highest number of publications on entrepreneurship education. Although China–UK, China–USA, UK–Spain, USA–UK, and Finland–Sweden have taken part in the most extensive partnerships with countries that are occasionally geographically distant from one another and have thus failed to advance the subject, the collaboration can consequence in the interaction of strategies and market collaboration.

## Discussion and future research topics

Based on the papers in the Scopus database, this study assessed the development of scientific research in entrepreneurship education between 2002 and 2023. From the above findings, it is clear that there is a growing trend in research in entrepreneurship education. The study on entrepreneurship education has steeply increased from the year 2017 to till date. The top contributing country is China and the prolific authors are Wibowo A with 17 articles, followed by Huang-Saad A and Narmaditya BS. The highest number of publications is made in the journal of Education and Training, followed by Proceedings of the European Conference on Innovation, Journal of Entrepreneurship Education, and Industry and Higher Education. More attention in the subject is warranted, given our article's significant contribution to the literature on entrepreneurial education. The co-occurrence network was also developed and was divided into three clusters. The major themes developed out of the co-occurrence network are *determinants of entrepreneurship education for building an entrepreneurial intention among students in higher education*, *entrepreneurship in the classroom*, and *innovation and entrepreneurship education*.

The emphasis on entrepreneurial education answers the desire for further research based on several theoretical stances (Palalić et al., 2017). Future research topics can focus on topics based on the prominence percentile. Table 4 shows the top four topic prominence percentile from SciVal. Since prominence is determined mostly by the citations and views of a topic's most recent publications, it represents its current visibility and momentum. Research areas that have shown a noticeable growth acceleration in recently published articles and are likely to have gained recent funding are represented by "New Topics." These new topics are generated based on direct citation relationships that have emerged over the past year and are derived from parent topics that already exist. Therefore, future research can enhance their research in such topics.

### Entrepreneurial intention; effectuation; entrepreneurship

Entrepreneurial goal intention (EGI) is primarily influenced by desire, self-efficacy, feasibility, opportunity, attitude, and collective efficacy. Additionally, EGI has a significant impact on entrepreneurial implementation intention. When a person has a strong propensity to act, the effect of perceived opportunity on EGI tends to be more significant (Esfandiar et al., 2019). Unquestionably, the global proliferation of

**Table 4** Topic prominence

Topic	Prominence percentile
Entrepreneurial intention; effectuation; entrepreneurship	99.900
Business model innovation; innovation; digital transformation	99.826
Social entrepreneurship; innovation; impact investing	99.470
Entrepreneurial university; academic entrepreneurship; innovation	99.390

COVID-19 presents a challenge to the landscape of higher education on a scale we have not seen since the development of technology enabled and online instruction. This has a particularly negative effect on classes that teach entrepreneurship (Liguori & Winkler, 2020). Thus, future research can talk about the pandemic's effects on entrepreneurship education worldwide and demand for more research and the creation of new resources for online entrepreneurship education.

### **Business model innovation; innovation; digital transformation**

As infrastructure improvements and technical advancements open up new business prospects, digital entrepreneurship is a hot topic. The public has shown a great deal of interest in new digital business models. Still, there has been very little research on the prospects, difficulties, and success factors of digital entrepreneurship (Kraus et al., 2018). Education in digital entrepreneurship typically has cheap start-up and operating costs. Thus, teaching about digital entrepreneurship is not only a popular topic right now, but it is also doable in many educational settings and speaks to students' real-life experiences.

### **Social entrepreneurship; innovation; impact investing**

Social entrepreneurship (SE) has seen a rise in study interest over the last ten years. This has led to crucial revelations about the function of SE in promoting inclusive growth and institutional change. However, the literature is relatively fragmented and lacks prevailing frameworks as a result of the rapidly expanding SE research, the literature's growing status, and the fact that SE draws from numerous other disciplines and fields (such as entrepreneurship, sociology, economics, and ethics) (Saebi et al., 2019). A major field of study and application is social entrepreneurship (SE). There are not many studies dividing up the current SE literature into different study themes and presenting popular and less popular research subjects, according to an analysis of the literature reviews that already exist on SE (Gupta et al., 2020).

### **Entrepreneurial university; academic entrepreneurship; innovation**

Depending on the academic setting, the concept of the entrepreneurial university might mean many different things. Both attitudes toward entrepreneurship and the selection of external partners for research collaboration could be significantly influenced by the local academic environment. It is extremely difficult strategically for university leaders to implement and coordinate entrepreneurial operations, as well as activities that are both inside and external to the university, whether it involves junior or senior academics (Klofsten et al., 2019). The ability of university administrators to internally define, conceptualize, and convey the true meaning of an entrepreneurial university—that being entrepreneurial is not just about launching new businesses, but rather a mindset or behavior for all members of the academic community—is crucial. It is not just about founding fast-growing businesses and obtaining venture capital; it also heavily emphasizes the significance of small businesses

to the economy and the duty of business owners to create a sustainable society (Phillips, 2018).

This article admits the substantial body of existing research on entrepreneurship education. Still, it stresses that much more needs to be done to advance the field as a whole. The approach yields several beneficial results that are crucial to theory and practice. Digital technology will alter how entrepreneurship is taught and learned. This indicates that we need a new theory that has a digitalization approach. To better understand the peculiarities of digital teaching methods, it is important to investigate the relationship between digital entrepreneurship and education (Nixon et al., 2018). To find new themes and explanations for entrepreneurship, a deeper understanding of the digitization of education is required. To construct more comprehensive theoretical frameworks, traditional and contemporary conceptions of education might be combined (Sousa & Magalhães, 2019).

Education on entrepreneurship is a crucial means by which governments can promote regional economic development. More money has gone into entrepreneurial education programs, especially those emphasizing start-up businesses in their early stages. With more targeted governmental actions, the low success percentage of new businesses could be raised. This involves better regulations that account for the various traits of entrepreneurs. An entrepreneur could be interested in various industry sectors, including technology and hospitality. Therefore, entrepreneurial education programs must adapt their teaching and learning methods to the demands of the various industries. The article has ramifications for educators coming up with tactics to persuade people to use new training techniques. Business owners must advance their understanding of digital entrepreneurship in light of the global economy's digital change. This indicates that current knowledge of emerging technologies must be included into teaching strategies. This will assist in fusing entrepreneurial education with digital innovation.

## Conclusion

The goal of the study was to chart the growth of entrepreneurship education research from 2002 to 2022 in terms of entrepreneurship education research. The 2185 documents used in this study demonstrate that the amount of research on entrepreneurship education has grown annually. Wibowo A, Huang-Saad A, and Narmaditya BS are the authors who frequently do study on this topic during the research time. Three themes have been emerged from the clusters, i.e., *determinants of entrepreneurship education for building an entrepreneurial intention among students in higher education, entrepreneurship in the classroom, and innovation and entrepreneurship education*. Also, future topics have been identified based on topic prominence from SciVal. Future research can focus more on entrepreneurial intention, digital entrepreneurship, social entrepreneurship, entrepreneurial universities, etc. Finally, it is important to note the limits of some studies. However, it must be acknowledged that all of the restrictions resulting from the mandatory choices made when using a bibliometric technique like Biblioshiny. First, a methodological bias was introduced during the “co-word analysis” because it was required to group some of the keywords,

such as those representing the same concept as the authors' criteria. Second, the parameters that were chosen affected the maps that were produced. Many similarity metrics and clustering techniques might have been used in this regard. Setting the ideal parameters to prevent the emergence of strategic diagrams that are too complicated to examine requires expertise in correctly configuring the Biblioshiny application. The next stage in this research may involve performing a more thorough content analysis of the publications in each thematic cluster using textual analysis tools like NVivo to demonstrate a deeper analysis of each discovered subject, in contrast to the bibliometric software approach.

The main lesson to be learned from this study on entrepreneurship education is that there are still a lot of untapped potential areas for investigation. Scientists in entrepreneurship education must keep coming up with new ways to teach while honing their critical thinking abilities. We recognize that interest in potential research areas varies and is mostly influenced by the researcher's sentiments regarding the issue. A consensus on particular outcomes is required to improve our understanding of the procedures that result in successful results of entrepreneurship education courses. This entails explaining to students the advantages of entrepreneurship education and the possibility of a time lag before witnessing the effects of enrolling in a program. To increase student engagement, the curriculum for entrepreneurship education needs to incorporate key learning objectives. Few studies forecast how entrepreneurship education will be taught in the future or how to make learning more efficient. To evaluate how critical thinking enhances learning outcomes, we are especially enthusiastic about the possible innovative teaching techniques in entrepreneurship education.

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## Declarations

**Conflict of interest** The authors have no conflicts of interest to declare.

**Ethical approval** The authors state that they have no known competing financial interests or personal affiliations that could have influenced the findings provided in this article. The author clarifies the anonymization of the data collecting or the use of questionnaires (if any).

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