

Global Trends on Electronic Learning and Entrepreneurship: Bibliometric Analysis (2001 - 2022)

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ABSTRACT

The use of electronic learning in entrepreneurship education will increase entrepreneurial intentions and behaviors in university students. The purpose of this study is to comprehensively analyze electronic learning in entrepreneurship globally. The research method used is VOSviewer-assisted bibliometric analysis. The review showed that there were 398 academic documents published in the Scopus database between 2001 and 2022. The results showed that the most publications occurred in 2021, and keyword identification formed 7 clusters that grouped research themes in recent years. Based on the studies conducted, this study presents a roadmap for prospective researchers as well as critical themes that are very likely for future research success.

INTRODUCTION

The current era of globalization, it is impossible to ignore the impact that information technology is having on the educational landscape (Al-Qahtani and Higgins, 2013). According to Jansen and Schuwer (2015), there are constant demands on the education sector to adapt technological advancements to efforts to raise the quality of education, particularly with regard to how Information and Communication Technology (ICT) is used in the field of education, particularly during the learning process. As we go into the 21st century, the trend of innovation and change in education will continue to happen and grow (Lai, 2020). Innovation in education refers to efforts to bring about changes with the goal of achieving positive outcomes in the realm of education (Gentile et al., 2020). Increasingly flexible learning schedules, more options for using and utilizing ICT, the use of media and multimedia in learning activities, computer-based instruction (CBI), computer assisted instruction (CAI), the use of television and video media, mobile learning, e-learning, learning management systems, online curricula, e-libraries, and learning models with individual learning systems are some of these changes (Carril et al. 2013). Competency references are often produced through standardization, accreditation, and certification by professional associations rather than from academic institutions that provide degrees (Gros and Garca Pealvo, 2016).

Information and communication technologies advance quickly, more educational institutions are turning to e-learning platforms to improve the efficiency and adaptability of instruction (Alkhalaf et al., 2012). One of the learning models being developed is e-learning, which will be necessary for education in the future (Arkorful and Abaidoo, 2015). E-learning is a type of remote education that uses electronic means to convey knowledge, such as the internet or mobile devices (Gorbunovs et al., 2016). Because all information can be immediately downloaded from e-learning sites and student learning outcomes may be swiftly evaluated without requiring in-class tests, e-learning makes it easier for teachers and students to carry out learning and perform assessments (Brown and Voltz, 2005; Simkova et al., 2012). Narrow or wide definitions of entrepreneurship education are possible. Entrepreneurs who go on to found businesses are, in a limited sense, the product of entrepreneurship education (Washuta & Bass, 2019). According to a general description, the result is a population of inventive, entrepreneurial people who work in various companies. This broad definition is one that more and more academics are coming to agree with, then to reach a wider audience, entrepreneurship education is increasingly taking place in an interdisciplinary context. (Xu, 2020). E-learning has established itself as an effective and popular instrument for reaching a large population with education (Cristian-Aurelian & Cristina, 2012).

There is a worldwide issue with e-learning in entrepreneurial education, not just in Indonesia. Indirect benefits of entrepreneurial education for the state. E-learning in entrepreneurship education aims to enhance personal abilities through e-learning and address business issues (Hua & Ren, 2020). The organization will operate in the manner expected thanks to this capability.

However, face-to-face procedures still typically employ traditional theories of learning (Deng & Feng, 2020). The goal of e-learning in entrepreneurship is to improve people's capacity to address challenges in the entrepreneurial space where additional benefits may be realized while operating the business as intended (Alemany et al., 2021). Online learning models are not used in traditional learning models, which nevertheless typically integrate face-to-face procedures (Yuan, 2020). To assist increase training objectives and add appropriate methodologies, research on e-learning and entrepreneurship is required (Leontyeva et al., 2021). Elements that stimulate entrepreneurship excitement are impacted by both internal and external factors (Sudarwati & Rukminingsih, 2018).

Research trends in e-learning and entrepreneurship has been conducted using both bibliometric and systematic literature review methods (Maulana et al., 2021); (Lin & Sekiguchi, 2020). E-learning and entrepreneurship research using bibliometric methods has been carried out by collecting documents from to 2011 between 2020 and using document data in the Scopus database, but the research is limited to bibliometrics and has not discussed the content of the analysis in related literature journals (Maulana et al., 2021). Research that reviews research trends on themes that combine e-learning and entrepreneurship is still limited; scientific literature shows that these themes are usually reviewed individually, for example, research trends in e-learning (Deti & Mandasari, 2021); (Djeki et al., 2022); (Elihami, 2022), or research trends in entrepreneurship and entrepreneurship education (Dissanayake et al., 2022); (Aparicio et al., 2019); (Kiyomi et al., 2022). Based on this, there is still limited literature data on research trends in e-learning and entrepreneurship collaboration. The latest research review still has limitations, there are only conducting analysis in the last 10 years and not literature content analysis related to this topic; therefore, our study aims to further analyze global trends in e-learning and entrepreneurship in the range of 2001 to 2022 through bibliometrics and content analysis of related literature.

The main research questions (RQs) proposed in the current study are as follows:

1. What is the distribution of publications about the e-learning and entrepreneurship between 2001 - 2022?
2. What are the highly-cited documents in studies of e-learning and entrepreneurship?
3. What are the most relevant journals and authors about the e-learning and entrepreneurship?
4. What are the most productive countries and academic institutions of the e-learning and entrepreneurship?
5. What are the primary research keywords concerning the e-learning and entrepreneurship?

METHODOLOGY

This study focuses on an internationally published map of the e-learning and entrepreneurial industries. This study uses both content and bibliometric

techniques. On May 20, 2023, research data were retrieved from the Scopus database. The VOSviewer application's analytical tools were used to analyze and display the data. Networks made up of researchers, nations, academic affiliations, and increases in the number of studies, keywords, and author collaborations were visualized and built using VOSviewer tools.

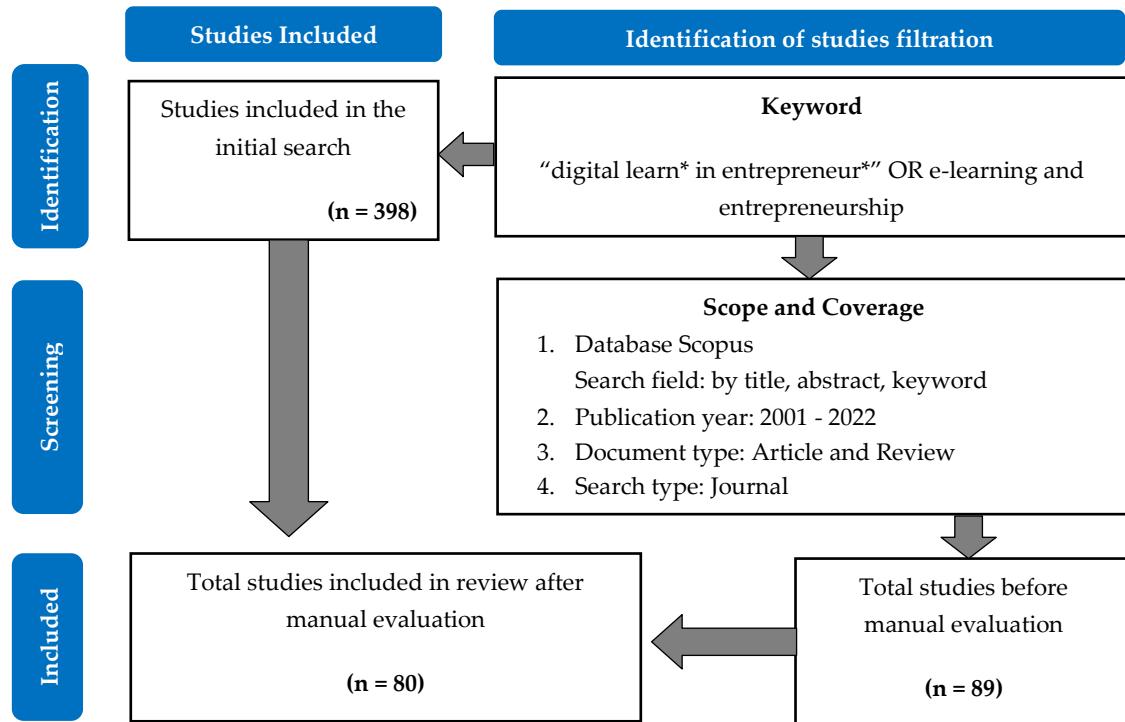


Figure 1. Flowchart of Data Collection Procedures

Analysis of searching articles in the Scopus database using the keywords: "digital learn* in entrepreneur*" OR e-learning and entrepreneurship. It then produces 398 documents, and several filters are applied to select articles, namely using document filters in the form of articles and reviews sourced from journals and only using the language in the form of the English version. In addition, the researchers chose the year of publication between 2001 and 2022. Using this filter, a total of 89 documents were obtained. The researcher then read the abstract of the article and screened for the completeness of the title, author, and publication journal, resulting in 80 relevant article documents. The minimum number of documents needed to analyze bibliometrics is 50 (Sjöstedt et al., 2015; Bornmann et al., 2014; Lehmann et al., 2008) and 50-100 (Glänzel & Moed, 2012; Seglen, 1994). However, the number of documents needed to study bibliometrics varies substantially, depending on the type of analysis. To undertake a bibliometric analysis of the subjects of e-learning and entrepreneurship, the 80 metadata in this study were deemed sufficient.

RESULT AND DISCUSSION

The Distribution of Publications about the E-learning and Entrepreneurship between 2001 - 2022

This review reveals publications on e-learning and entrepreneurship (2001 – 2022). The results of this review are discussed based on the research questions that have been prepared. An analysis of the publication of research articles between 2001 and 2022 was carried out by the authors, which shows that research on e-learning and entrepreneurship is still rarely carried out because the number of publications is still quite small and fluctuating. However, there has been a sharp growth in research on e-learning and entrepreneurship during the past three years, from 2020 to 2022, with the largest number of publications (20 articles) occurring in 2021. The number of articles published is listed as follows: 1 article (2001), 2 articles (2006), 1 article each in 2007 and 2008, 2 articles (2011), 2 articles (2012), 3 articles (2013), 2 articles (2014), 1 article each in 2015 and 2016; 5 articles (2017), 5 articles (2018), 6 articles (2019); 13 articles (2020); 18 articles (2021); and 16 articles (2022). The distribution trend of the number of publications on entrepreneurship and e-learning that were released between 2001 and 2022 is shown in the following (Fig. 2).

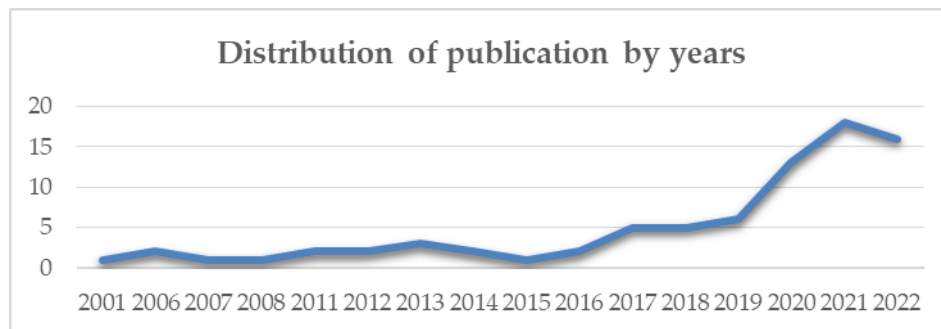


Figure 2. Distribution of publication by years

The Highly-Cited Documents in Studies of E-Learning and Entrepreneurship

The top 80 publications from all journals with the most citations were examined, together with data on author and year, document title, and journal, to determine the top ten most-cited documents on e-learning and entrepreneurship. Table 1 presents the total number of citations. These data may be used to identify publications that have the greatest effects on entrepreneurship and e-learning issues. There were 374 citations in the top 10 publications. The top ten most referenced documents in Table (1).

Table 1. The Top Ten Highly-Cited Documents

Author(s)& Year	Document Title	Journal	Citation
Al-Atabi, M., Deboer, J. (2014)	Teaching entrepreneurship using Massive Open Online Course (MOOC)	Technovation	82
Secundo, G., Mele, G., Vecchio, P.D., Elia, G., Margherita, A., Ndou, V. (2021)	Threat or opportunity? A case study of digital-enabled redesign of entrepreneurship education in the COVID-	Technological Forecasting and Social Change	82

Author(s)& Year	Document Title	Journal	Citation
	19 emergency		
Portuguez Castro, M., Gómez Zermeño, M.G. (2020)	Challenge based learning: Innovative pedagogy for sustainability through e-learning in higher education	Sustainability	46
Guerrero, M., Heaton, S., Urbano, D. (2021)37	Building universities' intrapreneurial capabilities in the digital era: The role and impacts of Massive Open Online Courses (MOOCs)	Technovation	37
Hua, S., Ren, Z. (2020)	"Online + Offline" course teaching based on case teaching method: A case study of entrepreneurship education course	International Journal of Emerging Technologies in Learning	33
Ramli, A., Shabbir, M.S., Bakar, M.S.B., Yusof, M.S., Ahmad, I. (2018)	Mediating role of E-learning resources in developing entrepreneurial inclinations amongst undergraduate students at Universiti Utara Malaysia	International Journal of Engineering and Technology	33
Bodea, C.-N., Mogoş, R.I., Dascălu, M.-I., (2015)	Simulation-based e-learning framework for entrepreneurship education and training	Amfiteatru Economic	19
Sudarwati, N., Rukminingsih (2018)	Evaluating e-learning as a learning media a case of entrepreneurship e-learning using schoology as media	International Journal of Emerging Technologies	18
Thompson, P., Randall, B. (2001)	Can e-learning spur creativity, innovation and entrepreneurship?	Educational Media International	14
Gentile, T.A.R., Reina, R., De Nito, E., Bizjak, D., Canonico, P. (2020)	E-learning design and entrepreneurship in three European universities	International Journal of Entrepreneurial Behaviour and Research	10

According to the analysis, the article with the highest number of citations is one published in 2014 with the title "Teaching entrepreneurship using Massive Open Online Course (MOOC)" and 82 total citations that examine the use of the Massive Open Online Course (MOOC) in entrepreneurship courses. According to research, MOOCs are a good platform for teaching

entrepreneurship because they give students access to resources that support collaborative learning and personal growth in areas such as resource acquisition and opportunity recognition (Al-Atabi and Deboer 2014). In the second category, the item 'Threat or opportunity?' The research found a new approach to learning digital entrepreneurship, specifically through storytelling, pitching, and business planning. This research illustrates the process of redesigning entrepreneurship learning programs for students by utilizing digital technology during the COVID crisis -19. This study had 82 citations and was published in 2021. However, factors that support conventional learning must be addressed when designing digital entrepreneurship education (Secundo et al., 2021).

The third category's most-cited paper, "Challenge based learning: Innovative pedagogy for sustainability through e-learning in higher education," had 46 citations overall and was published in 2020. This article details the outcomes of implementing online entrepreneurship courses that make use of challenge-based learning (CBL) with a group of 20 undergraduate students from various academic fields at universities in Mexico, demonstrating that digital entrepreneurship learning has been successful in inspiring students to come up with sustainable business ideas aimed at solving local, national, and global problems and continued in the formation business project (Portuguez Castro & Gómez Z).

The Most Relevant Journals and Authors about the E-Learning and Entrepreneurship

Examining the overall number of publications in journals and the number of publications on e-learning and entrepreneurship issues, it is possible to determine which journals are most successful in publishing research on this topic, total citations, citation score in 2021, SCImago Journal Rank in 2021, Scopus quartile, and publisher. To analyze the 10 most productive journals in publications regarding e-learning and entrepreneurship, researchers identified them based on the number of publications on the topic of e-learning and entrepreneurship (TP**). According to Table 2, "Technological Forecasting and Social Change" is the journal with the most publications on the topic of e-learning and entrepreneurship. It has 1,843 publications, 25,247 citations, and five publications on e-learning and relationship-related topics. With 1,479 general articles and 5,682 citations, the "International Journal of Emerging Technologies in Learning" is the second most cited journal. This was followed by five publications from the International Association of Online Engineering, which included e-learning and entrepreneurship. Third, "Education and Training" which has a total of 277 publications and 1,316 citations, has published three documents on topics relevant to e-learning and entrepreneurship, while the publisher is Emerald. Table (2) presents the Top Ten Highly Productive journals.

Table 2. The Top Ten Highly Productive Journals on E-Learning and Entrepreneurship

Journal	TP	TP **	TC	Cite Score	SJR (2021)	Scopus Index	Publisher
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Journal	TP	TP**	TC	Cite Score	SJR (2021)	Scopus Index	Publisher
Technological Forecasting and Social Change	1.843	5	25.247	13.7	2.336	Q1	Elsevier
International Journal of Emerging Technologies	1479	5	5.682	3.8	0.632	Q2	International Association of Online Engineering
Education and Training	277	3	1.316	4.8	0.614	Q1	Emerald Publishing
Sustainability	36.485	3	181.699	5.0	0.664	Q1	MDPI
Advances in Engineering Education	143	2	233	1.6	0.195	Q2	American Society for Education
Amfiteatru Economic	238	2	744	3.1	0.370	Q2	Bucharest University of Economic
Educational Media International	84	2	266	3.2	0.633	Q1	Taylor & Francis
Transactions on Engineering Management	349	2	2181	6.2	0.881	Q1	IEEE
Industry and Higher Education	183	2	428	2.3	0.404	Q2	SAGE
International Journal of Management Education	248	2	1360	5.5	0.819	Q1	Elsevier

TP = Total Publication, TP** = Total Publication in the e-learning and entrepreneurship, TC = Total Citation, SJR = SCImago Journal Rank

The analysis of the most prolific authors on topics regarding e-learning and entrepreneurship was carried out by looking at "Total Publication", "Total Citation", "h-index", "Current affiliation", and "Country". To analyze the ten most productive authors in publications on e-learning and entrepreneurship, identified based on the author's h-index. Table 3 shows the findings that the most productive author with topics on e-learning and entrepreneurship is Shabbir, M.S with the total number of publications is 60, total citation is 1,155, followed by the author's h-index is 19 and the author comes from Brunei Darussalam, for the most contributed topic in 2018-2022 is about Entrepreneurial Intention, Entrepreneurship, Technology Acceptance Model, Mobile Payment, and E-Learning. Second, Kurilova, A, has 60 total publications, 219 total citations, 9 h-index, and the authors are from the Russian Federation. Third, Portuguez Castro, M, has 21 total publications, 324 total citations, 9 h-index, and the author comes from Mexico. Table (3) in detail presents The Top Ten Most Prolific authors in e-learning and entrepreneurship.

Table 3. The Top Ten Most Prolific Authors in the E-Learning and Entrepreneurship

	Author	TP	TC	h-index	Current affiliation	Country
1.	Shabbir, M.S	60	1.155	19	UBD School of Business and Economics, Bandar Seri Begawan	Brunei Darussalam
2.	Kurilova, A	60	219	9	Togliatti State University	Russian Federation
3.	Portuguez Castro, M	21	324	9	Tecnologico de Monterrey	Mexico
4.	Ahmad, I	17	450	9	Universiti Utara Malaysia, Sintok	Malaysia
5.	Gómez Zermeño	42	392	8	Tecnologico de Monterrey	Mexico
6.	Agrusti, F	25	80	5	Università degli Studi Roma Tre	Italy
7.	Pronkin, N	13	57	5	Sechenov First Moscow State Medical University	Russian Federation
8.	Ahmad, H	7	17	3	Applied Science Private University	Amman, Jordan
9.	Meng, X	6	18	2	Zhejiang Wanli University	China
10.	Vlasova, S	3	3	1	Moscow Aviation Institute	Russian Federation

TP = Total Publication, TC = Total Citation

The Most Productive Countries and Academic Institutions of the E-Learning and Entrepreneurship

Looking at "Most Productive Academic Institutions," "Country," and "Total Publication in e-learning and Entrepreneurship" allows for analysis of the most prolific nations and top academic institutions that publish research on e-learning and entrepreneurship. Full data on The Top Ten Productive Countries and academic institutions are shown in Table (4).

Table 4. The Top Ten Productive Countries and Academic Institutions

	Most Productive Academic Institution	Country	TP**
1.	Moscow Aviation Institute National Research University	China	17
2.	Massachusetts Institute of Technology (MIT)	United States	10
3.	Nodo di Trento di EIT Digital	Italy	8
4.	Togliatti State University	Russian Federation	8
5.	Universitat Politècnica de València	Spain	6
6.	Technische Universität München	Germany	4
7.	Tecnologico de Monterrey	Mexico	4
8.	Bucharest University of Economic Studies	Romania	4
9.	University of Birmingham	United Kingdom	4
10.	Universitas Negeri Malang	Indonesia	4

TP** = Total Publication in the e-learning and entrepreneurship

Based on the analysis that has been done, it can be concluded from the review of countries that most countries/regions are interested in certain trends. For instance, China is the most productive nation, with 17 papers published on the subject of e-learning and entrepreneurship, the majority of which were published at the Moscow Aviation Institute National Research University. The United States, which had the most ties to the Massachusetts Institute of Technology (MIT) and had published a total of 10 articles, came second. The third country with the highest number of publications is Italy and the Russian Federation, both of which publish as many as eight research articles with relevant themes on e-learning and entrepreneurship. The Italian country with the highest affiliate that publishes is Nodo di Trento in EIT Digital; in the Russian Federation, the highest affiliate that publishes is Togliatti State University. Universitas Negeri Malang is the highest affiliate that publishes, and the Indonesian state is also included in the category of the top ten productive countries and academic institutions that are ranked tenth. The Indonesian state has published research on entrepreneurship and e-learning with as many as four articles indexed by Scopus.

The Primary Research Keywords and Author Collaboration Network Concerning the E-Learning and Entrepreneurship

Bibliometric metadata were analyzed for co-authorship, bibliographic coupling, keyword co-occurrence, and citations using the VOSViewer program. References to the same publication in two separate sources are regarded as bibliographic mergers because of the number of resources utilized to identify the link between items such as publications, journals, and authors. The development of the domain over time was revealed via a keyword co-emergence analysis (Deng & Xia, 2020). Consequently, this technique is effective for locating hot subjects in a given field of research. Citation analysis aids researchers in locating well-liked study areas and articles they have published (Lai, 2020). Tables or network visualization maps were used to display the findings of the study.

Construction for research using keywords e-learning in entrepreneurship built a network visualization map with the VOSviewer application. Each cluster consists of related keywords that appear in the same color. It should be noted that the node size indicates the number of events; in other words, the largest node displays the most relevant keywords. In this analysis, the determination of co-occurrence was used twice, forming seven clusters with 61 themes from the topic of e-learning in entrepreneurship. Figure (3) shows the network visualization map of the keyword co-occurrence.

providing design-based models that can be used in other contexts, despite the fact that other studies have demonstrated that participants in entrepreneurial education programs can identify their entrepreneurial skills, suggest solutions to social problems, and develop cognitive mastery (Castro and Zermeo 2021). In the field of education, there are media to help digital learning, one of which is web-based school, where the application of media-assisted e-learning is effective in learning in higher education entrepreneurship classes, with an average percentage of 71% for all components (Sudarwati & Rukminingsih, 2018). Contextual activities relevant to the course material are employed in conjunction with the construction of e-learning modules on 18 entrepreneurial subjects and the use of a flipped classroom approach, in which students apply what they learn from the modules (Harichandran et al., 2018). Furthermore, the Business Creativity Module (BCM) was developed for use in e-learning, allowing interactive group work, regular assessments, and feedback from each university module coordinator (Turnbull & Eickhoff, 2011).

Cluster 3 (blue), discusses themes about digital learning. This cluster is connected with the keywords learning, design, innovation, challenge-based learning, learning system suitability, educational innovation, digital devices, learning service, mobile learning, online learning, e-learning, and innovation. The analysis of digital learning clusters discusses various perspectives on digital devices that support the learning process. According to this analysis, initiatives to offer online learning entail open digital platforms, pedagogy for online course creation, and support for higher education (Langseth et al. 2022). Mobile business simulation games can be used to teach digital lessons in entrepreneurship education, which can improve students' entrepreneurial attitudes, self-efficacy, and inclinations (Chen et al., 2022; Shabbir, 2021). Furthermore, the BoostEdu platform is a learning platform developed through co-creation workshops and e-learning course development (Viaggi et al., 2021). The next theme of digital learning is effective mobile learning (m-learning) as a means of developing entrepreneurial competencies (Vieira Mattiello da Silva & Klein, 2020). Virtual classrooms in entrepreneurship learning can coordinate a large number of participants (Bhatti & Heffner, 2020). Then, Challenge-Based Learning (CBL) was used in entrepreneurship online courses and successfully generated sustainable business ideas (Portuguez Castro & Gómez Zermeño, 2020).

Cluster 4 (yellow) discusses themes about teaching. This cluster is linked to the keywords teaching, teaching quality, massive open online courses, moocs, entrepreneurial universities, the digital era, entrepreneurial activity, and higher education. The analysis of the teaching cluster discusses various perspectives on effective teaching methods to support online learning. In our analysis, teachers who use the tacit knowledge learning method have a positive effect on students' entrepreneurial orientation (Jing, 2022), where tacit knowledge is generally obtained through experience and self-learning, and is influenced by beliefs, perspectives, and values (Núñez-Canal et al., 2022). Furthermore, other studies have found that the demand for MOOCs (massive open online courses) in business and entrepreneurship classes is very large

(Mozahem, 2021), and MOOCs play an important role in digitizing entrepreneurial learning (Dong & Tu, 2021); (Yepes-Baldó et al., 2016), on the other hand, MOOCs are suitable platforms for teaching entrepreneurship because they provide tools to enable students' collaborative learning (Al-Atabi & Deboer, 2014). The use of "online + offline" teaching techniques therefore boosts students' interest in learning even more, widens the course material for entrepreneurship education courses, and improves their satisfaction with the course (Hua & Ren, 2020).

Cluster 5 (purple) discusses ICT themes. This cluster is linked to the keyword web-based course, websites, machine learning, innovative approaches, behavioral, curricula, and the Internet. The analysis of the ICT cluster discusses various perspectives on information and communication technology that supports online learning. Analysis in this study, since educational technology (EdTech) has been shown to improve educational outcomes in developed nations, products must be developed based on information and communication technology (ICT) that is mature and suitable for teachers' needs (von Maltitz & van der Lingen, 2022). The impact of wireless network technology on student creativity and entrepreneurship was then examined using the Internet and an evaluation index system (EIS) with highly accurate results (Lou, 2021). A relevant step toward attaining the successful development of sustainable entrepreneurship education is the application of cloud computing for the creation and deployment of online learning platforms in entrepreneurship education (Yuan, 2020). The role of information systems in entrepreneurship education is shown by an increase of 50%, student performance when using information systems in the entrepreneurial learning process (Mukhamadeev et al., 2019).

Cluster 6 (orange) discusses themes about innovation. This cluster was linked to the keyword education, creativity, cognitive abilities, virtual reality and artificial intelligence. The analysis of the innovation cluster discusses various perspectives related to the innovation emerging from e-learning and entrepreneurship. In our analysis, the use of virtual technology has led to advances in teaching reform, virtual simulations in entrepreneurship and innovation education, and virtual learning communities (Xi et al. 2022). Another innovation applied to e-learning and entrepreneurship learning is the development of a learning model prototype known as the intelligent tutoring system (ITS), which has been successfully developed and integrated into entrepreneurial teaching practices (Wei 2022). To address challenges in educating and assessing students within the context of traditional courses, innovations are created through e-learning platforms on entrepreneurial education capabilities (Alemany et al., 2021). Furthermore, innovations have been made regarding Artificial Intelligence (AI) academic programs in digital classes to educate students on entrepreneurship courses (Cantú-Ortiz et al., 2020). The Mercia Institute of Enterprises (MIE) and 12 partner HEIs are developing technologies that enhance enterprise education (TE3) initiatives to advance the use of learning technologies to enhance entrepreneurship and

entrepreneurship education which results in increased skills and knowledge in the field of entrepreneurship (Smith, 2007).

Cluster 7 (brown) discusses themes on electronic learning (e-learning). This cluster was connected to the keywords e-learning, online education, and business opportunities. The analysis of e-learning clusters discusses various perspectives related to electronic learning. Our analysis demonstrates that e-learning is useful for entrepreneurship education learning, but government support to enhance the quality of the Internet network so that it is not constrained by geographic conditions is crucial for the sustainability of e-learning, where e-learning can be implemented during the worldwide Covid-19 pandemic and because it encourages comfort with the use of educational technology, the technique can still promote entrepreneurship in regular circumstances (Widjaja et al., 2022). The development of students' professional skills in both online and offline enterprises is positively affected by the inclusion of start-ups in the e-learning model for entrepreneurship education (Z.-J. Liu et al., 2021). The usage of e-learning at universities places a greater emphasis on the professional figures involved than the whole e-learning process and course design (Gentile et al., 2020). According to Bodea et al. (2015), an e-learning framework for entrepreneurship was presented to facilitate student learning beginning with the step of choosing pertinent traits/aspects for a particular type of business to analyze business situations. E-learning has been used successfully in two initiatives aimed at entrepreneurial education (Cristian-Aurelian & Cristina, 2012). The desire for extremely intense programs that are equally successful at enhancing knowledge might be satisfied by e-learning (Hegarty, 2006). According to Thompson and Randall (2001), e-learning has the ability to overcome long-standing logistical, cultural, and geographic constraints in traditional education delivery.

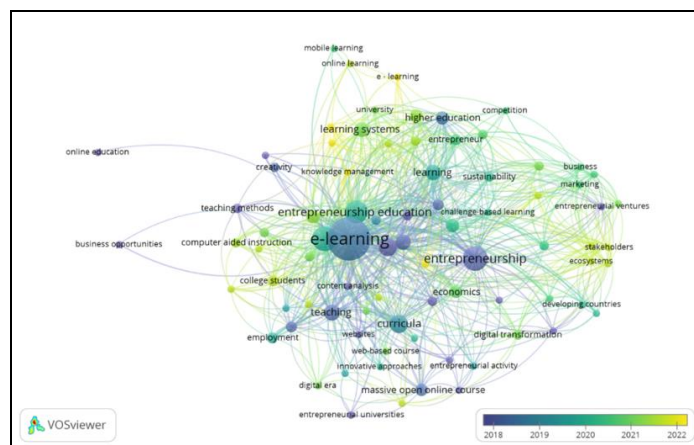


Figure 4. Co-keyword overlay visualization

An analysis of the distribution of the number of articles using keywords by year is shown in figure (4), where different colors indicate the publication year of the related document in which these keywords appear together. The hottest topics in research on e-learning and entrepreneurship are learning systems, massive open online courses (MOOC), online learning, digital

transformation, and entrepreneurial education. The findings show that the keyword has been prominent in recent years; therefore, it can be concluded that in recent years, many researchers have turned to research on the topic.

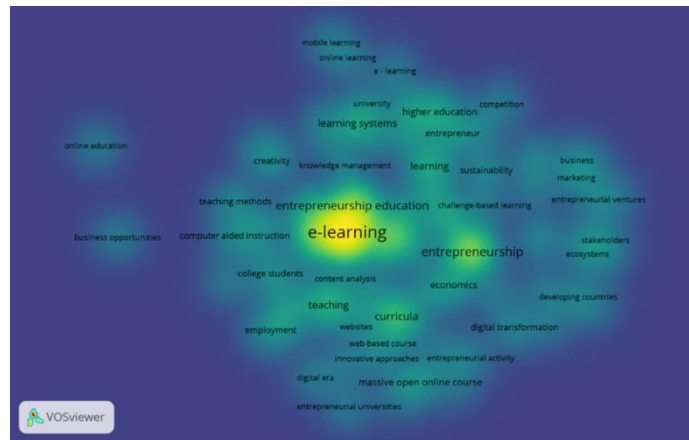


Figure 5. Co-keyword density visualization

Analysis of keyword density visualization is used to see research trends, where the more lit up the color means that the research topic has often been done, and the dimmer the color means that the research topic is still rarely done. Based on the results of keyword density visualization in figure (5), there are still many topics relevant to e-learning and entrepreneurship that are still rarely addressed, namely, challenge-based learning, virtual reality, artificial intelligence, cognitive abilities, digital creativity, design, innovation ecosystem, and digital devices. So that the topic has a great opportunity to be re-examined by researchers who are interested in the research theme of e-learning and entrepreneurship.

CONCLUSIONS AND RECOMMENDATIONS

This study identifies the most related research topics in e-learning and entrepreneurship, analyzes each cluster, and collaborates with key focal points and related research results. The co-occurrence analysis shows that e-learning and entrepreneurship are common keywords in this research theme. Research on e-learning and entrepreneurship has increased in the last five years, followed by technological advances and the COVID-19 pandemic. The keywords trending in recent years are learning systems, massive open online courses (MOOC), online learning, digital transformation, and entrepreneurial education. Based on the results of keyword density visualization, it is suggested that, in future research, there is still a great opportunity to conduct research with the theme of e-learning and entrepreneurship on topics that are still rarely done, namely, challenge-based learning, virtual reality, artificial intelligence, cognitive abilities, digital creativity, digital learning design, innovation ecosystem, and digital devices. Based on the content analysis, conclusions can be drawn for future research purposes, namely, that entrepreneurial learning through e-learning can be more effective with the help of digital media, such as web-based schools, mobile learning, mobile business simulation games, virtual

classrooms, and the BoostEdu platform. New effective teaching methods include Challenge-Based Learning (CBL), online + offline (blended learning), Business Creativity Module (BCM) or e-learning module, and massive open online courses (MOOC). Furthermore, innovations that emerged in the theme of e-learning and entrepreneurship were carried out through the application of virtual technology, the development of a prototype learning model known as the intelligent tutoring system (ITS), the development of Artificial Intelligence (AI) academic programs in digital classes, and the development of Technology Enhanced Enterprise Education (TE3) projects. So based on this analysis, future research still has a great opportunity to examine the theme, where the topic still has novelty so that it will continue to be explored by researchers in the future.

ADVANCED RESEARCH

The current study has created an up-to-date picture of research trends in e-learning and entrepreneurship. However, there are some limitations that must be considered. First, the articles analyzed in this study refer only to bibliographic data documented in Scopus as primary sources. The analyzed online databases do not include other scholarly sources like Web of Science, ERIC, Google Scholar, EBSCO, and Microsoft Academic, which may add more value to the information, despite the fact that the Scopus database was chosen for its thorough coverage of peer-reviewed research documents in education. Based on this, we suggest that researchers further expand their studies using other credible databases to reach more comprehensive conclusions. Second, we only focused on documents published in research articles and reviews with the type of documents in the form of journals so that future research can consider other sources, such as conference proceedings, books, book chapters, or notes. Finally, the database used in this review only extracted and analyzed documents written in English, thus excluding non-English publications that might yield valuable results. Therefore, further research should collect data from various languages to obtain more comprehensive results. Despite the above limitations, we believe that this research can be used as a reference for future researchers to understand the theme of e-learning and entrepreneurship.

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