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A bibliometric analysis of research on entrepreneurship education, 1977-2021

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Abstract
Entrepreneurship education is a field that develops and occupies an important position in the policy agenda in many countries. The research objective is to identify the research trend of entrepreneurship education as well as the scientific production from time to time, such as: sources, authors, and documents. The bibliometric analysis was used to analize the sample from 2176 articles which have been published between 1977 to 2021. To get the metadata from the Scopus bibliography database, on Friday, 23rd of July 2021, at 2:56 pm, it used the "entrepreneurship AND education" query in the article title. Microsoft Excel was used to do the frequency analysis, VOSviewer was used to visualize the data, and Harzing's Publish or Perish was used as citation metrics. The result showed the improvement in the literature about entrepreneurship education from 1980 until 2021, and the improvement happened in 2010. There is many research about entrepreneurship education which involves multi-author collaboration, those are published in multi-language, with total of 160 authors from 109 different countries and 160 institutions. The United States is the biggest contributor to this research, followed by China, The United Kingdom, Spain, and Indonesia. The most publication about entrepreneurship education published by Education and Training. This finding can help further research related to the overview of entrepreneurship education worldwide from time to time. This paper also proposes several future avenues of entrepreneurship education research. In future research, it is recommended to expand the use of the database and includes more fields in the search.

Keywords—Entrepreneurship; education; bibliometric analysis

Abstrak
Entrepreneurship education adalah bidang yang berkembang dan menempati posisi penting dalam agenda kebijakan di berbagai negara. Tujuan penelitian ini adalah untuk mengidentifikasi tren penelitian entrepreneurship education serta produksi ilmiah dari waktu ke waktu, seperti: sumber, penulis dan dokumen. Analisis bibliometri digunakan untuk menganalisis sampel dari 2176 artikel yang diterbitkan antara tahun 1977 hingga 2021. Untuk mendapatkan metadata yang diambil dari database bibliografi Scopus, pada Jumat, 23 Juli 2021, 2:56 pm, digunakan kueri "entrepreneurship AND education" dalam judul artikel. Microsoft excel digunakan untuk melakukan analisis frekuensi, VOSviewer untuk visualisasi data dan Harzing's Publish or Perish digunakan untuk metrik kutipan. Hasil menunjukkan bahwa ada peningkatan literatur tentang entrepreneurship education dari tahun 1980 hingga 2021, dan peningkatan yang signifikan sejak tahun 2010. Ada berbagai penelitian yang telah dilakukan pada entrepreneurship education yang melibatkan kolaborasi multi-penulis yang diterbitkan dalam berbagai bahasa, dengan total 160 penulis dari 109 negara yang berbeda dan 160 lembaga. Amerika Serikat adalah kontributor terbesar untuk penelitian ini, diikuti oleh China, United Kingdom, Spanyol dan Indonesia. Publikasi terbanyak tentang entrepreneurship education diterbitkan oleh Education and Training. Temuan ini dapat membantu penelitian di masa depan terkait dengan ikhtisar penelitian entrepreneurship education di seluruh dunia dari waktu ke waktu. Makalah ini juga mengusulkan beberapa jalan penelitian entrepreneurship education di masa depan. Dalam penelitian masa depan, disarankan untuk memperluas penggunaan database dan memasukkan lebih banyak bidang dalam kueri pencarian.

Kata kunci— Kewirausahaan; pendidikan; analisis bibliometrik

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I. INTRODUCTION

For the last two decades, entrepreneurship has appeared as one of the economic powers in the world. Many colleges and universities offer many courses related to entrepreneurship in many countries. The improvement also follows this situation in the field of entrepreneurship education. Many programs and curriculum developments in entrepreneurship education grow fast (Kuratko, 2005). Even entrepreneurship education gets the highest place in the policy agenda in Europe and the United States (von Graevenitz et al., 2010).The research related to entrepreneurship education also develops fast. Entrepreneurship education has practical significance and roles as agents to change people and accelerate global economic prosperity (Ratten & Usmanij, 2021). Entrepreneurship education has become one of the field studies with the fastest growth in the world. It has rising enthusiasts because entrepreneurship education can relate the practical business and academic theory (Snuggs & Jevons, 2018). However, It still needs much further research to revise the teaching practice of entrepreneurship education (Turner & Gianiodis, 2018).The research growth about entrepreneurship education and the related research have generated interesting challenges for supporting institutions and organizations. The field classification on business and management research places entrepreneurship education as the field of "skills and employability" and "management and complexity" (Aparicio et al., 2019). Management and Business faculty has a strong orientation towards entrepreneurship in their education program, but entrepreneurship is not only for the higher education level. Therefore, entrepreneurship education has a large context in term of educational levels and disciplines.

Many entrepreneurships education research has been done, and some use bibliometric analysis (Deveci, 2022; Slavinski et al., 2020; Zheng, 2018). The conducted research (Aparicio et al., 2019) uses Web of Science (WoS) database from 1987-2017. It reveals the research evolution of entrepreneurship education. The research result finds that entrepreneurship education has grown from entrepreneurship education as part of economic development strategy to an academic perspective. Besides, the research theme shows that the students have become the main agent in the process of entrepreneurship education. Meanwhile, as the basis for further research, the taxonomy scheme is done by creating a systematic mapping to explore and classify entrepreneurship education research. Using the Web of Science and Scopus database published in 1975 until 2014, it can be found that the taxonomy will create a stronger bound with education research, and it can support the collaboration of international research, which has a global impact (Fellnhofer, 2019).

By using the Systematic Literature Review approach from the Scopus database published in 1973-2016, it is found that training and entrepreneurship education can be a strong strategy for regional development. Whereas (Johann et al., 2020) it focus on thinking design in the context of entrepreneurship education. The research results on literature which discuss entrepreneurship in an international journal published by Web of Science (WoS) in 2009-2019, it reveals that entrepreneurship education still becomes a controversial academic, even the institution has had the initiative to adopt the practice in entrepreneurship education.

The difference between this study and previous research is that all data analyzed regarding entrepreneurship education was taken from the Scopus database from 1977 to 2021. Second, the main focus of this research is to find out who the main researchers in the field of entrepreneurship education are.

The rapid increase in entrepreneurship education research has the objectives to do, that is to reveal how the idea exists in the literature in the decade, being introduced, handled dan discussed. Besides, it also measures the reached citation which is relevant all the time quantitatively.

The objectives of this study is to reveal the trend and improvement of the research in the field of entrepreneurship education. This method has advantages relating to quantification and objectivity; therefore, it can reduce subjective biases and validate what experts may intuitively presume (Fauzan et al., 2022; Fauzan & Jahja, 2021). The bibliometric analysis from the literature related to this term is used to answer the questions below.

1. How is the research evolution and distribution about entrepreneurship education?
2. What is the main research field in the entrepreneurship education research?
3. Who is the main researcher and collaboration affected in the study of entrepreneurship education?

This article is arranged as follows: first, the outline and description from the literature of entrepreneurship education. Second, the methodology is presented. Third, they are findings and discussions. Fourth, they are research conclusion, limitation, and recommendation. The scopus database is used to take metadata and the analysis uses the software VOSviewer and Harzing's Publish or Perish.

II. DEFINITION AND PHILOSOPHY OF ENTREPRENEURSHIP EDUCATION

In 1947, Myles Mace from Harvard Business School started developing entrepreneurship education courses. Then, in 1953, Peter F. Drucker from New York University entered the innovation concept in entrepreneurship education (Katz, 2003).

Entrepreneurship education is defined as the effort to improve the skill in the field of opportunity selection, resource organization to face risks and business development (Kourilsky, 1995). Entrepreneurship education is also a proses which gives competence to an individual to recognize a business opportunity, improve the confidence, introspection and knowledge and skill to act on the power he/she has (C. Jones & English, 2004). entrepreneurship education is a program or education process that improves entrepreneurship attitudes and skills.

The interactive learning related to the business initiative and community is characteristic of entrepreneurship education. This experience based learning approach shows that there is a connection of industry in entrepreneurship education (Boon et al., 2013). Therefore, the teaching method is not static but dynamic and it can change based on the situation and condition, for instance the improvement for sosial media use in a learning experience. This is very essential to do so that the expected target from entrepreneurship education can be reached. Besides, the research has to be developed to be able to design the relevant and applicable entrepreneurship courses (Fayolle, 2013).

The objectives of entrepreneurship course are to change the students' point of view towards many innovative activities and risk taking in business(P. Jones et al., 2014). The entrepreneurship course also aims to teach students to understand entrepreneurship, act entrepreneurial, and be entrepreneurs (Heinonen & Poikkijoki, 2006). The main result of entrepreneurship education is the improvement of attitude, knowledge and skill, appropriateness, entrepreneurship intention, social-economy effect, the level to start a business and business performance (Nabi et al., 2017).

The indicators of students' behavior change as the result of entrepreneurship education can be seen from three components, which are the affective, cognitive and skill results (Fisher et al., 2008). There is the will to start a new business or be involved in the available business innovation, which is the effective result (Kyro, 2008). Meanwhile, the critical thinking which comes from new knowledge, comprehend and information obtained to start a business, is a cognitive result (P. Jones & Colwill, 2013). Any attitude changes as the result of skill include the needed device to be an entrepreneur. Therefore, it is needed to integrate the anthropocosmic point of view about education in teaching entrepreneurship education, that is to count the interconnection which is had by the individual and the connection in community (Lu & Jover, 2019).

III. RESEARCH METHOD

The methodology design for this research includes two steps, that are the Source Document selection and bibliometric analysis. The steps for each stage are detailed as follows.

3.1. Source Document Selection

Bibliography information was analyzed from the chosen article. For the purpose of this research, metadata was gathered from the Scopus database on Friday, 23rd of July 2021, at 2.56 pm, which contained a thousand scientific publications and bibliography information related to the authors, affiliations, countries and citations. The scopus database had a bibliography competitiveness compared with the other database, that was the main research subject from many scientific papers (Harzing & Alakangas, 2016), besides it had wider time scope from the recorded unit (Mongeon & Paul-Hus, 2016). To do the bibliography research, there were different search steps (Riera & Iborra, 2017). This research used the "entrepreneurship AND education" query for the article title to gather the metadata in the period of 1977 until 2021. The research including special search in the article title could improve the information specificity and recovery (Aleixandre et al., 2015; Sweileh et al., 2017). Metadata was downloaded in RIS dan CSV format.

To do this research used several devices, such as: Microsoft excel to do frequency analysis, Harzing's Publish or Perish software to metric the citation and VOSviewer software to visualize data. VOSviewer software could report the performance indicator and the word analysis, based on the assumption that the keywords in the article were the appropriate description of the content. The emergence of two keywords in the same article was an indication of the relation of referred issues in the article. The pattern and trend of certain disciplines could be revealed by measuring the association power between representative terms from generated relevant publications in the same article area (Zupic & Čater, 2015).

3.2. Bibliometric Analysis

Bibliometric Analysis is part of scientometrics, which utilizes mathematical methods and statistics to analyze the scientific activity in the research (Callon et al., 1991). According to (Garfield et al., 1964; Liang & Liu, 2018; White & McCain, 1989) bibliometric analysis is the quantitative approach to analyze the academic

literature using the bibliography to give a general description of a research field which can be classified based on the paper, author and journal (Merigó & Yang, 2017). There are two main approaches in the bibliometric method, that are performance analysis and science chart mapping or bibliometric mapping (Noyons et al., 1999). Performance analysis evaluates the impact of the citation from scientific production generated by many actors that interact each other in research field. These actors can be in the form of authors, countries, universities, departments and many others. The most popular indicator in this performance analysis is to be measured from the total of publications and citation (Yu & Shi, 2015). The total of publications correlated with author productivity, meanwhile the total of citations correlated with the effect towards the scientific community (Merigó & Yang, 2017). There is scientific mapping to describe the structures and dynamics in the scientific field (Zupic & Čater, 2015). This thing represents about how disciplines, fields, specializations, documents, authors are related each other (Moral-Muñoz et al., 2014). Each bibliometric method is useful for certain research questions and the most general questions can be answered by using bibliometrics for scientific mapping (Aria & Cuccurullo, 2017).

IV. FINDINGS AND DISCUSSION

To get the general description about the research related to entrepreneurship education, several general statistic from the set of presented data. All articles which fullfill the quest query evaluated from several aspects as follows: document type and source, research productivity, publication language, subject field, the most active source title, publication distribution by country, the most active institution, obscenity, key words, title and analysis of abstract and citation analysis.

Most of the findings presented in term of frequency and percentage. Meanwhile, we present the annual growth data as the total documents which is taken each year including frequency and percentage, until July 2021. We report the citation analysis as the citation metric and reveal 10 articles which are the most cited in entrepreneurship education.

4.1 Research evolution and distribution

The research evolution and distribution about entrepreneurship education and also trend in distribution, can be analyzed as follows: (a) the total of publication based on the year, (b) Source Document and type, (c) journal and (d) document language.

Publication Year. This analysis will check the research productivity based on the total of published document each year. The document check based on the publication year helps the researcher to observe the subject pattern and popularity from time to time (Ahmi & Mohamad, 2019). According to Scopus database, Robert E. Nelson is the first author who publish the article about entrepreneurship education entitled by "*Entrepreneurship Education in Developing Countries*", which published by Asian Survey, in 1977, Vol. 17, Issue. 9, p. 880-885 (Nelson, 1977). The improvement was started in 2002 and the growth in entrepreneurship education has been increasing until now (Look at Figure 1). Table 1 has summarized the detail of the total entrepreneurship education publication since 1977. According to the pattern of publication total, entrepreneurship education is still looked to be the favourite topic for the academics.

The highest total of citation each year happened in 2013, that is 3071 citation each year with the total of publication 91 documents, and the paper entitled by ""*Examining the formation of human capital in entrepreneurship: A meta-analysis of entrepreneurship education outcomes*" written by B.C. Martin, J.J. McNally, M.J. Kay, it gave the highest total citations with 504 citations each year (Martin et al., 2013). Meanwhile the second rank with the citation total each year 2662 happened in 2005. As for in 2010, the total of citations each year is 2634. The illustration of total publications and citations each year is presented in Table 1.

Table 1. Publication Year and Total Citations

YEAR	TP	% (N=2176)	NCP	TC	C/P	C/CP	h-index	g-index
1977	1	0.05	1	6	6	6	1	1
1981	3	0.14	2	2	0.67	1	1	1
1985	1	0.05	1	2	2	2	1	1
1986	1	0.05	1	0	0	0	0	0
1987	2	0.09	2	205	102.5	102.5	1	2
1988	3	0.14	3	186	62	62	2	3

1989	2	0.09	2	20	10	10	2	2
1990	1	0.05	1	0	0	0	0	0
1992	1	0.05	1	0	0	0	0	0
1993	1	0.05	1	355	355	355	1	1
1994	8	0.37	8	664	83	83	7	8
1995	5	0.23	3	17	3.4	5.67	2	4
1996	5	0.23	5	189	37.8	37.8	4	5
1997	4	0.18	4	869	217.25	217.25	4	4
1998	3	0.14	3	72	24	24	2	3
1999	6	0.28	6	359	59.83	59.83	4	6
2000	3	0.14	3	227	75.67	75.67	3	3
2001	5	0.23	4	27	5.4	6.75	4	5
2002	10	0.46	8	578	57.8	72.25	6	10
2003	13	0.60	13	965	74.23	74.23	6	13
2004	12	0.55	9	712	59.33	79.11	6	12
2005	27	1.24	25	2662	98.59	106.48	13	27
2006	40	1.84	38	2302	57.55	60.58	19	40
2007	35	1.61	32	2587	73.91	80.84	14	35
2008	48	2.21	41	1947	40.56	47.49	19	44
2009	35	1.61	30	628	17.94	20.93	13	24
2010	104	4.78	79	2634	25.33	33.34	22	50
2011	90	4.14	68	1611	17.9	23.69	17	39
2012	90	4.14	77	1561	17.34	20.27	23	38
2013	91	4.18	74	3071	33.75	41.5	28	55
2014	141	6.48	109	2351	16.67	21.57	24	46
2015	123	5.65	99	2086	16.96	21.07	19	43
2016	146	6.71	115	1926	13.19	16.75	24	39
2017	195	8.96	135	1331	6.83	9.86	16	30
2018	253	11.63	180	1343	5.31	7.46	15	26
2019	266	12.22	165	964	3.62	5.84	15	22
2020	248	11.40	109	489	1.97	4.49	10	16
2021	154	7.08	40	135	0.88	3.38	7	9
Total	**2176**	**100.00**						

Note: TP=Total Publications; NCP= Number of Cited Publications; TC=Total Citation; C/P=The average Citation each Publication; C/CP=The average Citation each Cited Publication; h=h-index; and g=g-index.

The illustration of total publication and citation can be seen in figure 1.

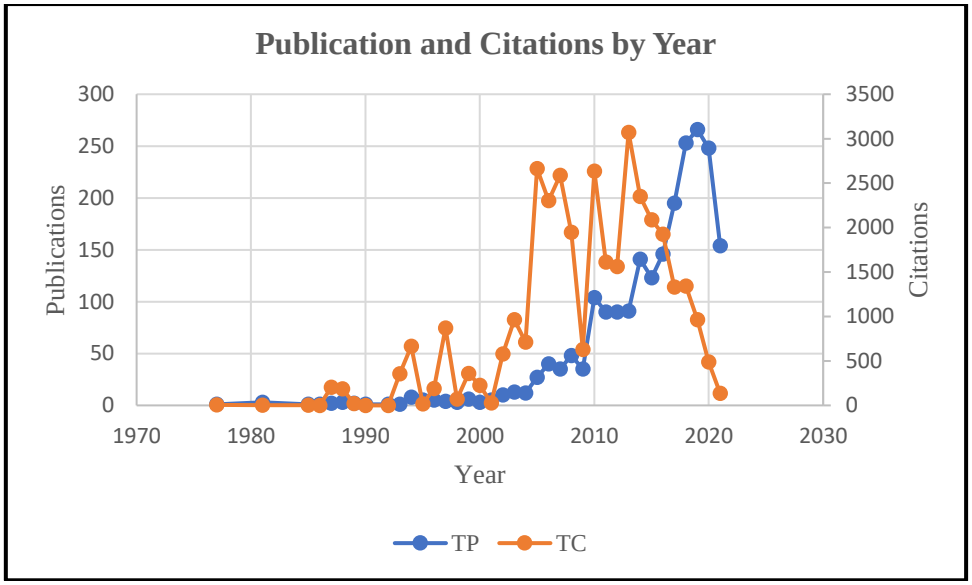


Fig. 1. Total Publications and Citations

Document Type and Source. Document type is the document based on the document authenticity from the article, conference paper, book chapter and so on, meanwhile the Source Document in the form of journals, conference proceedings, books, the serial of trade books or publications. The conference papers which appear under the document type can be different from the conference paper which appear under the Source Document (Sweileh et al., 2017). For instance, the paper presented in the conference will be classified as the conference paper under the document type. Yet, the same paper can be classified as the complete journal article, conference proceedings or book chapter under the Source Document, depend on the publication status.

The published documents in entrepreneurship education spread in twelve types of documents. There are 1340 documents (61,58%) from the total of publication in the form of articles, followed by conference paper 400 documents (18,38%), and the book chapter 288 documents (13,24%). Table 2 summarized information related to document type from the entrepreneurship education study.

Table 2. Document Type

Document Type	Frequency	% (N=2176)
Article	1340	61.58
Conference Paper	400	18.38
Book Chapter	288	13.24
Review	69	3.17
Editorial	30	1.38
Book	28	1.29
Retracted	6	0.28
Conference Review	4	0.18
Erratum	4	0.18
Note	4	0.18
Data Paper	2	0.09
Undefined	1	0.05
Total	**2176**	**100.00**

Meanwhile, as presented in Table 3, the Source Document is classified into five sources, that are: journals, conference proceedings, books, book serials, and trade journal. According to Table 3, journal is the highest Source Document with 1430 documents representing 65,72% from the total of publication, followed by the conference proceedings with 334 documents (15,35%). The illustration of source document can be seen in table 3.

Table 3. Source Document

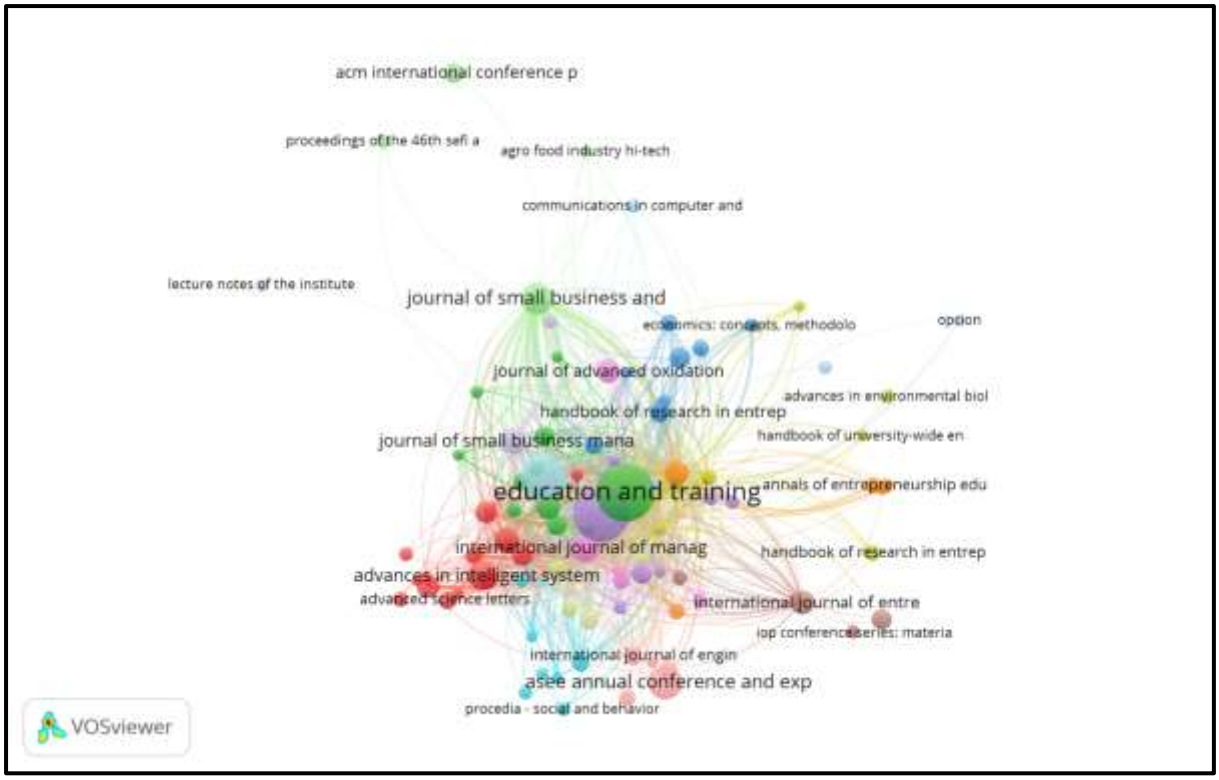
Source Document	Frequency	% (N=2176)
Journal	1430	65.72
Conference Proceeding	334	15.35
Book	285	13.10
Book Series	124	5.70
Trade Journal	3	0.14
Total	**2176**	**100.00**

The Most Active Journal. This paper also presents the most active journal which has minimal 15 publications or more about entrepreneurship education. Table 4 presents the information about the publishers, and Education and Training is one of the highest publisher that contributes towards publication in entrepreneurship education with 111 documents (7,78%). The illustration of the most active journal can be seen in table 4.

Table 4. The Most Active Journal

Source Title	Total Publication	% (N=1427)
Education And Training	111	7.78
Journal Of Entrepreneurship Education	100	7.01
Industry And Higher Education	71	4.98
ASEE Annual Conference And Exposition Conference Proceedings	39	2.73
Journal Of Small Business And Enterprise Development	34	2.38
International Journal Of Management Education	29	2.03
Proceedings Of The European Conference On Innovation And Entrepreneurship Ecie	29	2.03
Advances In Intelligent Systems And Computing	27	1.89
Journal Of Small Business Management	24	1.68
Education Training	20	1.40
International Journal Of Entrepreneurship And Small Business	20	1.40
Journal Of Advanced Oxidation Technologies	20	1.40
Journal Of Physics Conference Series	20	1.40
Sustainability Switzerland	19	1.33
Frontiers In Psychology	17	1.19
International Journal Of Entrepreneurial Behaviour And Research	15	1.05

Figure 2 shows co-appearance visualization by the document source with 5 total minimum documents. Figure 2 reveals that Education and Training that is the most sources document publishing study about entrepreneurship education. The node size shows the total document, meanwhile the connecting line thickness shows the strength of connection between source document. The relevant source documents, like as shown in the same colour, often appear together. For instance, the diagram shows that Education and Training, Journal of Small Business and Enterprise Development, Journal of Small Business Management, Agro Food Industry Hi-Tech, ACM International Conference Proceeding Series, Proceeding of the 46th SEFI and all other source documents which are green closely related and usually appear together. In particular, VOSviewer has generated fifteen different colours which represent 15 clusters with 91 source documents, 894 links and the total power of 4394 links. The illustration of Network visualization map from the citation based on the source document can be seen in figure 2.



Source: VOSviewer

Fig. 2. Network visualization map from the citation based on the source document

Document Language. As shown in Table 5, English is the general language used from the gathered publication. There are 2133 documents representing 97,04% from the total documents which use English. Several publications are also published in Spanish, Chinese, Croatian and other languages. There are 22 documents are known to be published in bilingual. The illustration of the language used for publication can be seen in table 5.

Table 5. The Language Used for Publication

Language	Frequency	% (N=2198)
English	2133	97.04
Spanish	32	1.46
Portuguese	8	0.36
Chinese	4	0.18
Croatian	3	0.14
French	3	0.14
Lithuanian	3	0.14
Russian	3	0.14
Italian	2	0.09
Norwegian	2	0.09
Korean	1	0.05
Slovenian	1	0.05
Swedish	1	0.05
Turkish	1	0.05
Ukrainian	1	0.05

Total	**2198**	**100.00**

*22 documents have been published in bilingual

4.2 The main research field of entrepreneurship education

The main research field of entrepreneurship education is analyzed in the term of (a) main subject field, (b) the frequency of keywords, dan (c) the document title and abstract.

Subject Area. This paper further categorizes publication based on the subject area as summarized in Table 6. Because entrepreneurship education more focus on study related to Business, Management and Accountancy, can be found that those three studies representing 29,62% from the total of each publication. Other fields which have given the significant contribution including Social Sciences, Economics, Econometrics and Finance, Engineering, and Computer Science. The illustration of subject area can be seen in table 6.

Table 6. Subject Area

Subject Area	Total Publication	% (N=3990)
Business, Management and Accounting	1182	29.62
Social Sciences	1084	27.17
Economics, Econometrics and Finance	525	13.16
Engineering	336	8.42
Computer Science	245	6.14
Arts and Humanities	83	2.08
Decision Sciences	82	2.06
Environmental Science	72	1.80
Psychology	66	1.65
Mathematics	58	1.45
Energy	56	1.40
Physics and Astronomy	38	0.95
Chemistry	31	0.78
Materials Science	31	0.78
Agricultural and Biological Sciences	26	0.65

Key words Analysis. For the purpose of key words analysis, the author map the key words for each documents using VOSviewer software. VOSviewer is a strong network analysis software which helps visualizing dynamics and structure of science, and also does the connector and event together for the key words analysis to explore and check the intelectual structure of the intended research area (Valenzuela et al., 2017; van Eck & Waltman, 2010). Figure 3 presents the key words network visualization made by the author, that is entrepreneurship education. In Figure 3, it can be seen that colour, circle size, font size and the connecting line thickness which shows the connection strength between key words (Sweileh et al., 2017).

To minimize the presence of the same meaning key words, Tesaurus in VOSviewer application help the deleting key words which have the same meaning. According to the analysis result, there are 9 clusters in entrepreneurship education research which have been developed based on the key words. The first cluster is pink related to entrepreneurship education, that is: entrepreneurial intentions, entrepreneurial education, gender, self efficacy, innovation and entrepreneurship. Therefore, the other clusters are green, purple, light blue and yellow, blue, orange, brown. The illustration of the authors keywords network visualization map can be seen in figure 3.

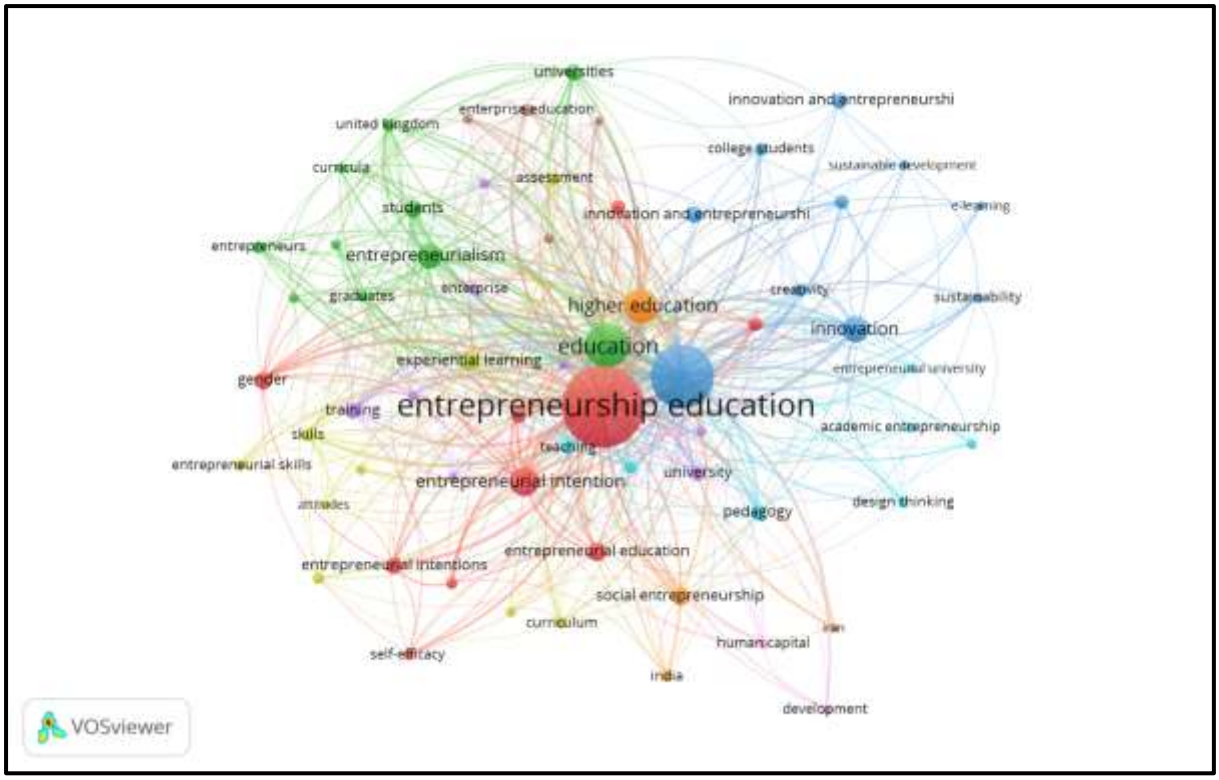


Fig. 3. The Author's key words network visualization map
Source: VOSviewer

Meanwhile, the research topic that is worth testing towards the further researches can be seen in Figure 4. The colour of yellow shows the topic related to entrepreneurship education. It means that the further research can be related to entrepreneurship education with entrepreneurial intentions, entrepreneurial education, gender, self-efficacy, innovation and entrepreneurship, human capital, sustainability, attitudes, entrepreneurial learning, pedagogy, design thinking. The illustration of keywords overlay visualization map can be seen in figure 4.

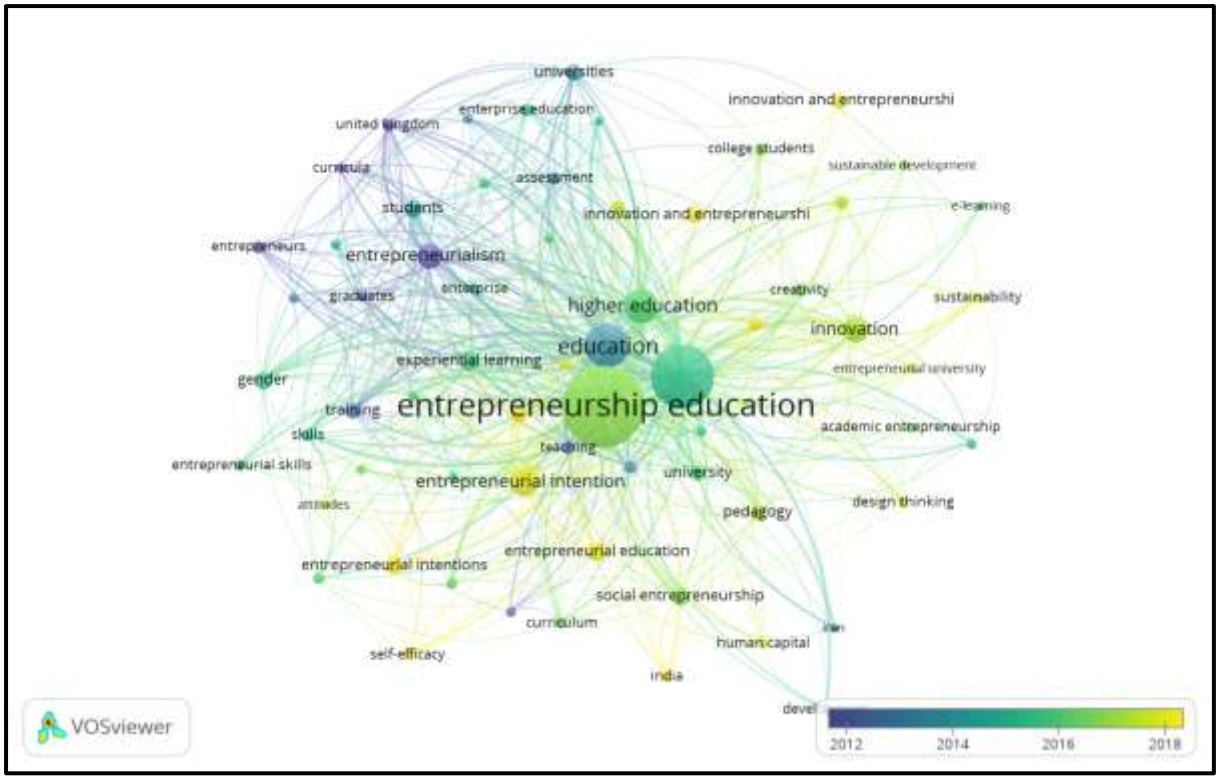


Fig. 4. Key words overlay visualization map
Souce: VOSviewer

We also analyze the key words in spreadsheet document to count the number of the total apperance. Table 7 shows the total frequency of key words which are used from the taken documents. There are 160 key words which are used in the entrepreneurship education research. Entrepreneurship education becomes the key word with the highest performance (16,48%), followed by entrepreneurship (8,09%), education (6,87%), students (5,17%), and higher education (2,96%). The illustration of top keywords can be seen in table 7.

Table 7. Top Keywords

Keyword	Total Keyword	% (N=5399)
Entrepreneurship Education	890	16.48
Entrepreneurship	437	8.09
Education	371	6.87
Students	279	5.17
Higher Education	160	2.96
Engineering Education	152	2.82
Curricula	113	2.09
Innovation	108	2.00
Teaching	107	1.98
Education Computing	92	1.70
Entrepreneurial Intention	89	1.65
Entrepreneur	76	1.41
Entrepreneurial Education	71	1.32
Entrepreneurialism	71	1.32

College Students	55	1.02

The Analysis of Title and Abstract. This research studies the document title and abstract which are gathered based on the number of events and joint incidents using VOSviewer. In particular, this analysis uses the method of binary number in the development of joint network. According to VOSviewer creator, the use of binary calculation methodology means that several times the noun phrase appears in the title and the abstract has no role. The noun phrase which appears once in the title and publication abstract get the same treatment as the noun phrase does, for instance ten times (van Eck & Waltman, 2010).

Figure 5 shows the term visualization that together to be network based on the title and abstract field with the number of minimum appearance of the term 20. Figure 5 shows innovation as the main term that act as the central node of the entire network in the entrepreneurship education research. The node size shows weight of occurrence of the term meanwhile the connecting line thickness shows the connection strenght among the terms. The related words, as they are presented in the same colour, often appears together. For instance, the diagram shows that innovation, reform, challenge, idea, project, college student and all other terms that are red closely related and usually appear together. In particular, VOSviewer has generated four different colours which represent 4 clusters with 296 terms of problem title, 29368 links, dan total link strenght is 111978. The illustration of VOSviewer visualization from the network of the co-occurrence term based on the title and abstract field can be seen in figure 5.

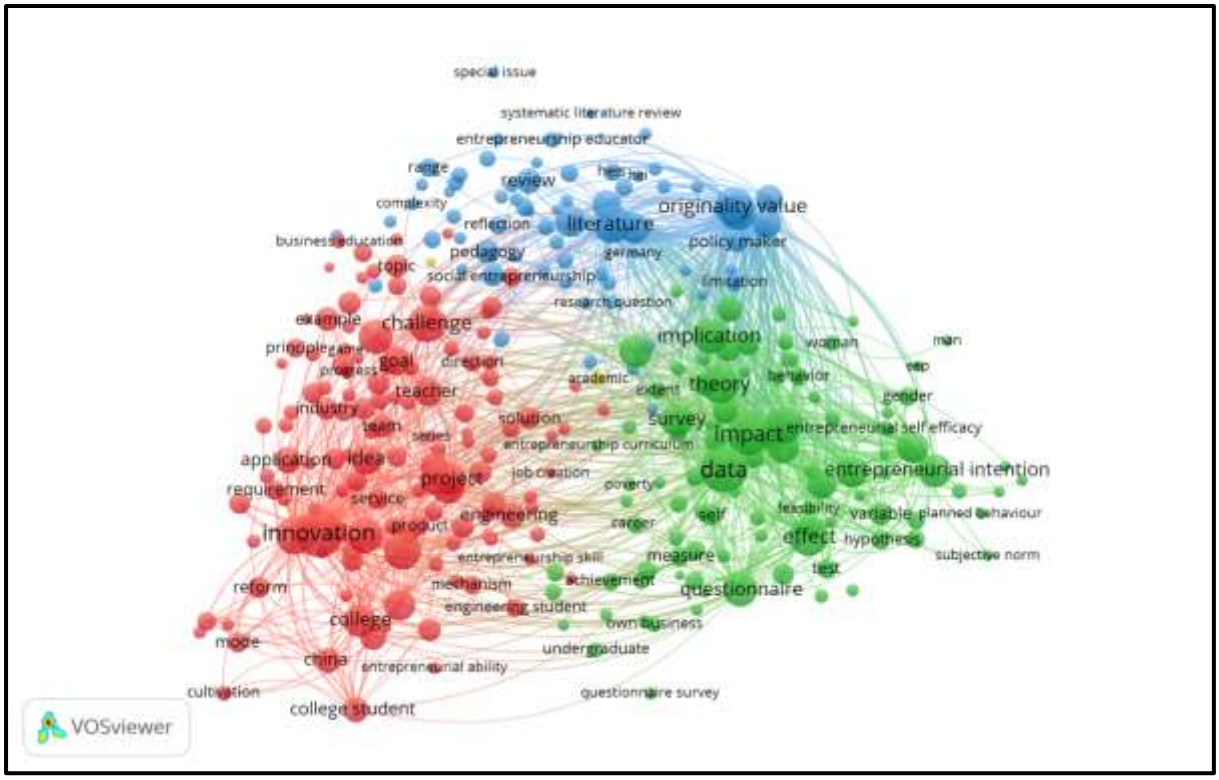


Fig. 5. VOSviewer visualization from the network of the co-occurrence term based on the title and abstract field.
Source: VOSviewer

4.3 Main researcher and research collaboration

This research investigates the characteristics of scientific collaboration about entrepreneurship education research by analyzing (a) most frequently contributing countries, (b) main institution that includes in entrepreneurship education research, (c) author's analysis, and (d) citation analysis.

Geografic Publication Distribution. This paper also evalutes the number of publication based on the country, total 109 countries identified to be related in entrepreneurship education publication. Table 8 shows that 10 top active countries that contribute at least more than 60 publications in entrepreneurship education. United States donates the highest number of publication (368) which represent 13,75% from the total publication in entrepreneurship education followed by China (9,86%), United Kingdom (9,19%), Spain (3,14%), and Indonesia (2,91%). This result shows that the developed countries place the leading position in the research about entrepreneurship education. When two countries in Asia, that are Indonesia and Malaysia also have enough significant distribution in entrepreneurship education research. The illustration of top countries contributing in publication can be seen in table 8.

Table 8. 10 Top Countries Contributing in Publication

Country	Total Publication	% (N=2677)
United States	368	13.75
China	264	9.86
United Kingdom	246	9.19
Spain	84	3.14
Indonesia	78	2.91
Malaysia	77	2.88
France	73	2.73
Finland	72	2.69
Germany	69	2.58
Sweden	65	2.43

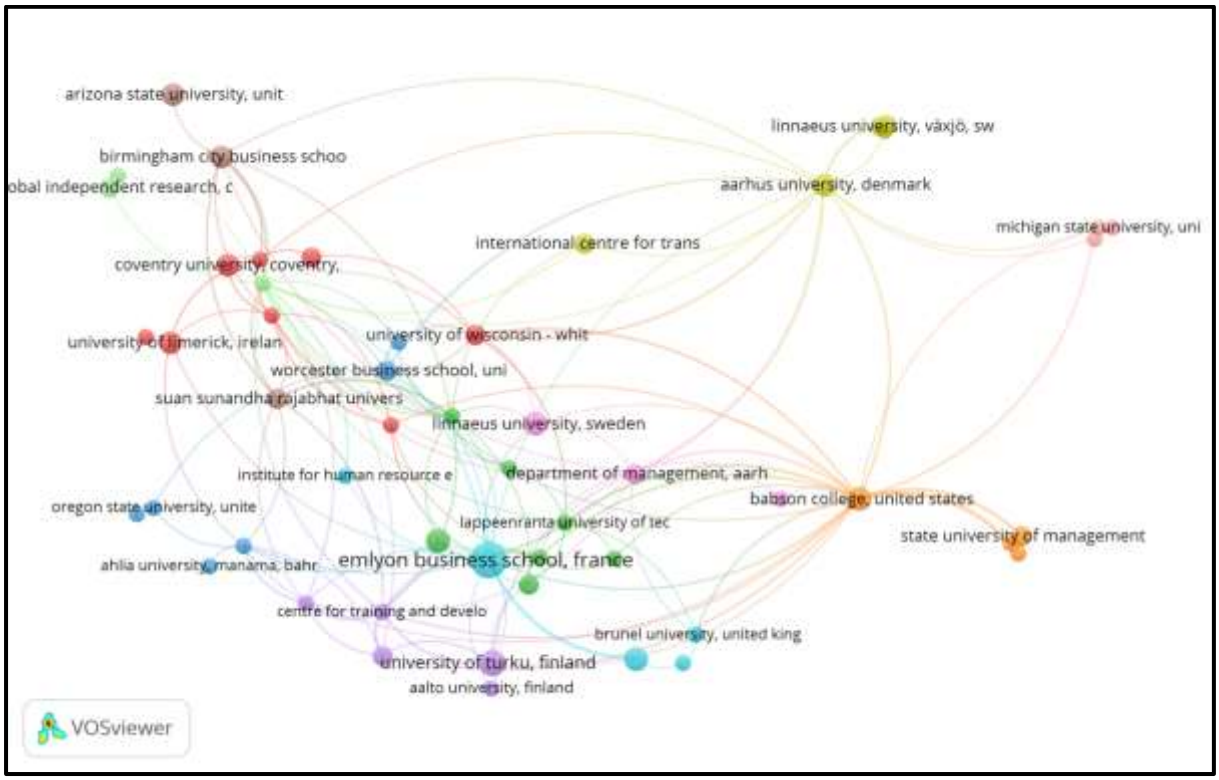
Most Influential Institution. The participation of research institution is also counted in this paper, which is based on the minimum 14 publications. There are 160 institutions which have contributed in research about entrepreneurship education. Table 9 shows 10 top institutions by the minimum 14 publications. Meanwhile, EMLYON Business School has the highest number of entrepreneurship education publication with 35 publications (3,06%), followed by LUT University to be the second top with 19 publications (1,66%) and University of Limerick in the third position with 18 publications (1,57%). The illustration of most influential institution can be seen in table 9.

Table 9. Most Influential Institution

Affiliation	Total Publication	% (N=1145)
E.M. Lyon Business School	35	3.06
LUT University	19	1.66
University of Limerick	18	1.57
Universiti Kebangsaan Malaysia	17	1.48
Aarhus Universitet	17	1.48
Birmingham City University	17	1.48
Birmingham City Business School	17	1.48
Turun yliopisto	16	1.40
Babson College	15	1.31
Tecnologico de Monterrey	14	1.22

Figure 6 shows the collaboration among institutions in entrepreneurship education research. VOSviewer presents the analysis result with the minimum 3 documents for each institution and 1 citation. The analysis result shows that each istitution collaborate each other in entrepreneurship education research. For instance, E.M. Lyon Business School, France collaborates with Brunel University, United Kingdom (represented by light blue colour).

Aarhus University, Denmark collaborates with Linnaeus University, Sweden, International Center for Transformational Entrepreneurship (represented by yellow colour), and other colours. In particular, VOSviewer has generated eleven different colour which represent 11 clusters with 52 institutions, 140 links, and total link strenghts 215. The illustration of VOSviewer visualization from the term of co-occurrence network based on the affiliation among the institutions can be seen in figure 6.



Source: VOSviewer

Fig. 6. VOSviewer visualization from the term of co-occurrence network based on the affiliation among the institutions**.**

The Author's Analysis. For the purpose of author's analysis, Harzing's Publish or Perish aplication is used to help the author to map the author number, the most productive author, affiliation and citation analysis provided for each document.

Based on the Harzing's Publish or Perish analysis, there are 160 unique authors who contribute at total 2176 publications in entrepreneurship education. Table 10 presents publication number based on the author number for each publication. According to Table 10, 531 publication documents (24,40%) written singular, meanwhile the rest is multi-author. Most of article in the entrepreneurship education written together by two authors, there are 684 documents (31,43%) and three authors are 517 documents (23,76%). The highest author number that writes publication in entrepreneurship education is twenty four authors, that are the article entitled by "*PLAYER – a European Project and a Game to Foster Entrepreneurship Education for Young People*", written by Benjamin Fonseca,.et.al., published by Journal of Universal Computer Science, vol. 18, no. 1 (2012), 86-105 (Fonseca et al., 2012). The illustration of author number each document can be seen in table 10.

Table 10. Author Number each Document

Author Count	Total Publication	% (N=2176)
1	531	24.40

2	684	31.43
3	517	23.76
4	249	11.44
5	107	4.92
6	36	1.65
7	20	0.92
8	7	0.32
9	8	0.37
10	2	0.09
13	2	0.09
15	1	0.05
17	1	0.05
24	1	0.05
0	10	0.46
Total	**2176**	**100.00**

Source: Harzing's Publish or Perish

This research also presents the most active author who publishes document in entrepreneurship education. Table 11 includes the most active author with at least 9 publications. According to Table 11, Harry Matlay, who affiliates with UCE Business School, Birmingham, United Kingdom, is the most active author in this field, publishing 34 publications about entrepreneurship education. The illustration of the most productive author can be seen in table 11.

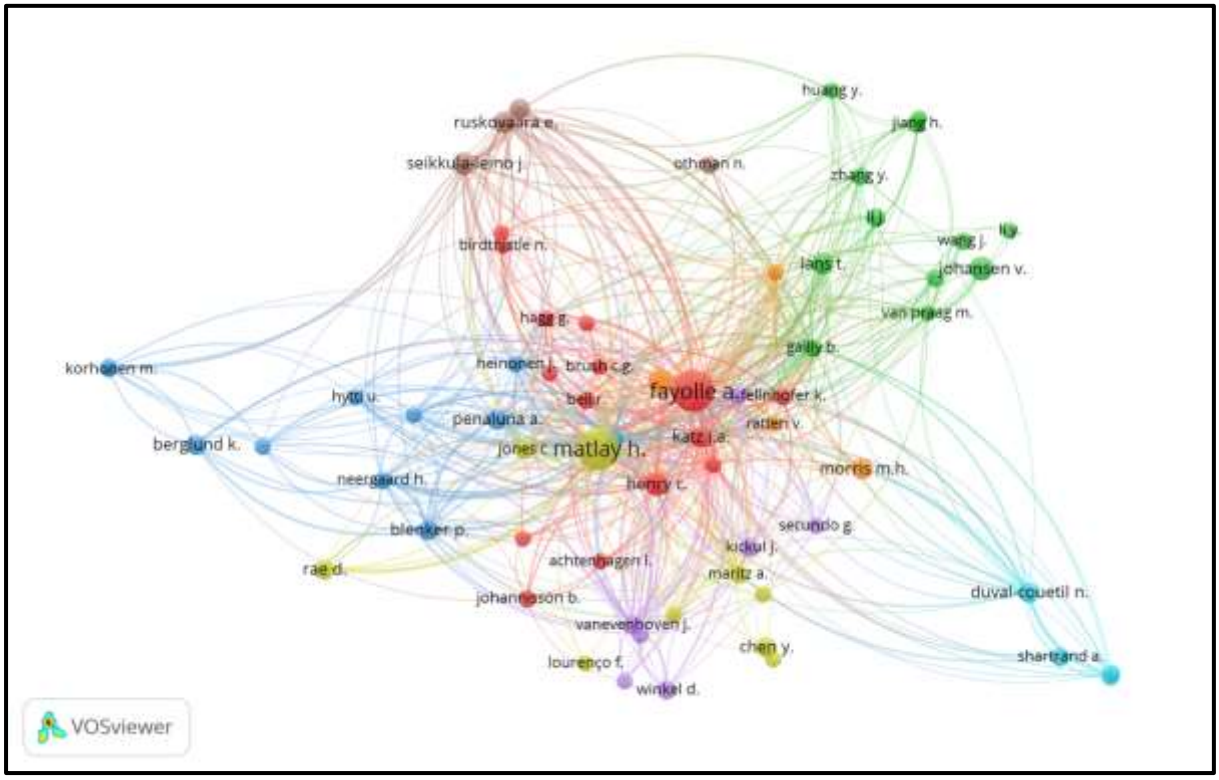
Table 11. The Most Productive Author

Author's Name	Affiliation	Country	TP	% (N=761)
Matlay, H.	UCE Business School, Birmingham	United Kingdom	34	4.47
Fayolle, A.	E.M. Lyon Business School, Ecully	France	31	4.07
Henry, C.	Dundalk Institute of Technology, Dundalk, Co Louth	Ireland	11	1.45
Johansen, V.	Eastern Norway Research Institute	Norway	11	1.45
Jones, P.	International Centre for Transformational Entrepreneurship, Coventry University,	United Kingdom	11	1.45
Seikkula-Leino, J.	Centre for Training and Development, Lappeenranta University of Technology	Finland	10	1.31
Lans, T.	Education and Competence Studies Group, School of Social Sciences, Wageningen University	Netherland	9	1.18
Morris, M.H.	University of Notre Dame	United States	9	1.18
Ruskovaara, E.	Centre for Training and Development, Lappeenranta University of Technology	Finland	9	1.18
Berglund, K.	School of Business, Stockholm University	Sweden	8	1.05

Note: TP=Total Publications;

The following, this research analyzes the author collaboration by doing the analysis using VOSviewer. This analysis is based on the influential author who has more than five citations and counted using full count method. Colour, circle size, font size and connecting line thickness show the connection strength among the authors. The connected authors, as it is shown in the same colour, it is usually grouped together. According to

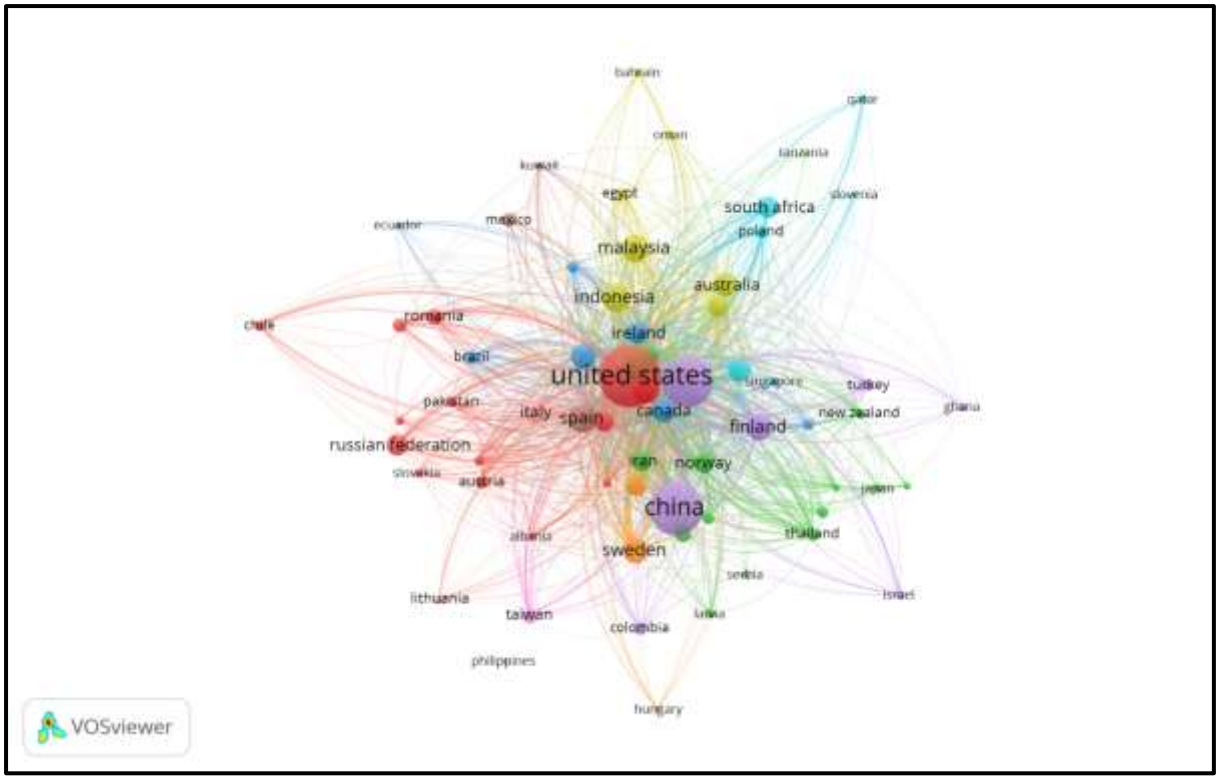
visualization generated by VOSviewer, it can be seen that all authors collaborate and investigate together, for instance, Harry Matlay collaborates with Rae D, Jones C, Maritz A, Chen Y, Lourenco F (yellow colour), Alain Fayolle collaborates with Katz J.A, Henry C, Johannisson B, McGowan P, Achtenhagen I (red color), Ruskovaara E collaborates with Othman N, Seikkula-Leino J (brown colour), and the other authors who appear in diagram doing collaboration (look Figure 7). In the Figure 7, there are 66 items with 8 clusters, 585 links with total link strenghts 1661. The illustration of VOSviewer visualization from the co-occurrence network based on the author can be seen in figure 7.



Source: VOSviewer

Fig. 7. VOSviewer visualization from the co-occurrence network based on the author

Figure 8 furthermore shows author network visualization and countries which affiliate with them. Only countries with more than five articles and more than one citation which are considered in this analysis. According to full count method, it shows that United States plays the prominent role in cooperating with other countries. United States has worked with Romania, Chile, Pakistan, Austria, Russian Federation (red colour). Meanwhile China is looked cooperating with Finland, Turki, Ghana, Israel, Colombia (purple colour). As for Indonesia cooperates with Malaysia, Australia, Egypt, Oman, Bahrain (yellow colour). The illustration of Network visualization map from the author together between countries can be seen in figure 8.



Source: VOSviewer

Fig. 8. Network visualization map from the author together between countries

Unit of analysis = Country
Count Method: Full Count
The minimum number of country document = 5
The minimum number of country citation = 1

Citation Analysis. Table 12 summarizes citation metric for the documents taken on Friday, 23rd July 2021, 2.56 pm. As it is shown, there are 35083 citations are reported in 44 years (1977 - 2021) about entrepreneurship education publication. This citation metric is generated by Harzing's Publish or Perish software by importing file in the format of RIS from the Scopus database into the software to present the citation metric. The illustration of citation metric can be seen in table 12.

Table 12. Citation Metric

Metric	Data
Publication year	1977-2021
Citation year	44 (1977-2021)
Paper	2176
Citation	35083
Citation/year	797.34
Citation /paper	16.12
Author/paper	2.56
h-indeks	86
g-indeks	155

Source: Harzing's Publish or Perish

Meanwhile, Table 13 shows top 10 artcles that mostly cited (based on the number of documents that is cited) according to Scopus database. The document entitled by "*The emergence of entrepreneurship education: Development, trends, and challenges*" by Donald F. Kuratko (2005) who affiliates with Indiana University, United States has received top citation number (1039 citations or the average 64.94 citations each year). The illustration of most cited article can be seen in table 13.

Table 13. Most Cited Article (each year)

No	Authors	Title	Year	Cites	Cites Per Year	Cites Per Author
1	D.F. Kuratko (Kuratko, 2005)	The emergence of entrepreneurship education: Development, trends, and challenges	2005	1039	64.94	1039
2	F. Wilson, J. Kickul, D. Marlino (Wilson et al., 2007)	Gender, entrepreneurial self-efficacy, and entrepreneurial career intentions: Implications for entrepreneurship education	2007	874	62.43	291
3	L. Pittaway, J. Cope (Pittaway & Cope, 2007)	Entrepreneurship education: A systematic review of the evidence	2007	676	48.29	338
4	J.A. Katz (Katz, 2003)	The chronology and intellectual trajectory of American entrepreneurship education 1876-1999	2003	609	33.83	609
5	A. Fayolle, B. Gailly, N. Lassas-Clerc (Fayolle et al., 2006)	Assessing the impact of entrepreneurship education programmes: A new methodology	2006	583	38.87	194
6	H. Oosterbeek, M. van Praag, A. Ijsselstein (Oosterbeek et al., 2010)	The impact of entrepreneurship education on entrepreneurship skills and motivation	2010	572	52	191
7	T.J. Bae, S. Qian, C. Miao, J.O. Fiet (Bae et al., 2014)	The relationship between entrepreneurship education and entrepreneurial intentions: A meta-analytic review	2014	534	76.29	134
8	G. Gorman, D. Hanlon, W. King (Gorman et al., 1997)	Some research perspectives on entrepreneurship education, enterprise education and education for small business management: A ten-year literature review	1997	531	22.13	177
9	H.M. Neck, P.G. Greene (Neck & Greene, 2011)	Entrepreneurship education: Known worlds and new frontiers	2011	520	52	260
10	B.C. Martin, J.J. McNally, M.J. Kay (Martin et al., 2013)	Examining the formation of human capital in entrepreneurship: A meta-analysis of entrepreneurship education outcomes	2013	504	63	168
11	G. von Graevenitz, D. Harhoff, R. Weber (von Graevenitz et al., 2010)	The effects of entrepreneurship education	2010	360	32.73	120
12	A.A. Gibb (Gibb, 1993)	Enterprise culture and education: Understanding enterprise education and its links with small business, entrepreneurship and wider educational goals	1993	355	12.68	355
13	A. Fayolle, B. Gailly (Fayolle & Gailly, 2015)	The impact of entrepreneurship education on entrepreneurial attitudes and intention: Hysteresis and persistence	2015	353	58.83	177
14	C. Henry, F. Hill, C. Leitch (Henry et al., 2005)	Entrepreneurship education and training: Can entrepreneurship be taught? Part I	2005	330	20.63	110
15	G. Nabi, F. F. Linan, A. Fayolle, N. Krueger, A. Walmsley (Nabi et al., 2017)	The impact of entrepreneurship education in higher education: A systematic review and research agenda	2017	329	82.25	66
16	T.N. Garavan, B. O'Cinneide (Garavan & O′Cinneide, 1994)	Entrepreneurship education and training programmes: A review and evaluation - Part 1	1994	317	11.74	159
17	A. Fayolle (Fayolle, 2013)	Personal views on the future of entrepreneurship education	2013	302	37.75	302
18	D.A. Kirby (Kirby, 2004)	Entrepreneurship education: Can business schools meet the challenge?	2004	302	17.76	302
19	A. Fayolle, B. Gailly (Fayolle & Gailly, 2008)	From craft to science: Teaching models and learning processes in entrepreneurship education	2008	300	23.08	150
20	K.H. Vesper, W.B. Gartner (Vesper & Gartner, 1997)	Measuring progress in entrepreneurship education	1997	297	12.38	149

V. CONCLUSION, IMPLICATION, SUGGESTION, AND LIMITATIONS

This research aims to investigate the intelectual production in entrepreneurship education research using bibliometric analysis. By adopting bibliometric analysis, he/she can evaluate the research and publication productivity in the certain domain (Moed et al., 2001). The result of bibliography analysis can give the information to evaluate certain research performance and can use it to manage several policies related to funding allocation and compare scientific input and output (Gu, 2004). The following, the result of bibliometric analysis can explain factors that support research contribution in a research area and guide the bachelor in generating impact studies (Akhavan et al., 2016).

According to the research objectives which have presented at the beginning of this paper, then, the conclusion can be presented as follows.

The first question of the study was regarding the identification of the research evolution and distribution about entrepreneurship education. This research focus in entrepreneurship education publication that is gathered from Scopus database on Friday, 23rd of July 2021, 2.56 pm. This study finds 2176 documents from Scopus database by using the quest query based on the article title, that is "entrepreneurship education". Based on the arranged documents from Scopus database, the study about entrepreneurship education was initiated by Robert E. Nelson entitled by "*Entrepreneurship education in Developing Countries*", published in Asian Survey, in 1977, volume 17, Issue 9, page 880-885. Since that time, the entrepreneurship education publication number has increased year by year until now. The development of this topic is fast and to be believed that several research chances related to entrepreneurship education is still interesting for the researcher. It will continue to increase in the future. The most publication generated in 2019 with 266 documents (12,22%). 1340 (61,58%) publication from the document type donated by the article, meanwhile the source document in the form of journal, recorded 1430 (65,72%) publications. Most of all publications written in English are 2133 documents (97,04%) by 160 authors from 109 countries and 160 institutions. There is the source document (journal) which is the most active in publishing the research about entrepreneurship education, that is Education and Training with 111 (7,78%) documents.

Regarding the second research question, what is the main research field in the entrepreneurship education research. The reserach about entrepreneurship education generally published in group publication in the field of Business, Management and Accounting, 1182 (29,62%). Besides, the research about entrepreneurship education is also done in the field of social science, economics, econometrics and finance, engineering, and many others. The key word "entrepreneurship education" is the most key word which appear in this reserach, that is 890 (16,48%). Meanwhile in the analysis of title and abstract, "innovation" and "impact" become the research network center. The area focus and key word analysis can be seen from the analysis result which prosessed by using VOSviewer in anlyzing title and abstract.

United States is the most contributor from 109 countries including entrepreneurship education publication with 368 (13,75%) from the total publication, followed by Chine and United Kingdom. Meanwhile E.M. Lyon Business School becomes the institution that mostly contribute in entrepreneurship education, 35 (3,06%) publications. Most of research written by two authors 684 (31,43%), and Harry Matlay affiliates with UCE Business School, Birmingham, United Kingdom as the most productive author from 160 authors that include in entrepreneurship education research, 34 (4,47%) publication. Most of the author from many countries and institutions do collaboration for writing article using entrepreneurship education topic.

Finally, to address the third research question regarding the most researcher and collaboration affected in the study of entrepreneurship education, citation matrices have been used. The publication effect in the topic of entrepreneurship education can be seen from the citation that is revealed in this paper. Based on the publication for 44 years in (1977-2021), there are 2176 documents which are published with the total 35083 citations. The number total 35083 citations. Total ada 797.34 each year 16.12 citation per paper for document gathered from Scopus database about entrepreneurship education. The article written by Donald F. Kuratko (2005) from Indiana University, entitled by "*The emergence of entrepreneurship education: Development, trends, and challenges*" receives the highest number of citation (1039 citations or average 64,94 citations each year).

The findings of this research on entrepreneurship education are different from similar studies that use bibliometric analysis, such as that conducted by (Deveci, 2022; Slavinski et al., 2020; Zheng, 2018).

Although the bibliometric analysis has certain characteristic, this research also has limitation which has to be handled to give the clear understanding toward the paper reader and to increase further research. First, key word used is only for entrepreneurship education based on the article title. Therefore, the result of query quest in the other field such as abstract, key word, author, affiliation, source title have not been included yet in this analysis. The main reason is that most research focuses in the certain area will be entered in the document title. Several people may place the terms related to the quest query in the source document of affiliation. Eventhough the focus

of their research may not specifically related to what is searched by the researcher. Therefore, screening and cleaning are essential to be done before analysis can be done. Further research may be expanded by the other quest query, for intance abstract, key word.

Second, there is not 100% perfect quest query, the errors both positive or negative have to be anticipated (Sweileh et al., 2017). Third, this research just focuses on Scopus database as the primary source of the document search. Even Scopus is one of the widest database which indexs all scientific work (Ahmi & Mohamad, 2019; Sweileh et al., 2017). Scopus does not easily cover all availabe sources. Other available database can be included in the further research such as Web of Science, Google Scholar, Dimension, and PubMed. Gathering all these database also can contribute to more interesting and precious result. Despite this limitation, this research has contributed towards knowledge by presenting the research trend nowadays in entrepreneurship education. This research also expands and completes the previous findings about entrepreneurship education that uses bibliometric approach and gives meaningful outlook about the previous trend of literature.

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