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Entrepreneurship in Technical and Vocational Education and Training: A Bibliometric Review

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Abstract

Entrepreneurship is an important initiative of the country to overcome the problem of unemployment as well as to boost the country's economy. This initiative can be seen through the application of entrepreneurship in Technical and Vocational Training Education (TVET). The existing entrepreneurship in TVET studies are extensive, making it difficult for researchers to make an overview of the field. Therefore, this study was produced to provide an analysis of entrepreneurship in TVET publications on a bibliometric basis obtained through the Scopus database to assist in building and illustrating the literature of studies in the field. This study uses a bibliometric analysis method using Harzing's Publish or Perish for citation metrics and analysis, VOSviewer for data visualization, and Microsoft Excel for frequency analysis. Based on the study results, 4 clusters were obtained to reflect the overall entrepreneurship in TVET: entrepreneurial attributes, entrepreneurial involvement, entrepreneurial implementation, and entrepreneurial needs. Indonesia and the State University of Malang are the highest country and university producing articles in this field. It suggests additional research for discussion in databases such as Web of Science, Google Scholar, Dimension, or PubMed. The combination of these various sources of databases will result in more valuable study results.

Keywords: Bibliometric Analysis, Entrepreneurship, TVET, VOSviewer, Harzing's Publish or Perish

Introduction

Entrepreneurship has long been recognized as a catalyst for economic development and is the main driving force in enhancing a country's innovation, creativity, and competitiveness. These statements acknowledge by Galvão et al (2018), who stated that entrepreneurship promises skills and abilities in training individuals to plan their future to be more creative and autonomous. Entrepreneurship is a skill that can build through learning in education (Volkmann, 2004; Kumara, 2012; Ismail & Ahmad, 2013; Soeharso & Riyanti, 2021). Entrepreneurship and education need to be harnessed and interconnected if we are to develop the human capital necessary for the future development of society (Wilson et al.,

2009). Entrepreneurship applied in this TVET is a formal lesson through training and education for students interested in doing business. This formal learning has been practically implemented at various levels since primary school. It is seen as an effort to positively affect the motivation and attitude of students to become successful entrepreneurs (Krpálek & Krelová, 2016).

In addition, entrepreneurship can be seen as part of the shift towards generic skills in TVET by focusing on educational content that is more about abilities than knowledge (Fejes et al., 2019). It is linked to the individual's ability to turn his ideas into action by engaging in creativity and innovation (Gamede & Uleanya, 2017; Ganefri et al., 2017; Nyukorong, 2018) as well as risk-taking as a capacity to design and implement projects to achieve the expected objectives.

However, specific studies have yet to show the development of research trends that have been carried out on entrepreneurship in TVET. Therefore, a bibliometric analysis should be carried out for this purpose. The analysis was used on the Scopus database from 1981 until January 2023 related to the publication of entrepreneurial studies in TVET. The following research questions were used in this study to conduct a bibliometric analysis of published entrepreneurship in TVET research

RQ 1 What is the present trend of publications related to entrepreneurship in TVET?
RQ 2 Which countries, institutions, and authors have produced the most and significantly influenced entrepreneurship in TVET studies?
RQ 3 What keywords and themes are relevant to entrepreneurship in TVET studies?
RQ 4 Which are the most influential articles on entrepreneurship in TVET studies?
RQ 5 Which journals/proceedings are favored for entrepreneurship in TVET studies?

Entrepreneurship in TVET not only helps students to start a business but also helps to develop skills for employability (Castro & Zermeño, 2021). The exposure to skills training students in entrepreneurship will also encourage them to be more committed to the entrepreneurial pathway. Through the advantages of this combination of TVET and entrepreneurship skills, it can be used as a platform for students to engage in any training that can benefit them (Mack et al., 2021). In a previous study by Samad et al (2018), entrepreneurship is one of the domains that aids the formation of automotive industry trainees in behavioral competence and employability skills (Samad et al., 2018). The same goes for Fejes et al (2019), which state that the entrepreneurial learning applied to handicraft skills in Sweden is to create flexible employees where the main driver is adaptive and productive in a commercial context.

In addition, technical skills are not capable of developing an organization and require soft skills to sustain an organization (Mohammed & Mohamed, 2017). TVET students who can always build a mentality to work in the field will be a problem in the future if they are not equipped with entrepreneurial experience, as they cannot compete in the job market and survive (Ganefri et al., 2017). These skills, together with technical and entrepreneurial skills, will have a high impact on the quality of TVET graduates when they want to start a business due to the advantages of having a solid foundation in technical skills and thus supporting good business practices and avoiding unemployment (Galvão et al., 2018). Ianya can also lead to more job opportunities than waiting to be hired by others (Suradi et al., 2017; Gamede & Uleanya, 2019).

The word “Biblio” was derived from the combination of the Latin and Greek word "biblion," which means book or document, and "metrics" refers to measurement (Ahmi, 2021). The bibliometric analyses objective is to measure and review the literature in a specific

research field based on publication statistics (Tiberius & Weyland, 2023). From the point of view of previous studies related to bibliometric analysis on entrepreneurship in the context of education, several studies have been conducted, as stated in table 1. Referring to this, the studies that have been carried out are focused on studying entrepreneurship in education. No specific bibliometric analysis studies on entrepreneurship in TVET and no data source from Scopus have been analyzed yet. Most of the analysis implemented is related to publishing trends, productive journals, productive authors, productive articles, and relevant keywords.

Table 1
Summary of previous studies

Author	**Domain/Search Strategy**	**Data Source & Scope**	**TDE**	**Bibliometric Attributes Examined**
Tiberiusand Weyland (2023)	entrep* education	Web of Science (1977 – 2021)	799	- Publication trend - Citation Trend - Subject Area Publication - Source Title - Core authors - Citation network and clustering - Co-citations analysis - Highly cited journal - Highly cited articles
Deveci (2022)	set tittle “enterprise education,” “entrepreneurial education,” and “entrepreneurship education”.	Web of Science (1991-2020)	352	- Publication trend - Authors productivity - Institution productivity - Source article productivity - Country productivity - Co-authorship network and clustering among authors - Co-authorship network and clustering among countries - Co-authorship network and clustering among institution

Author	Domain/Search Strategy	Data Source & Scope	TDE	Bibliometric Attributes Examined
				- Co-citation analysis - Highly cited articles - Co-occurrence keyword network and clustering
Dissanayake et al(2022)	"entrepreneurship education" and "universities"	Web of Science (2004 – 2022)	447	- Publication trend - Highly cited authors - Highly cited journal - Number article based country and international collaboration - Citation impact publication - Relevant keyword
Haibin et al (2020)	"Internet plus" AND "innovation and entrepreneurship education"	China National Knowledge Infrastructure (CNKI) (2015 – 2020)	493	- Publishing trend - Productive author - Productive institution - Productive journal - High frequency keyword - Popular research topic - Popular research trend
Aparicio et al (2019)	"entrepren* education"	Web of Science (1987-2017)	325	- Publication trend - Productive journal - Highly cited articles - Highly cited authors - Thematic evolution based keywords

TDE=Total documents examined

Methods

This study took all data from the Scopus database from 1981 to January 2023. A total of 284 articles were obtained, and all data regarding the article was collected in Microsoft Excel for a frequency analysis process to display the publication's content features (Slavinski et al., 2020). After that, the data is also analyzed bibliometrically through Harzing's Publish or Perish

software to obtain citation metrics information of each author, journal, and country from this study's publication and integrate observation on the desired topic (Gillani et al., 2022). To visualize the results of the analysis and to display that data file in the shape of a network file, VOSviewer was used. Van-Eck and Waltman developed VOSviewer in 2010; it is text-mining software that shows how various objects are similar (Deveci, 2022). VOSviewer displays a co-authorship and word co-occurrence network map to manage the data for an intuitive and accurate comprehension (Gillani et al., 2022) of entrepreneurship in TVET research. It also provides more good depictions of data than maps created with other well-known techniques (Fellnhofer, 2019).

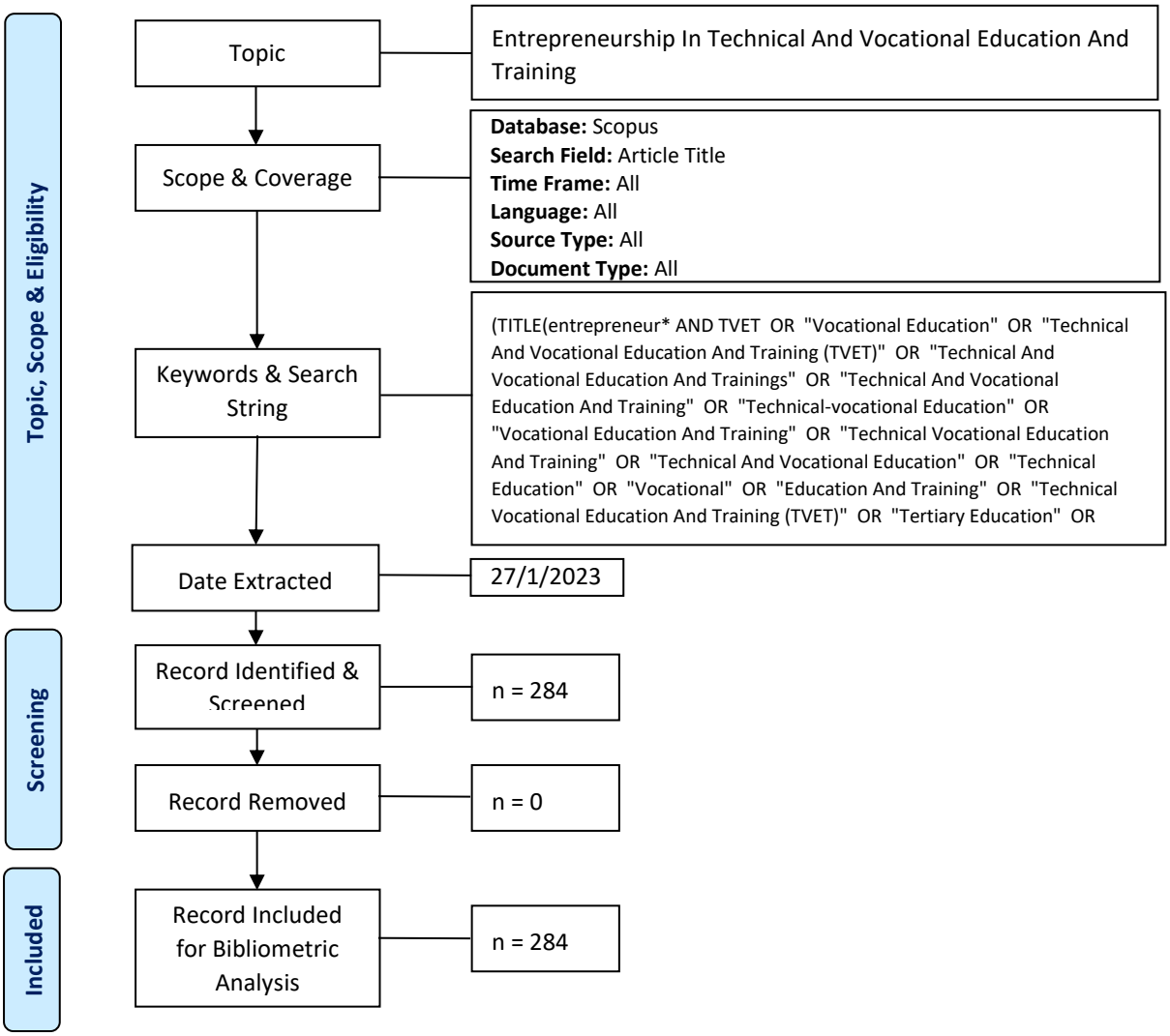

Figure 1. Flow diagram of the search strategy.
Source: Zakaria et al (2021); Mansour et al (2022)

Results and Findings

Publication Trends

Table 2 shows the publication of entrepreneurial studies in TVET from 1981 to January 2023. The highest publication was in 2021, with 42 articles published. Publication for this study began as early as 1981 and increased sharply in 2010 but decreased again. However, the rebound can be seen consistently in 2014 to date. The first document was written by Brannam (1981), which describes how entrepreneurship in TVET is applied through

entrepreneurship lab projects. Only a few documents were published during this emerging period (Udomsap & Hallinger, 2020). For 28 years, there were only 26 publications released. However, the documents started to be published highly for a pickup pace period (Udomsap & Hallinger, 2020) in 2010 but decreased dynamically until 2013. Research on entrepreneurship in TVET began to proliferate in 2014 until now.

This situation is in line with the initiatives of several countries, such as India and Malaysia, in implementing entrepreneurship in TVET. The initiative can be seen through the double existence of an entrepreneurial education curriculum explicitly developed for TVET students in India in 2011 and 2014 (Zenner et al., 2017). In Malaysia, an Entrepreneurship Action Plan (PTK) for Higher Education Institutions has been issued from 2011 to now to improve the entrepreneurial ecosystem in the TVET higher education institute (HEI) landscape from time to time (KPT, 2016).

In table 2, the highest number of citations was referred to the publication around 2005, 542 citations, while the publication at the beginning of the study did not have any citations.

Table 2
Year of Publication

Year	TP	NCP	TC	C/P	C/CP	*h*	*g*
1981	1	0	0	0	0	0	0
1982	1	0	0	0	0	0	0
1994	2	2	460	230	230	2	2
1996	2	2	173	86.5	86.5	2	2
2001	2	2	197	98.5	98.5	2	2
2002	1	1	96	96	96	1	1
2003	3	2	73	24.33	36.5	2	3
2004	2	1	75	37.5	75	1	2
2005	2	2	542	271	271	2	2
2006	3	2	283	94.33	141.5	2	3
2007	3	3	20	6.67	6.67	2	3
2008	3	2	139	46.33	69.5	2	3
2009	1	0	0	0	0	0	0
2010	13	10	65	5	6.5	5	7
2011	2	2	13	6.5	6.5	2	2
2012	6	4	25	4.17	6.25	2	5
2013	3	3	164	54.67	54.67	3	3
2014	14	12	233	16.64	19.42	7	14
2015	14	11	173	12.36	15.73	6	13
2016	12	8	68	5.67	8.5	5	8
2017	27	17	176	6.52	10.35	9	13
2018	26	22	228	8.77	10.36	7	14
2019	32	23	144	4.5	6.26	7	11
2020	37	28	192	5.19	6.86	8	13
2021	42	21	51	1.21	2.43	3	5
2022	29	7	19	0.66	2.71	2	4
2023	1	0	0	0	0	0	0
Total	**284**	**187**	**3,609**				

Notes: TP=total number of publications; NCP=number of cited publications; TC=total citations; C/P=average citations per publication; C/CP=average citations per cited publication; h=h-index; and g=g-index.

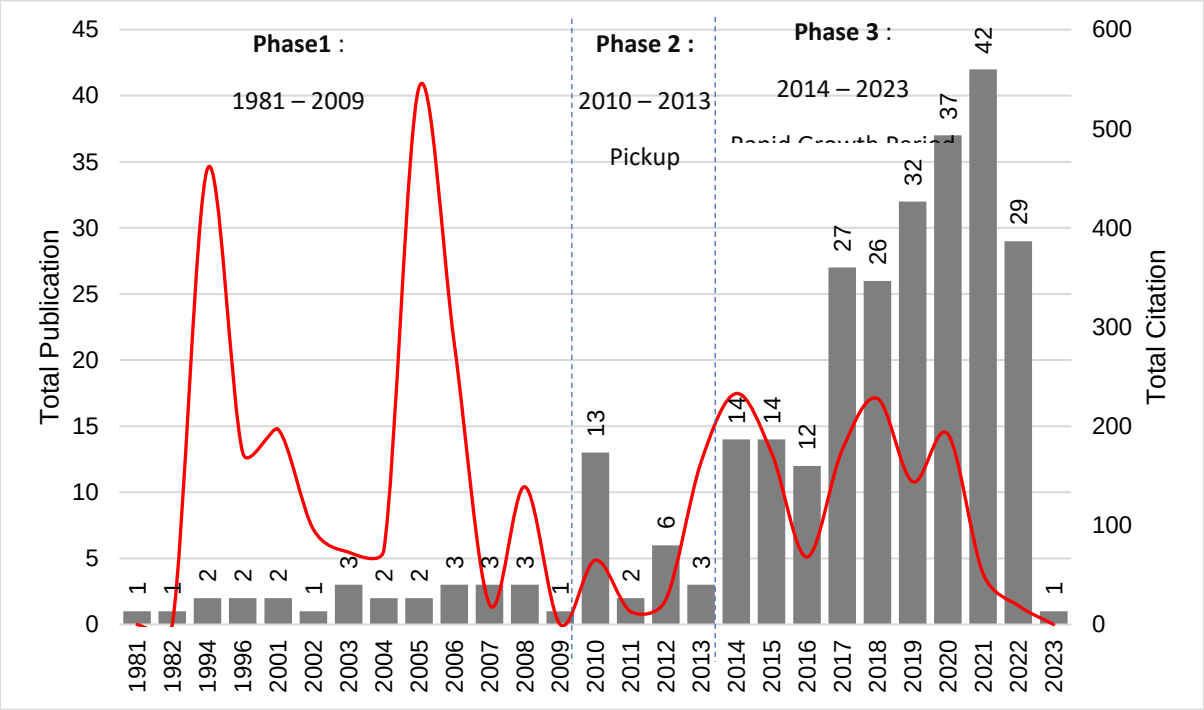

Figure 2. Total Publications and Citations by Year

The Document, Source Type, and Language

Based on table 3, most entrepreneurial studies in TVET have been published in articles (176 articles) representing more than half of the types of publishing documents produced. Referring to table 4, the most dominant type of publishing medium is a journal, with a complete publication of 187 journals.

Table 3
Document Type

Document Type	Total Publications (TP)	Percentage (%)
Article	176	61.97%
Conference Paper	72	25.35%
Book Chapter	24	8.45%
Review	6	2.11%
Book	2	0.70%
Editorial	2	0.70%
Note	1	0.35%
Total	**284**	**100.00**

Table 4
Source Type

Source Type	Total Publications (TP)	Percentage (%)
Journal	187	65.85%
Conference Proceeding	60	21.13%
Book	25	8.80%
Book Series	12	4.23%
Retracted	1	0.35%
Total	**284**	**100.00**

A total of 278 articles on entrepreneurship studies in TVET were produced in English (Table 5). It is also this study's primary language of publication (97.54%). Other than that, other languages like Spanish (1.75%), Chinese (0.35%), dan Russian (0.35 %) is also the preferred language in the publication of the study.

Table 5
Languages

Language	Total Publications (TP)*	Percentage (%)
English	278	97.54%
Spanish	5	1.75%
Chinese	1	0.35%
Russian	1	0.35%
Total	**285**	**100.00**

*one document has been prepared in dual languages

Subject Area

Scopus classified the written Scopus of 284 observed publications as belonging to research in 26 different scientific subjects. Table 6 shows that the subject area of social sciences had the most publications (152 articles), followed by business, management, and accounting (102 papers) and engineering (51 papers).

Table 6
Subject Area

Subject Area	Total Publications (TP)	Percentage (%)
Social Sciences	152	53.52%
Business, Management, and Accounting	102	35.92%
Engineering	51	17.96%
Computer Science	49	17.25%
Economics, Econometrics, and Finance	39	13.73%
Arts and Humanities	20	7.04%
Physics and Astronomy	18	6.34%
Psychology	16	5.63%
Mathematics	15	5.28%
Decision Sciences	14	4.93%
Environmental Science	10	3.52%
Materials Science	10	3.52%
Agricultural and Biological Sciences	6	2.11%
Energy	6	2.11%
Medicine	4	1.41%
Earth and Planetary Sciences	3	1.06%
Biochemistry, Genetics, and Molecular Biology	2	0.70%
Multidisciplinary	2	0.70%
Chemical Engineering	1	0.35%
Chemistry	1	0.35%

Publication by Countries

This section analyses the current situation of collaborations and determines the most significant country for entrepreneurship in TVET research. Research on entrepreneurship in TVET has been published by scholars from 56 countries in the Scopus database. The most active countries that made contributions to publications on entrepreneurship in TVET are shown in Table 7. Indonesia was rated first with full publications of 65 documents; China came second with full publications of 55; the United Kingdom placed third in total publications of 23, while Malaysia was ranked fourth with 18 publications. While in terms of total citations, Ireland was rated first with a total citation of 1,111 citations, the UK came in second place (922), followed by the US placed third with a total citation of 350, and in fourth place was Indonesia with a total citation of 230.

Table 7
Top 10 Countries contributed to the publications

Country	TP	NCP	TC	C/P	C/CP	*h*	*g*
Indonesia	65	44	230	3.54	5.23	7	13
China	55	22	104	1.89	4.73	5	9
United Kingdom	23	19	922	40.09	48.53	9	19
Malaysia	18	12	86	4.78	7.17	5	9
United States	16	12	350	21.88	29.17	9	12
India	11	6	71	6.45	11.83	3	6
Finland	7	7	55	7.86	7.86	4	7
Ireland	7	7	1111	158.71	158.71	7	7
Nigeria	7	3	15	2.14	5.00	3	3
South Africa	7	5	32	4.57	6.40	4	5

Notes: TP=total number of publications; NCP=number of cited publications; TC=total citations; C/P=average citations per publication; C/CP=average citations per cited publication; h=h-index; and g=g-index.

Authorship Analysis

This section primarily analyses the current collaboration situation and lists the best authors on entrepreneurship in TVET studies. The current study also identified the authors who published the most papers on entrepreneurship in TVET. Table 8 displays the most productive authors with at least three publications in entrepreneurship in TVET. One of the most significant authors on entrepreneurship in TVET is Henry C., Matlay H., and Wibowo A. They have produced five publications, which is more than any other author. Henry C., who received 635 citations overall, came first, followed by Hill F. (558 citations) and Leitch C. (558 citations).

The h-index is a non-dimensional measure of an author's scholarly influence based on the frequency with which their work has been cited by other scholars in the field (Dissanayake et al., 2022). Based on the table, with the highest h-index (5), Henry C. has published at least five articles that have been cited at least five times among other scholars.

Table 8
Most Productive Authors

Author's Name	**Affiliation**	**Country**	**TP**	**NCP**	**TC**	**C/P**	**C/CP**	***h***	***g***
Henry	Dundalk Institute of Technology	Ireland	5	5	635	127.00	127.00	5	5
Matlay	Global Independent Research	United Kingdom	5	5	146	29.20	29.20	4	5
Wibowo	Universitas Negeri Jakarta	Indonesia	5	4	91	18.20	22.75	3	5
Mukhadis	Universitas Negeri Malang	Indonesia	4	3	7	1.75	2.33	2	2
Tentama	Universitas Ahmad Dahlan	Indonesia	4	4	14	3.50	3.50	2	3
Dardiri	Universitas Negeri Malang	Indonesia	3	2	6	2.00	3.00	2	2
Ferreira	Universidade da Beira Interior	Portugal	3	3	76	25.33	25.33	3	3
Galvão	Centro de Estudos Transdisciplinares para o Desenvolvimento (CETRAD)	Portugal	3	3	85	28.33	28.33	3	3
Hill	Queen's University Belfast	United Kingdom	3	3	558	186.00	186.00	3	3
Leitch	Lancaster University Management School	United Kingdom	3	3	558	186.00	186.00	3	3
Narmaditya	Universitas Negeri Malang	Indonesia	3	3	61	20.33	20.33	2	3
Suswanto	Universitas Negeri Malang	Indonesia	3	2	6	2.00	3.00	2	2
Wu	Jiangxi Science and Technology Normal University	China	3	3	13	4.33	4.33	2	3

Notes: TP=total number of publications; NCP=number of cited publications; TC=total citations; C/P=average citations per publication; C/CP=average citations per cited publication; h=h-index; and g=g-index.

Table 9
Number of Author(s) per document

Author Count	Total Publications (TP)	Percentage (%)
1	69	24.30%
2	90	31.69%
3	50	17.61%
4	44	15.49%
5	17	5.99%
6	5	1.76%
7	4	1.41%
8	3	1.06%
9	1	0.35%
0*	1	0.35%
Total	**1103**	**100.00**

*Conference review document. No author is listed.

Figure 3 below shows the author's strength of collaboration on the network visualization map via VOSviewer software. The circle's size reflects the volume of articles, the connecting line's color indicates the cluster of collaboration among author, and the text size and thickness indicate the degree of the authors' connection (Deveci, 2022; Mansour et al., 2022). The finding shows that the collaborating authors were categorized into 7 clusters. Cluster 1 contained nine authors (*Agustina Y., Basuki A., Churiyah M., Rahayu W. P, Salahudin A., Santosa H., Wijijayanti T., Winarno A., and Winarnowinarno A.*); Cluster 2 contained seven authors (*Akbar A., Ananda A.F., Imam Agung A., Ma'ruf Idris M., Mukhadis A., Pali M., Purnomo and Sutadji E.*); Cluster 3 contained six authors (*Alfianto I, Kuncoro T., Sudjani, Sugiono, Usman H. and Wibawa A.P*); Cluster 4 contained five authors (*Nurhadi D., Rohman M., Sudjimat D.A, Sugandi R.M, and Syafrudie H. A*); Cluster 5 contained four authors (*Dardiri A., Hasbi H., Mardji M, and Mazarina D.H*); Cluster 6 contained three authors (*Kiranawati T.M, Sukerti N.W, Suswanto H.*); and Cluster 7 contained three authors (*Elmunsyah H., Islami P.A.F., and Muladi*).

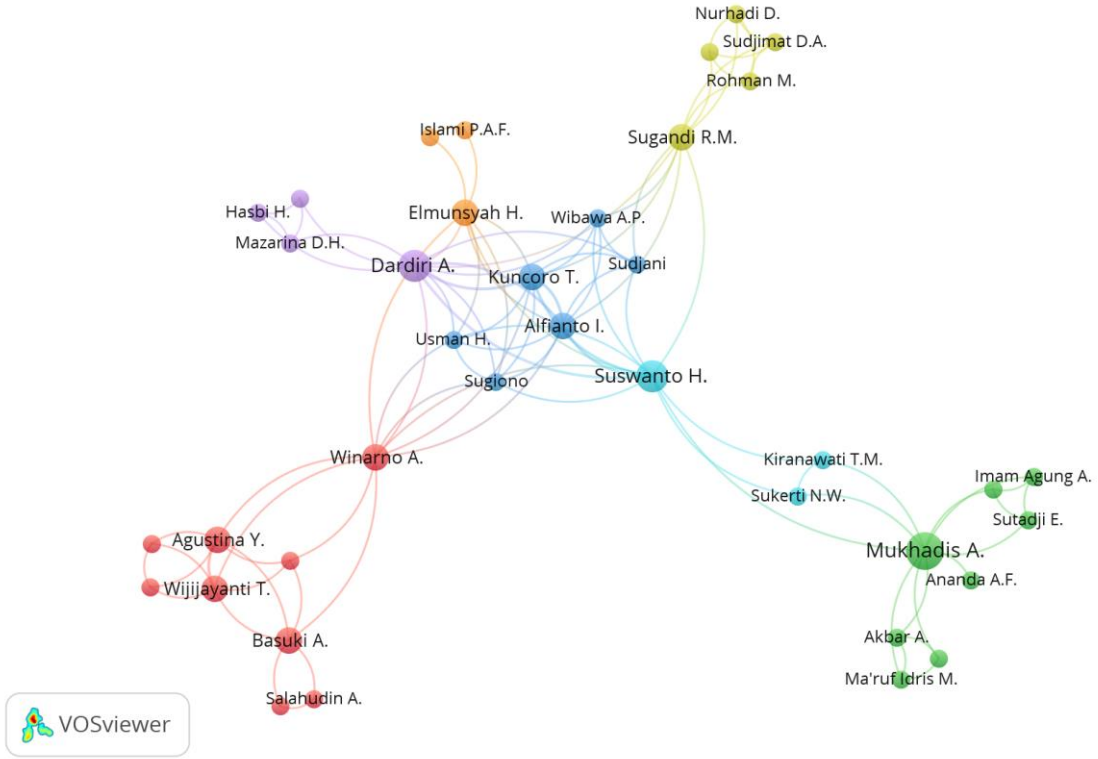

Figure 3
Network visualization map of the co-authorship by authors with at least one document and zero citation of an author

Figure 4 contains the countries with the strength of collaboration on the network visualization map. With a setting of 1 minimum number of documents of a country and 0 minimum number of citations of a country, all 57 countries meet the thresholds dataset. Nine clusters within this network show nine groups that actively collaborate among themselves. Cluster 1 includes six countries (Finland, Italy, Pakistan, Russian, Saudi Arabia, and South Korea); Cluster 2 includes four countries (Indonesia, Iran, Malaysia, and Oman); Cluster 3 includes four countries (Australia, Bahrain, Denmark, and Sweden); Cluster 4 include three countries (China, Philippine's, and Taiwan); Cluster 5 include three countries (Hungary, Iraq, and Turkey); Cluster 6 include three countries (Brazil, Ghana, and UK); Cluster 7 include three countries (Nigeria, Press, and US); Cluster 8 include two countries (Canada, India) and Cluster 9 include two countries (Ireland, Netherlands). Countries with similar colors shared the same cluster. The size of the circles represents the number of documents per country, and the thickness of the lines depicts the strength of collaboration (Ahmi, 2021).

Most Active Institution

The most influential institution with a minimum of 4 publications is summarized in Table 10. The most active institution in the field was in Indonesia. Universitas Negeri Malang, or State University of Malang at Malang, Indonesia, was the most productive institution and ranked first with 20 publications. However, 7 of the top 8 places in the list of productive universities publishing articles of at least five are pioneered by universities from Indonesia. The only university outside of Indonesia that publishes more than five publications is Universiti Putra Malaysia, also known as Universiti Pertanian Malaysia.

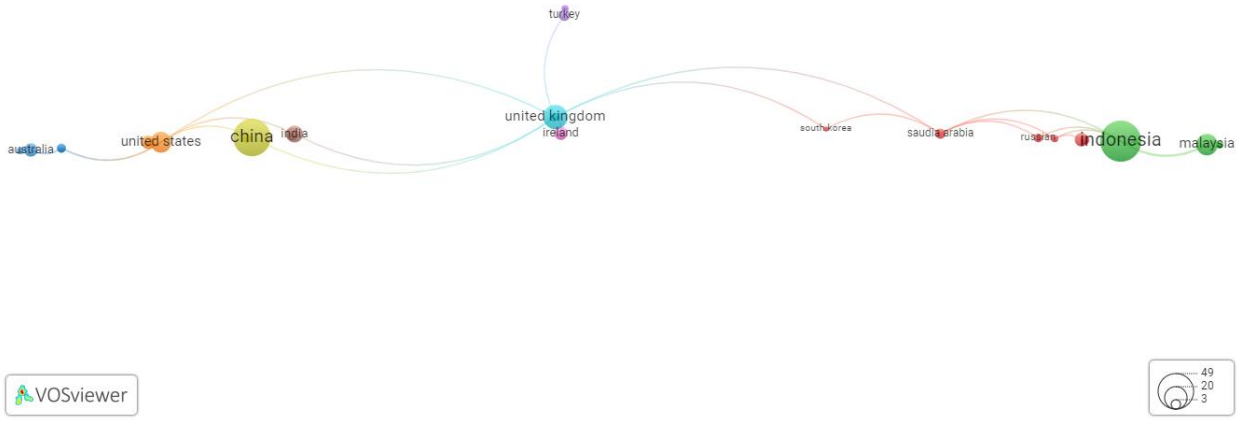

Figure 4. Network visualization map of the co-authorship by countries with at least one document and zero citation of a country

Table 10
Most productive institutions with a minimum of four publications

Affiliation	Country	TP	NCP	TC	C/P	C/CP	*h*	*g*
Universitas Negeri Malang	Indonesia	20	16	90	4.50	5.63	4	8
Universitas Negeri Jakarta	Indonesia	9	7	110	12.22	15.71	4	9
Universitas Negeri Semarang	Indonesia	7	5	14	2.00	2.80	2	3
Universiti Putra Malaysia	Malaysia	6	5	52	8.67	10.40	2	6
Universitas Pendidikan Indonesia	Indonesia	6	4	17	2.83	4.25	2	4
Universitas Negeri Yogyakarta	Indonesia	5	4	7	1.40	1.75	2	2
Universitas Ahmad Dahlan	Indonesia	5	5	15	3.00	3.00	2	3
Universitas Negeri Makassar	Indonesia	5	3	10	2.00	3.33	2	3
University of Trás-os-Montes and Alto Douro	Portugal	4	4	101	25.25	25.25	4	4
Dundalk Institute of Technology	Ireland	4	4	480	120.00	120.00	4	4
Universiti Teknologi Malaysia	Malaysia	4	1	1	0.25	1.00	1	1
Queen's University Belfast	Ireland	4	4	566	141.50	141.50	4	4
Jiangxi Science and Technology Normal University	China	4	3	13	3.25	4.33	2	3
Centro de Estudos Transdisciplinares para o Desenvolvimento CETRAD	Portugal	4	4	101	25.25	25.25	4	4

Notes: TP=total number of publications; NCP=number of cited publications; TC=total citations; C/P=average citations per publication; C/CP=average citations per cited publication; h=h-index; and g=g-index.

Keyword Analysis

From frequency analysis via Microsoft Excel, the top author's keywords with a minimum of 10 publications were listed in Table 11 below. It shows that the keyword "entrepreneurship education" is the most frequently used among authors in entrepreneurship in TVET research, with a total of 53 publications. It follows with the keyword "entrepreneurship" with 51 publications and "students" with 47 publications.

Table 11
Top author's keywords with a minimum of 10 publication

Author Keywords	Total Publications (TP)	Percentage (%)
Entrepreneurship Education	53	18.66%
Entrepreneurship	51	17.96%
Students	47	16.55%
Education	29	10.21%
Higher Vocational Colleges	29	10.21%
Vocational Education	25	8.80%
Training	24	8.45%
Entrepreneurial Intention	23	8.10%
Entrepreneurial Education	14	4.93%
Surveys	14	4.93%
Innovation And Entrepreneurship	13	4.58%
Apprentices	12	4.23%
Teaching	11	3.87%
Innovation	10	3.52%

When two keywords occur in the article simultaneously, this is known as co-occurring keywords, indicating a relationship between the two concepts (Ahmi, 2021; Mansour et al., 2022). Therefore, the co-occurrence of author's keyword analysis is needed for mapping research keywords in the studies and tracing the studies' development (Sedighi, 2016). Thesaurus files were used to clean up and harmonize all the author's keywords that were repeating in the excel file (Ahmi, 2021). With setting five minimum number of occurrences of a keyword, 27 keywords meet the thresholds from the 532 keywords in the dataset.

Based on the analysis, 5 clusters of co-occurrences of author's keywords in entrepreneurship in TVET research have been generated. The network and overlay visualization of the author's keywords co-occurrence is shown in Figures 5 and 6 below, respectively. For example, the diagram suggests that entrepreneurial attitude, entrepreneurial intention, entrepreneurial interest, entrepreneurial learning, entrepreneurial self-efficacy, vocational college, and vocational high school, which are colored in red, are closely connected and frequently appear together. From figure 6, the latest co-occurrence author's keyword that occurred in entrepreneurship in TVET studies recently is referred to in yellow color which is "economic and social effect," "higher vocational college," "teaching methods," entrepreneurial self-efficacy, "college students" and "vocational college."

The most popular theme involving the topic of the study among scholars can be analyzed from the co-occurrence analysis of the keywords obtained from the Scopus database (Ahmi, 2021). The themes were revealed by using the co-occurrence analysis available in VIOSviewer. The keywords were sorted first by cluster and then by total link strength for each subject according to how often they appear in each cluster. The number of articles with two or more keyword combinations is referred to as the total link strength (see Table 15 in the Appendix).

The keyword "entrepreneurship education" is the highest occurrence (65) in the "Entrepreneurial Needs" theme, which is referred to as Cluster 1 with the red color circle. Circles in the same color cluster suggest a similar topic among the publications (Zakaria et al., 2021). As aforementioned, the "Entrepreneurial Needs" cluster includes business,

competence, education, entrepreneurial mindset, entrepreneurial skills, entrepreneurial training, entrepreneurship, and training. In this cluster, it contains a higher citation impact.

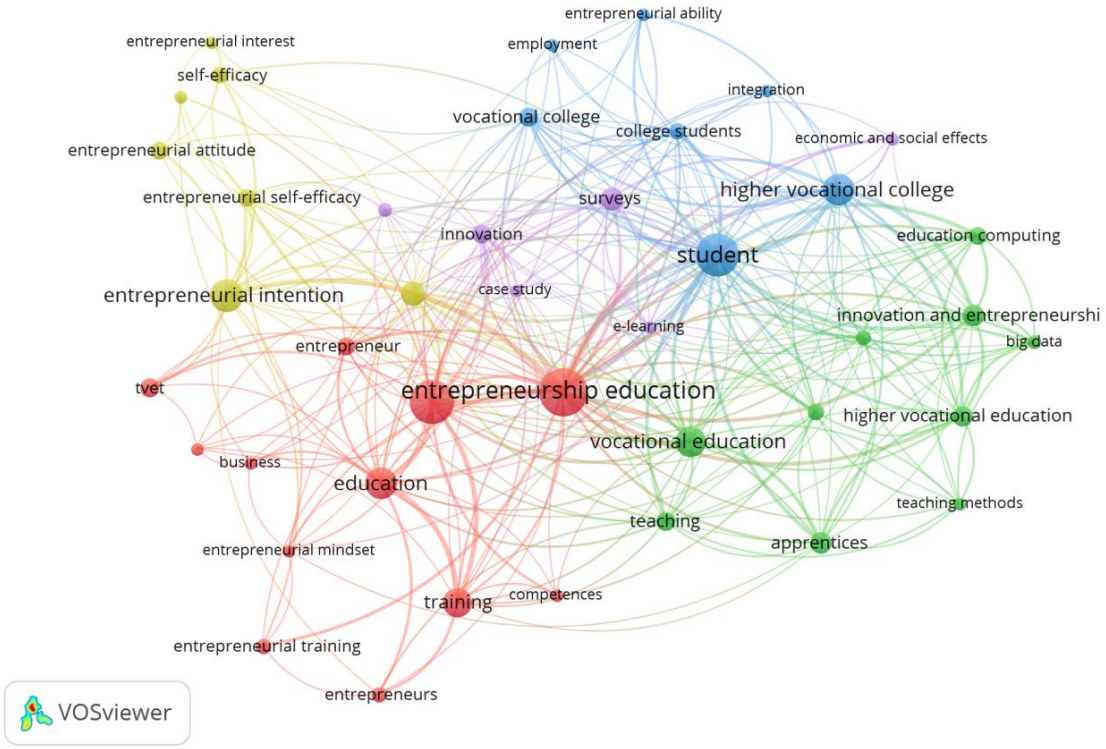

Figure 5. Network visualization of the co-occurrence author's keywords

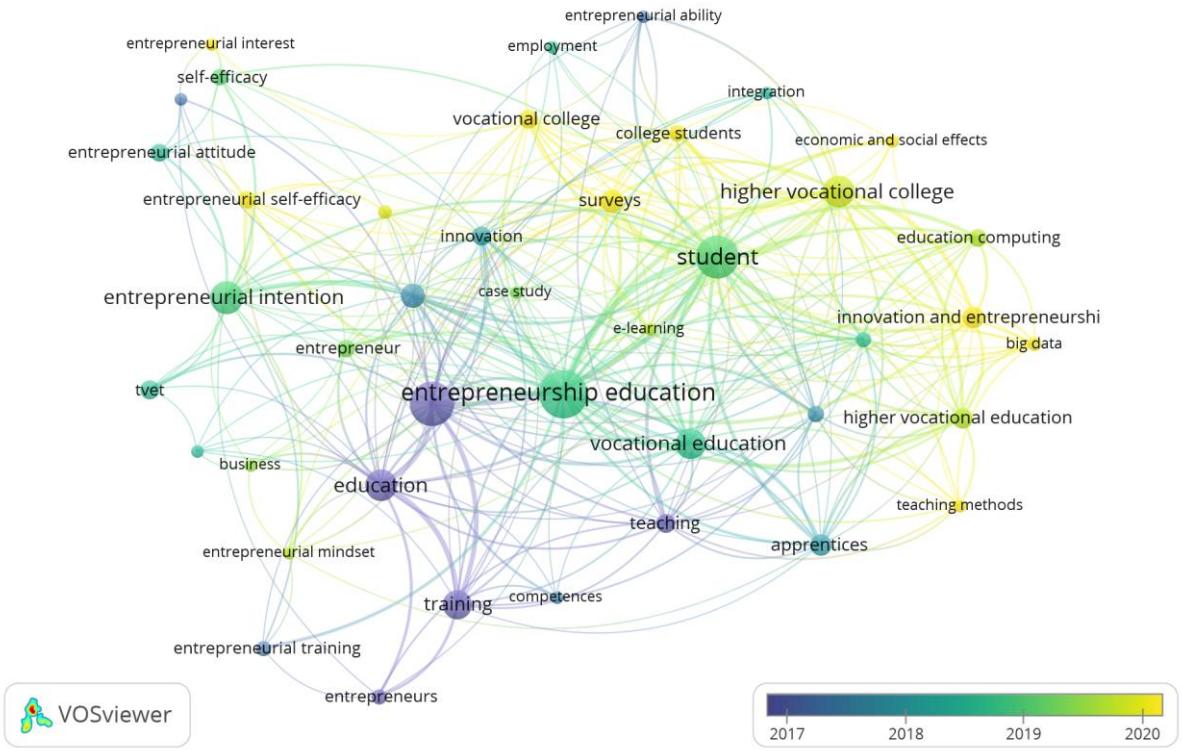

Figure 6. Overlay visualization of the co-occurrence author's keywords

The primary word for the green cluster "Entrepreneurial Implement" is "vocational education," with 25 occurrences in all publications studies. There are another ten words in this theme: curriculum, computing, engineering education, innovation and entrepreneurship, teaching and teaching methods.

Cluster 3 is named the "Entrepreneurial Involvement" theme (blue color). The highest occurrence keyword in this cluster is "student," with 51 third-highest occurrences and the highest total link strength (174) among all the 42 keywords in these publications that have been harmonized. The other keywords included in this blue cluster are "college students," "higher vocational college," "integration," and "vocational college."

The theme named "Entrepreneurial Attributes," referred to as cluster 4 (yellow), showed that "entrepreneurial intention" is the main keyword in the cluster with 30 repetitions and 51 total link strengths. Followed by "entrepreneurial self-efficacy" (17), "entrepreneurial attitude" (9), "entrepreneurial interest" (5), and "entrepreneurial learning" (5).

Findings show that the smallest cluster, 5 in purple color referred to as the "Entrepreneurial Improvement" theme consists of 5 keywords (case study, e-learning, economic and social effects, innovation, and surveys). The most occurrence keyword in this cluster is "surveys," with 14 occurrences in this publication.

ENTREPRENEURIAL

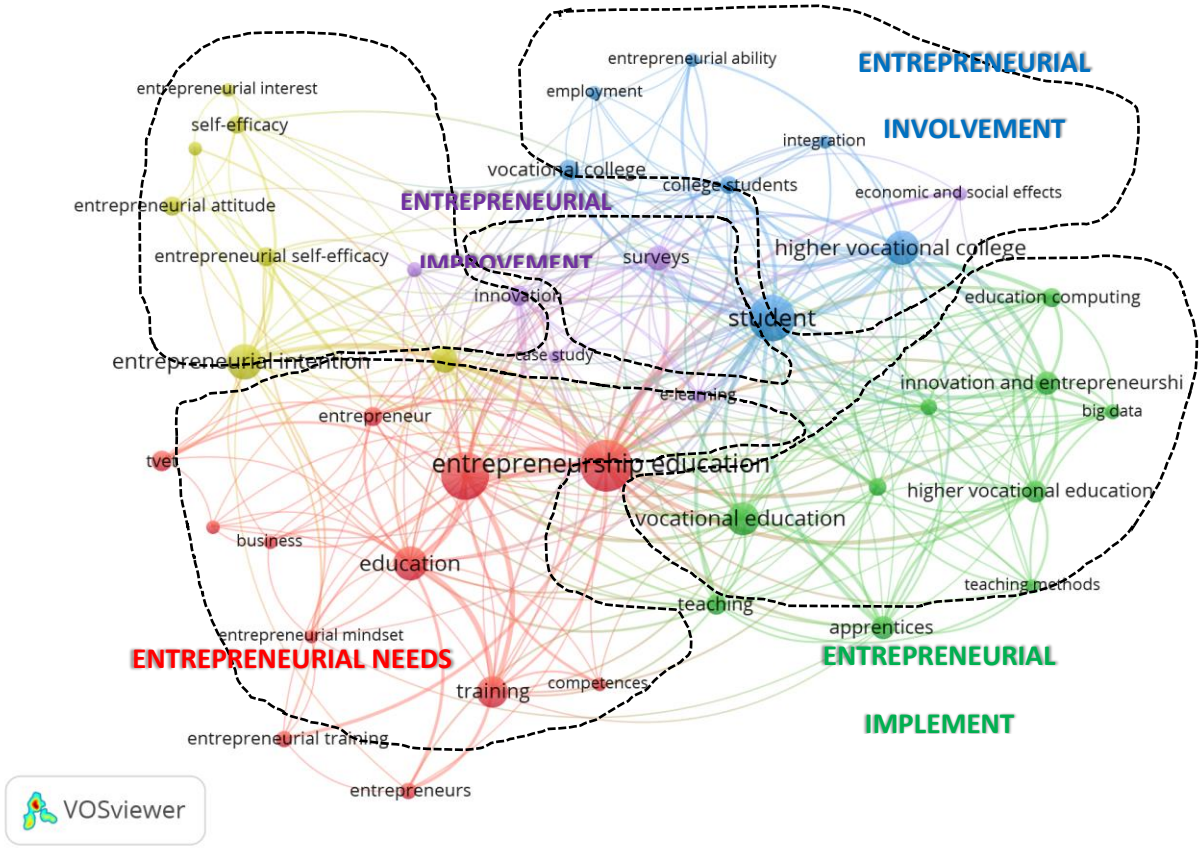

Figure 7. Themes of research based on author's keyword

Citation Analysis

In citation analysis, the citation metrics retrieved on 27 January 2023 for 42 years (1981 – 2023) are generated in Table 12. It shows that during the period, 3,609 citations were cited for 284 published articles, with an average of 85.93 citations per year.

Table 13 displays the total number of citations and the average number of citations per year for the ten highest-cited articles retrieved from the Scopus database. According to Scopus data, the ten articles have been cited the most over 42 years. The article entitled "Entrepreneurship education and training: Can entrepreneurship be taught? Part I" by Henry et al. (2005a) has so far received the highest total of citations (387 citations or an average of 21.5 citations per year), followed by "Entrepreneurship Education and Training Programmes: A Review and Evaluation - Part 1" by Garavan and O'Cinneide with 366 citations or an average of 12.62 citations per year and "Entrepreneurial characteristics amongst university students: Some insights for entrepreneurship education and training in Turkey" by Gürol and Atsan with 270 citations or an average of 15.88 citations per year.

Table 12
Citations metrics

Metrics	**Data**
Reference date	27/1/2023
Publication years	1981-2023
Citation years	42
Total number of papers	284
Total citations	3609
Citations per Year	85.93
Citations per Paper	12.71
Citations per Author	1867.66
Papers per Author	146.95
Authors per Paper	2.64
Hirsh *h*-index	26
Egghe *g*-index	56

Table 13
Top 10 highly cited articles

No.	Authors	Title	Cites	Cites per Year
1	Henry et al (2005a)	Entrepreneurship education and training: Can entrepreneurship be taught? Part I	387	21.5
2	Garavanand O'Cinneide (1994)	Entrepreneurship Education and Training Programmes: A Review and Evaluation - Part 1	366	12.62
3	Güroland Atsan (2006)	Entrepreneurial characteristics amongst university students: Some insights for entrepreneurship education and training in Turkey	270	15.88
4	Hynes (1996)	Entrepreneurship education and training - introducing entrepreneurship into non-business disciplines	171	6.33
5	Henry et al (2005b)	Entrepreneurship education and training: Can entrepreneurship be taught? Part II	155	8.61
6	Dana (2001)	The education and training of entrepreneurs in Asia	150	6.82
7	Nabiand Holden (2008)	Graduate entrepreneurship: Intentions, education, and training	127	8.47
8	Ibrahimand Soufani (2002)	Entrepreneurship education and training in Canada: A critical assessment	96	4.57
9	Garavanand O'Cinneide (1994)	Entrepreneurship Education and Training Programmes: A Review and Evaluation Part 2	94	3.24
10	Dehghanpour Farashah (2013)	The process of impact of entrepreneurship education and training on entrepreneurship perception and intention: Study of the educational system of Iran	85	8.5

Publication by Source Title

Table 14 provides information on top source titles that published five or more articles on entrepreneurship in TVET. In terms of the number of articles per source title on entrepreneurship in TVET, findings indicate that the most productive source title was the journal of "Education and Training" with 17 publications and 850 citations, followed by "AIP Conference Proceedings" with 11 publications and seven citations. This finding is consistent with the study of Tiberiusand Weyland (2023), which also found that the most productive journal for producing entrepreneurial education articles was the Journal Education And Training. The most active journal publishing articles on entrepreneurship in Malaysia in TVET is the Journal of Technical Education And Training by Tun Hussein Onn University of Malaysia (UTHM).

Table 14
Most active source titles

Source Title	TP	TC	Publisher	Cite Score	SJR 2021	SNIP 2021
Education And Training	17	850	Emerald Publishing	4.8	0.614	1.578
AIP Conference Proceedings	11	7	American Institute of Physics (AIP)	0.8	0.189	0.262
Journal Of Physics Conference Series	7	644	IOP Publishing	0.8	0.21	0.395
Journal Of Technical Education And Training	7	6	UTHM	1.6	0.228	0.63
Frontiers In Psychology	6	32	Frontiers Merda S. A	4	0.873	1.605
International Journal Of Innovation Creativity And Change	6	40	Primrose Hall Publishing Group	0.5	0.225	0.349
IOP Conference Series Materials Science And Engineering	6	4	IOP Publishing	1.1	0.249	0.344
Journal Of Small Business And Enterprise Development	6	7	Emerald Publishing	5.4	0.731	1.474
ACM International Conference Proceeding Series	5	98	Association for Computing Machinery (ACM)	1	0.232	0.31
Industry And Higher Education	5	0	SAGE	2.3	0.404	1.037
Journal Of Entrepreneurship Education	5	48	Allied Business Academies	N/A	N/A	1.225

Notes: TP=total number of publications; TC=total citations; CiteScore = average citations received per document published in the source title; SJR = SCImago Journal Rank measures weighted citations received by the source title; SNIP = source normalized impact per paper measures actual citations received relative to citations expected for the source title's subject field.

Discussion and Conclusion

Bibliometric is a process in which we measure the properties (biographic data of the documents) of the collection documents (Ahmi, 2021), and this study referred to entrepreneurship in TVET documents. Most of the documents produced in this study are in English. Data taken on 27 January 2023 over the 42 years retrieved a total of 284 and 3609 articles and citations, respectively. It makes the citation per year 85.93, citation for each article 12.71, articles per author 146.95, and authors per article 2.64. Through this bibliometric analysis process, 5 study questions were answered.

Research Question 1

The development of the publication of entrepreneurial studies in TVET, which began in 1981, increased dynamically and consistently after 33 years. Most of these study articles are published in the Journal of Education and Training. Although the publication collapsed in the

second phase, it increased rapidly. This situation illustrates that entrepreneurship in TVET study is still relevant and growing. It is in line with the initiative of the United Nations agency, UNESCO-UNEVOC, which fosters entrepreneurship among youth worldwide as a strategy to be applied in TVET. UNESCO-UNEVOC believes that entrepreneurial learning offers a practical and effective means to develop the transferable skills needed in this changing world. Leaders and practitioners of TVET institutions can play an important role (Lindner, 2020).

Research Question 2

Overall, Indonesia dominates this entrepreneurship in TVET studies. This can be seen from the RQ2 results that showed the most productive country and institution producing publications is the State University of Malang, Indonesia. Although the most productive author is from Ireland, frequency analysis in Excel via co-authorship analysis in VOSviewer, showed that most of the collaboration among authors was pioneered by Indonesia. Co-authorship reflects research collaboration between institutions, authors, and countries in an adequate manner. Several recent papers have shown that collaboration has a measurable influence on citation behavior (Glänzel & Schubert, 2005). However, internationally co-authored papers were twice as heavily cited as papers compared in a single country (Narin et al., 1991). Therefore, international collaboration must frequently have a good impact and phenomenon, especially in high citation impact to those authors, institutions, and countries. This targeting is more important than "global visibility."

Research Question 3

This entrepreneurship in TVET study has diverse topics. Through frequency analysis by Excel of 284 articles, "entrepreneurship education" is the most favorite topic among authors in this study. The highest keyword citation of each cluster is referenced as a cluster theme (Sedighi, 2016). The resulting cluster theme covers “entrepreneurship education” (needs), “vocational education” (implement), “student” (involvement), “entrepreneurial intention" (attributes), and "surveys" (improvement).

Entrepreneurship education can equip students with the knowledge, skills, and competencies they need to translate it into a necessary entrepreneurial exploration (Otache, 2019). Vocational education, part of the TVET education system, is the implementer in ensuring that entrepreneurship can be applied, as emphasized by UNESCO-UNIVOC. The application of entrepreneurship in TVET requires the involvement of students of various levels, such as secondary schools, post-secondary and tertiary levels (Lindner, 2020).

According to Galvão et al (2018), entrepreneurial education is fundamental in developing students' entrepreneurial intentions. Entrepreneurial intention is one of the key points from the 6 points outlined by Ibrahim et al (2022) in need to review existing TVET education strategies and approaches. Apart from entrepreneurial intentions, which are considered one of the attributes of entrepreneurship (Aamir et al., 2019), it is also supported by other attributes, such as self-efficacy, attitude, interest, and learning, among the keywords in this cluster. In order to improve the implementation of entrepreneurship in TVET, activities such as survey studies, case studies, and various forms of study are indispensable.

Research Questions 4 and 5

The authors of the three most influential articles are from Ireland and Turkey, while the UK and US pioneer all the publishers of journals and proceedings. However, the country that

pioneered high publication was Indonesia, not on articles that were high citations and favored journals or proceedings.

From all this conclusion, these studies are not decreasing, but still frequently accepted by publishers and keep moving forward for more international collaboration. However, this study does not represent the end of research on this topic. While Scopus is one of the most comprehensive databases that archives all academic research, it does not necessarily include all sources that have been published (Mansour et al., 2022). It is just a small sample of data from a single database Scopus. It suggests additional research for discussion in other databases such as Web of Science, Google Scholar, Dimension, or PubMed. The combination of these various sources of databases will result in more valuable study results.

In addition, this study is limited to the setting of the article title search only. It is because the search's setting through the article's title is more appropriate and closer to the topic of study. However, other options are through the setting of titles and abstracts. This setting is a recommendation for future studies to look deeper into this study. It is because this setting also requires initial data screening, which involves the process of filtering and harmonizing the data.

References

Aamir, S., Atsan, N. F., & Erdem, A. F. (2019). A review of entrepreneurship education research in the special issues of Education + Training journal. *Education + Training, 61*(9), 1078-1099. doi:10.1108/et-02-2019-0027

Ahmi, A. (2021). *Bibliometric Analysis for Beginners: A starter guide to begin with a bibliometric study using Scopus dataset and tools such as Microsoft Excel, Harzing's Publish or Perish and VOSviewer software*(pp. 180). Retrieved from https://play.google.com/books/reader?id=kZ9BEAAAQBAJ&pg=GBS.PR5&hl=en

Aparicio, G., Iturralde, T., & Maseda, A. (2019). Conceptual structure and perspectives on entrepreneurship education research: A bibliometric review. *European Research on Management and Business Economics, 25*(3), 105-113. doi:10.1016/j.iedeen.2019.04.003

Brannam, D. L. (1981). CETA and Vocational Education Cooperate to Implement Entrepreneurship at the Local Level. *Journal of Career Development, 8*(2), 127-134. doi:10.1177/089484538100800207

Castro, M. P., & Zermeño, M. G. G. (2021). Identifying Entrepreneurial Interest and Skills among University Students. *Sustainability, 13*(13). doi:10.3390/su13136995

Dana, L. P. (2001). The education and training of entrepreneurs in Asia. *Education + Training, 43*(8/9), 405-416. doi:10.1108/EUM0000000006486

Dehghanpour Farashah, A. (2013). The process of impact of entrepreneurship education and training on entrepreneurship perception and intention. *Education + Training, 55*(8/9), 868-885. doi:10.1108/ET-04-2013-0053

Deveci, I. (2022). Review of entrepreneurship education literature in educational contexts: Bibliometric analysis. *Participatory Educational Research, 9*(1), 214-232. doi:10.17275/per.22.12.9.1

Dissanayake, H., Iddagoda, A., & Popescu, C. (2022). Entrepreneurial Education at Universities: A Bibliometric Analysis. *Administrative Sciences, 12*(4), 185. doi:10.3390/admsci12040185

Fejes, A., Nylund, M., & Wallin, J. (2019). How do teachers interpret and transform entrepreneurship education? *Journal of Curriculum Studies, 51*(4), 554-566. doi:10.1080/00220272.2018.1488998

Fellnhofer, K. (2019). Toward a taxonomy of entrepreneurship education research literature: A bibliometric mapping and visualization. *Educational Research Review, 27*, 28-55. doi:10.1016/j.edurev.2018.10.002

Galvao, A., Marques, C. S., & Marques, C. P. (2018). Antecedents of entrepreneurial intentions among students in vocational training programmes. *Education + Training, 60*(7/8), 719-734. doi:10.1108/et-03-2017-0034

Gamede, B. T., & Uleanya, C. (2017). The role of entrepreneurship education in secondary schools at Further Education and Training phase. *Academy of Entrepreneurship Journal, 23*(2), 1-12.

Gamede, B. T., & Uleanya, C. (2019). Impact of entrepreneurship education on business organisations. *Journal of Entrepreneurship Education, 22*(2).

Ganefri, Hidayat, H., Kusumaningrum, I., & Mardin, A. (2017). Needs analysis of entrepreneurships pedagogy of technology and vocational education with production base learning approach in higher education. *International Journal on Advanced Science, Engineering and Information Technology, 7*(5), 1701-1707. doi:10.18517/ijaseit.7.5.1510

Garavan, T. N., & O'Cinneide, B. (1994). Entrepreneurship Education and Training Programmes. *Journal of European Industrial Training, 18*(8), 3-12. doi:10.1108/03090599410068024

Gillani, S. M. A. H., Senin, A. B. A., Jurgen, B., Muniba, & Gillani, S. M. A. H. (2022). Bibliometric Analysis of Digital Entrepreneurial Education and Student Intention; Reviewed and Analyzed by VOSViewer from Google Scholar. *International Journal of Interactive Mobile Technologies (iJIM), 16*(13), pp. 48-65. doi:10.3991/ijim.v16i13.30619

Glänzel, W., & Schubert, A. (2005). Analysing scientific networks through co-authorship. In H. F. Moed, W. Glänzel, & U. Schmoch (Eds.), *Handbook of quantitative science and technology research: The use of publication and patent statistics in studies of S&T systems* (pp. 257-276). Switzerland: Springer, Dordrecht.

Gurol, Y., & Atsan, N. (2006). Entrepreneurial characteristics amongst university students. *Education + Training, 48*(1), 25-38. doi:10.1108/00400910610645716

Haibin, W., Meidonz, J., Liyan, W., & Yongping, S. (2020). *The Bibliometrics and Visualization Analysis the Literature of Innovation and Entrepreneurship Education Based on Internet plus in China.* Paper presented at the 5th International Conference on Information Science, Computer Technology and Transportation, ISCTT 2020.

Henry, C., Hill, F., & Leitch, C. (2005a). Entrepreneurship education and training: can entrepreneurship be taught? Part I. *Education + Training, 47*(2), 98-111. doi:10.1108/00400910510586524

Henry, C., Hill, F., & Leitch, C. (2005b). Entrepreneurship education and training: can entrepreneurship be taught? Part II. *Education + Training, 47*(3), 158-169. doi:10.1108/00400910510592211

Hynes, B. (1996). Entrepreneurship education and training - introducing entrepreneurship into non-business disciplines. *Journal of European Industrial Training, 20*(8), 10-17. doi:10.1108/03090599610128836

Ibrahim, A. B., & Soufani, K. (2002). Entrepreneurship education and training in Canada: a critical assessment. *Education + Training, 44*(8/9), 421-430. doi:10.1108/00400910210449268

Ismail, M. Z., & Ahmad, S. Z. (2013). Entrepreneurship education: an insight from Malaysian polytechnics. *Journal of Chinese Entrepreneurship, 5*(2), 144-160. doi:10.1108/JCE-02-2013-0003

KPT, K. P. T. M. (2016). *Pelan Tindakan Keusahawanan Institusi Pendidikan Tinggi 2016-2020*. Putrajaya: Kementerian Pendidikan Tinggi Retrieved from http://www.pnc.upm.edu.my/upload/dokumen/menul320171013112713Pelan_Tindakan_Keusahawanan_IPT_20162020.pdf

Krpalek, P., & Krelova, K. K. (2016). Possibilities for Developing Business Potential in Economic Education. Examples of Implementation in Slovakia and the Czech Republic. *Economics & Sociology, 9*(4), 119-133. doi:10.14254/2071-789x.2016/9-4/7

Kumara, P. A. P. S. (2012). Undergraduates' Intention Towards Entrepreneurship : Empirical Evidence From Sri Lanka. *Journal of Enterprising Culture, 20*(01), 105-118. doi:10.1142/s0218495812500057

Lindner, J. (2020). *Entrepreneurial learning for TVET institutions: A practical guide*: UNESCO Publishing.

Mack, A. J., White, D., & Senghor, O. (2021). The benefits of exposing post-secondary students to entrepreneurship training in Trinidad and Tobago. *Humanities and Social Sciences Communications, 8*(1). doi:10.1057/s41599-021-00905-8

Mansour, A. Z., Ahmi, A., Popoola, O. M. J., & Znaimat, A. (2022). Discovering the global landscape of fraud detection studies: a bibliometric review. *Journal of Financial Crime, 29*(2), 701-720. doi:10.1108/JFC-03-2021-0052

Mohammed, I., & Mohamed, W. A. B. W. (2017). An analysis of the impact of soft skills on Malaysian technical institutions. *Advanced Science Letters, 23*(9), 8984-8987. doi:10.1166/asl.2017.10008

Nabi, G., & Holden, R. (2008). Graduate entrepreneurship: intentions, education and training. *Education + Training, 50*(7), 545-551. doi:10.1108/00400910810909018

Narin, F., Stevens, K., & Whitlow, E. S. (1991). Scientific co-operation in Europe and the citation of multinationally authored papers. *Scientometrics, 21*, 313-323.

Nyukorong, R. (2018). A proposed entrepreneurship education curriculum framework. *International Journal of Higher Education and Sustainability, 2*(2), 81-101. doi:10.1504/IJHES.2018.096104

Otache, I. (2019). Enhancing the effectiveness of entrepreneurship education: the role of entrepreneurial lecturers. *Education + Training, 61*(7/8), 918-939. doi:10.1108/et-06-2018-0127

Samad, N. A., Ahmad, W. M. R., Sern, L. C., Harun, H., Awang, H., & Noor, M. S. N. F. (2018). Exploring domains and elements for behavioural competency and employability skills. *Journal of Technical Education and Training, 10*(1), 82-90. doi:10.30880/jtet.2018.10.01.007

Sedighi, M. (2016). Application of word co-occurrence analysis method in mapping of the scientific fields (case study: the field of Informetrics). *Library Review, 65*(1/2), 52-64. doi:10.1108/LR-07-2015-0075

Slavinski, T., Todorovic, M., Vukmirovic, V., & Montenegro, A. M. (2020). Women, entrepreneurship and education: Descriptive bibliometric analysis based on scopus

database. *Journal Women's Entrepreneurship and Education, 2020*(3-4), 181-201. doi:10.28934/jwee20.34.pp181-201

Soeharso, S. Y., & Riyanti, B. P. D. (2021). The Intentions To Become Entrepreneurs In Tthe Indonesian Vocational School Graduates. *Academy of Entrepreneurship Journal, 27*(5), 1-5.

Suradi, S., M. Yasin, R., & Rasul, M. S. (2017). Increasing technopreneurs for a developing a nation: The majlis amanah rakyat (MARA) experience. *Journal of Technical Education and Training, 9*(1), 73-86.

Tiberius, V., & Weyland, M. (2023). Entrepreneurship education or entrepreneurship education? A bibliometric analysis. *Journal of Further and Higher Education, 47*(1), 134-149. doi:10.1080/0309877X.2022.2100692

Udomsap, A. D., & Hallinger, P. (2020). A bibliometric review of research on sustainable construction, 1994–2018. *Journal of Cleaner Production, 254*, 120073. doi:10.1016/j.jclepro.2020.120073

Volkmann, C. (2004). Entrepreneurial studies in higher education. *Higher education in Europe, 29*(2), 177-185. doi:10.1080/0379772042000234802

Wilson, K. E., Vyakarnam, S., Volkmann, C., Mariotti, S., & Rabuzzi, D. (2009). *Educating the next wave of entrepreneurs: Unlocking entrepreneurial capabilities to meet the global challenges of the 21st century.* Paper presented at the World Economic Forum: A Report of the Global Education Initiative.

Zakaria, R., Ahmi, A., Ahmad, A. H., & Othman, Z. (2021). Worldwide melatonin research: a bibliometric analysis of the published literature between 2015 and 2019. *Chronobiology International, 38*(1), 27-37. doi:10.1080/07420528.2020.1838534

Zakaria, R., Ahmi, A., Ahmad, A. H., Othman, Z., Azman, K. F., Ab Aziz, C. B., . . . Shafin, N. (2021). Visualising and mapping a decade of literature on honey research: a bibliometric analysis from 2011 to 2020. *Journal of Apicultural Research, 60*(3), 359-368. doi:10.1080/00218839.2021.1898789

Zenner, L., Kothandaraman, K., & Pilz, M. (2017). Entrepreneurship Education at Indian Industrial Training Institutes – A Case Study of the Prescribed, Adopted and Enacted Curriculum in and around Bangalore. *International Journal for Research in Vocational Education and Training, 4*(1), 69-94. doi:10.13152/ijrvet.4.1.4

APPENDIX

Table 15

Keyword List in VOSviewer (after harmonized via thesaurus file)

Keyword	Occurrences	Total Link Strength
entrepreneurship education	65	166
entrepreneurship	54	100
student	51	174
entrepreneurial intention	30	51
education	29	73
higher vocational college	29	98
vocational education	25	72
training	24	55
entrepreneurial self-efficacy	17	38
vocational school	16	46
surveys	14	61

apprentices	13	45
innovation and entrepreneurship	13	56
higher vocational education	12	54
teaching	11	38
vocational college	11	32
innovation	10	33
tvet	10	12
education computing	9	42
entrepreneur	9	23
entrepreneurial attitude	9	10
College students	8	37
curriculum	8	32
engineering education	7	31
entrepreneurial training	7	11
entrepreneurs	7	15
big data	6	27
vocational high school	6	12
business	5	11
case study	5	17
competences	5	9
e-learning	5	21
economic and social effects	5	15
employment	5	7
entrepreneurial ability	5	16
entrepreneurial interest	5	4
entrepreneurial learning	5	7
entrepreneurial mindset	5	13
entrepreneurial skills	5	8
integration	5	12
teaching methods	5	20