A bibliometric analysis on "edu-technopreneurship" topic and chance on its development in language, literature, and literacy fields

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ABSTRACT

The industrial revolution 4.0 era gives a huge challenge for higher education institutions. They are demanded to be able to produce skilled, competent, and creative graduates in competing their skill in regional, national, and international scopes. Edu-technopreneurship is an important issue necessarily conducted by higher education institutions to face this challenge. This study aimed to map a topic on edu-technopreneurship in scopus and a chance of its development in language, literature, and literacy fields. By using keywords of "education", "technology", and "entreprenership" in the scopus page, were found 1,383 documents discussing about these topics. These data were then analyzed quantitatively to see the developmental trend happening. Besides, a bibliometric analysis was conducted using VOS viewer to see the interrelation between documents. The result shows that studies on these topics have been frequently conducted and experiencing improvement significantly by the year. They are often related to economy, technique, technology, and education. However, they do not deal with langauge, literature, and literacy. It indicates that there is a big opportunity and challenge to study the "edu-technopreneurship" in language, literature, and literacy fields in the future.

Introduction

The industrial revolution 4.0 era as followed by the society 5.0 presents huge challenges for Indonesian people. This will result in changes of the human life structures in terms of local/regional/national to global rivalry, comperative to competitive quality, based-natural

resource economic development to human resource, agricultural era to industrial and information era, and so forth.

In general, there are three economic waves, including agriculture, industry, and information (Toffler, 1971). We recently face the fourth wave, that is creative economy in orientation to creative ideas (Shock in Hermawan & Tripriyo, 2016). The key of this change and development of the human civilization is a need of skilled human resouces with high competencies to be able to compete in regional, national, and international level (Ulya et al., 2022).

This becomes a huge challenge for higher education institutions. It is undeniable that the condition of graduates in Indonesia recently deals with a big dilemma since their degree do not give a guarantee to get a job. Beside affected by the number of graduates gradually increasing by the year, the ability of higher education institutions in preparing high competitive graduates is also considered weak. It is in contrary to what is mandated in Undang-Undang 20 Tahun 2003 on Sistem Pendidikan Nasional, education shall be able to develop individuals to build their self potency through learning processes.

The development of an entrepreneur compentence based on education and technology (edu-technopreneurship) on students is one of the strategical steps to build their self potencies, creativities, and soft skills (Pelipa & Marganingsih, 2019; Sánchez, 2013; Sutrisno & Cokro, 2018). The implementation of edu-technopreneurship in learning processes is expected to develop an entrepreneur soul such as confident, independent, enthusiastic, optimistic, leardership, visionary, and so forth. Integrating the entrepreneurship in higher education institutions will create an effective, efficient, flexible and creative learning environment in creating an edupreneur. Moreover, an edupreneur is a leader of a community and has huge responsibilities to organize and create graduates for the improvement of human resources in the future (Tharaney, Vivek; Upadhyaya, 2014).

In the fields of language, literature, and literacy, entrepreneurship is an integral aspect. Hence, preliminary studies indicate that linguistic entrepreneurship is a highly promising area for exploration. This topic encourages students to develop language skills that set them apart in today's global society (De Costa et al., 2016). In this regard, the language and literary competencies taught in academic programs have significant potential for entrepreneurial endeavors (Hilaliyah & Anam, 2017). Such is the significance of the edu-technopreneurship issue that Ikaprobsi, the association of Indonesian Language Education Study Program, has designated entrepreneurship in the Indonesian language and its pedagogy as one of the key graduate profiles of the Indonesian Language Education Study Program (Suwandi et al., 2016).

There are numerous business opportunities within language, literature, and education. They include the development of digital publishing, event management, online media creation, and the establishment of networks or writing communities, among others. According to the Standard Classification of Indonesian Business Fields (KBLI) in 2020, at least three broad business categories are accessible to the language, literature, and education sectors: (1) education; (2) information and communication; (3) arts, entertainment, and recreation (Badan Pusat Statistik, 2020). Each of these categories can be further broken down into more specific subcategories. Furthermore, the potential for entrepreneurial literacy expansion can be based on the creative economy development sectors outlined by the Ministry of Tourism and Creative Economy. According to the official Ministry website, there are 17 subsectors in the creative economy: 1) game development, 2) architecture, 3) interior design, 4) music, 5) visual arts, 6) product design, 7) fashion, 8) culinary arts, 9) film, animation, and video production, 10) photography, 11) visual communication design, 12) television and radio broadcasting, 13) crafts, 14) advertising, 15) performing arts, 16) publishing, and 17) computer applications (Kementerian Pariwisata dan Ekonomi Kreatif, 2020).

These prospects are accessible to students in the Indonesian Language Education (and Literature) Study Program to enhance their entrepreneurial competencies. In this regard, learners in this program possess proficiency in four language (and literary) skills that can serve as their primary assets in developing entrepreneurial literacy. By optimizing these skills, they have the chance to develop literacy optimally through the creation of valuable products and services.

Regarding the initial investigation on the edu-technopreneurship topic, it indicates that this topic has been widely studied. It is a strategical issue that is definitely interesting to be investigated in depth. However, which are the areas directly related to this topic? Are language, literature, and literacy also one of the fields associated with this topic? By a bibliometric study, these two questions become problems discussed in this article.

Method

A qualitative technique using a literature review approach was used to conduct this study (Moleong, 2019). It sought to identify the needs and trends for growing edu-technopreneurship research. In order to gather the information in the form of published papers, the term "education", "technology", and "entrepreneurship" was used in the research database Scopus. The data were obtained from Scopus as many as 1,383 documents. Additionally, the collected data were processed using Microsoft Excel software to provide

pertinent tables and graphs pertaining to the growth of Scopus-based studies of edu-technopreneurship. Additionally, the information was examined bibliometrically using the VOSviewer program to study and illustrate the findings of bibliometric investigations (Leydesdorff & Rafols, 2012).

Results and Discussion

A bibilometric analysis on "edu-technopreneurship" topic in this article is from scopus between 2001 and 2020. Based on the investigation, there are 1,383 documents related to this topic. These documents were obtained from the keywords of "education, technology, entrepreneurship" not "edu-technopreneurship". They are divided into two types, involving 766 journal articles and 617 conference papers.
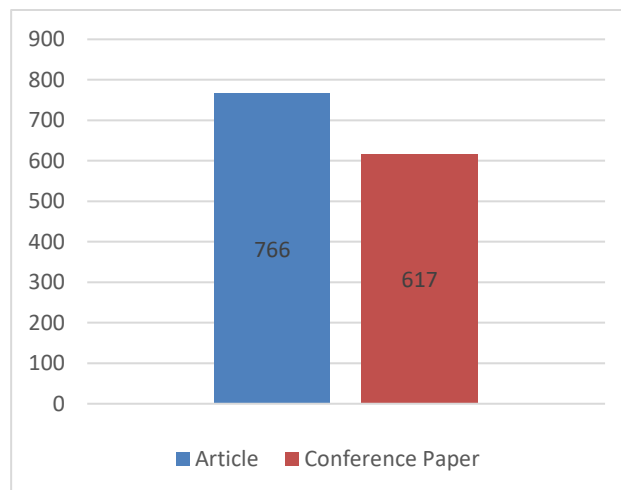

Fig 1. Number and Types of Documents on "Edu-technopreneurship" Topic

Fig 1 shows that the ratio between journal articles and conference papers on the "edu-technopreneurship" topic is nearly equal. Besides, between 2001 and 2020, the trend on studying this topic shows an improvement by the time. It is reflected in the following Fig 2.
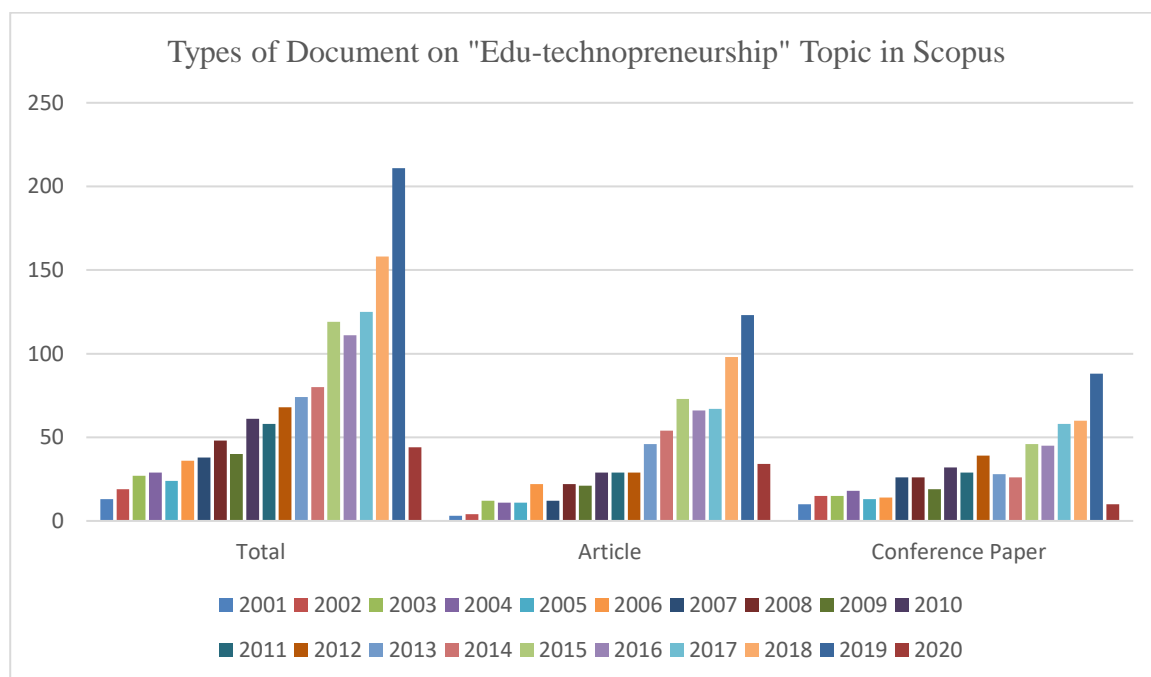
Fig 2. Types of Documents on "Edu-technopreneurship" Topic in Scopus

Fig 2 indicates the gradation of improvement on studying this topic by the year. In 2001, the number of publication was 13 documents. It surely increased into 19 documents in 2002, 27 documents in 2003, and so on, until the peak in 2019 with 211 documents. In 2020, the publication becomes descreasing since they are only counted for several months. The significant improvement happens from 2015 with 119 documents. The upward curve of graph shows that this topic becomes famous frequently investigated by many researchers, apart from being the parts of the dynamics of the time.

The great number of documents published is also directly proportional with the number of citations on the existing documents. The following table 1 shows 20 documents with the greatest number of citations for the "edu-technopreneurship" topic.

Table 1. Most Citation Rankings on "edu-technopreneurship" Topic

No	Name	Title	Year	Type	Citation
1	Garud R., KarnÃ¸e P.,	Bricolage versus breakthrough: Distributed and embedded agency in technology entrepreneurship	2003	Article	779
2	Perkmann M., et.al	Academic engagement and commercialisation: A review of the literature on university-industry relations	2013	Article	744
3	Colombo M.G., Grilli L.,	Founders' human capital and the growth of new technology-based firms: A competence-based view	2005	Article	494

No	Name	Title	Year	Type	Citation
4	Powers J.B., McDougall P.P.,	University start-up formation and technology licensing with firms that go public: A resource-based view of academic entrepreneurship	2005	Article	342
5	Franklin S.J., Wright M., Lockett A.,	Academic and surrogate entrepreneurs in university spin-out companies	2001	Article	279
6	Solomon G.,	An examination of entrepreneurship education in the United States	2007	Article	221
7	Jacob M., Lundqvist M., Hellsmark H.,	Entrepreneurial transformations in the Swedish University system: The case of Chalmers University of Technology	2003	Article	214
8	Ensley M.D., Hmieleski K.M.,	A comparative study of new venture top management team composition, dynamics and performance between university-based and independent start-ups	2005	Article	206
9	Guerrero M., Urbano D.,	The development of an entrepreneurial university	2012	Article	201
10	Audretsch D.B.,	From the entrepreneurial university to the university for the entrepreneurial society	2014	Article	172
11	Clarysse B., Tartari V., Salter A.,	The impact of entrepreneurial capacity, experience and organizational support on academic entrepreneurship	2011	Article	161
12	Van Looy B., et.al.	Entrepreneurial effectiveness of European universities: An empirical assessment of antecedents and trade-offs	2011	Article	156
13	Pérez M.P., Sánchez A.M.,	The development of university spin-offs: Early dynamics of technology transfer and networking	2003	Article	151
14	Wennberg K., Wiklund J., Wright M.,	The effectiveness of university knowledge spillovers: Performance differences between university spinoffs and corporate spinoffs	2011	Article	148
15	Martinelli A., Meyer M., Tunzelmann N.,	Becoming an entrepreneurial university? A case study of knowledge exchange relationships and faculty attitudes in a medium-sized, research-oriented university	2008	Article	136
16	Abreu M., Grinevich V.,	The nature of academic entrepreneurship in the UK: Widening the focus on entrepreneurial activities	2013	Article	135

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No	Name	Title	Year	Type	Citation
17	Fini R., Grimaldi R., Santoni S., Sobrero M.,	Complements or substitutes? the role of universities and local context in supporting the creation of academic spin-offs	2011	Article	133
18	Franke N., LÃ¼thje C.,	Entrepreneurial intentions of business students - A benchmarking study	2004	Article	132
19	Haeussler C., Colyvas J.A.,	Breaking the Ivory Tower: Academic entrepreneurship in the life sciences in UK and Germany	2011	Article	129
20	Perkmann M., King Z., Pavelin S.,	Engaging excellence? Effects of faculty quality on university engagement with industry	2011	Article	126

Considering titles in Table 1, the most issue is the entrepreneurship education in higher education institutions. To see the interrelation between documents, the study then conducted an analysis using VOSviewer application. This application has some strenghts in comparison to other applications, in terms of the ability to identify a combination of noun phrases that are relevant with the topic being mapped and the existence of integrated cluster system to see the interrelation between documents (Waltman in Tupan, 2018). By using VOSviewer, the study obtained a description of interrelation between documents with reference to co-authorship and co-occurance.

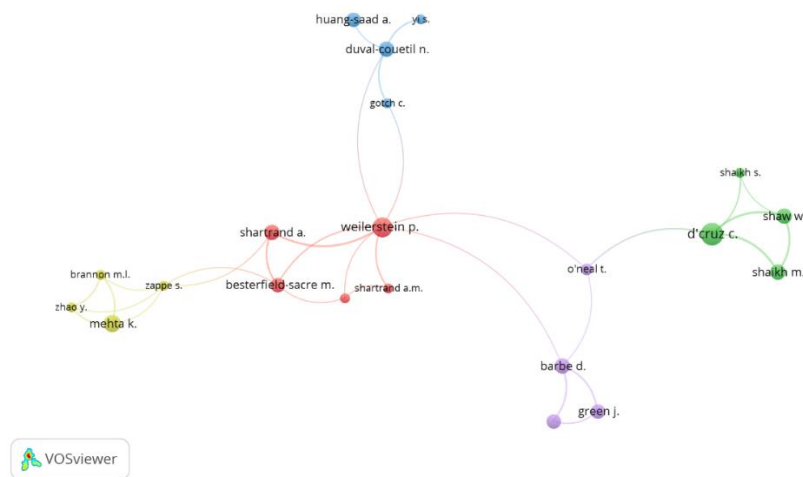Based on the co-authorship category, the study indicates the relation between authors as reflected in Fig 3.

Fig 3. Co-authorship on "Edu-technopreneurship" topic

Fig 3 reflects the relation of co-authorship in two or more documents. There are 3,224 authors who studied this topic amongst 1,383 documents. However, not all authors have relationships with other authors on two or more documents. Hence, the study limited authors

by selecting authors with having involvement of, at least, 2 documents and 1 citation. Then, the study obtained 239 authors with these criteria. After that, the study analyzed the relation between them in terms of co-authorship. The study found that there were 20 authors who has the strongest involvement as reflected in Table 1. There were five clusters with the strongest cluster, including Weilerstein P., Shartrand A., Besterfield-sacre, Shartrand A.M., and Shuman. This group of the author has the strongest network with other authors on this topic.

In fact, there are some groups of the author with the network strenght of 37 with 5 documents and 103 citations. They are Belloti F, Berta R., de Gloria A., Lavagnino E., and Ott M. Nevertheless, they have no records on conducting co-authorship with other authors. Thus, these names do not appear in Fig 3.

In addition, the relation of co-authorship on authors' origin is represented in Fig 4. 3,224 authors who involved in conducting studies on this topic are from 155 countries. The study limited the origin due to the contribution of 30 documents minimally. The study found 31 countries as divided into clusters. Indonesia is in the strongest cluster with United States as the center and followed by other countries with huge population such as China, India, Australia, South Africa, Taiwan, and Canada. The second cluster (blue) includes Great Britain, Greek, Finland, and Belgium. The third cluster (green) involves Germany, Italy, Sweden, Ireland, and Romania. The fourth cluster (yellow) contains Brazil, Netherland, and Spain. The fifth cluster (light blue) is occupied by France and United Arab Emirates. The six cluster (purple) is Russia.
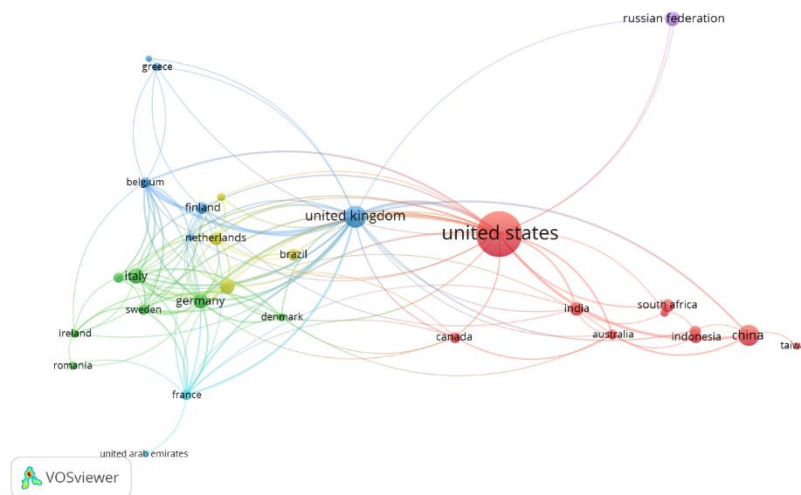

Fig 4. Visualization of Distribution of Country Contributing in "Edu-technopreneurship" Topic

The co-occurance category is a category based on the interrelation of keywords in two or more documents, as represented in Fig 5.
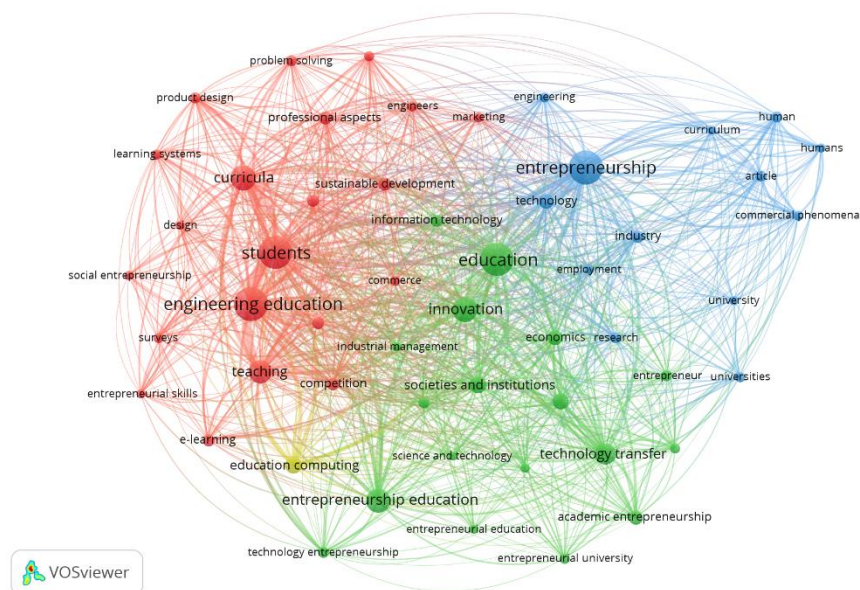
Fig 5. Visualization of Publication Trend Based on Keywords

Based on Figure 5, there are 6,215 keywords amongst 1,383 documents. The study limited the keywords by selecting the keywords used in 30 documents to see the publication trend. It found 53 keywords as reflected in Figure 5. These keywords are divided into 4 cluster. The first cluster, the strongest one, include engineering education (red) with 21 items. The second cluster is occupied by education and innovation (green) with 18 items. The third cluster is entrepreneurship (blue) with 13 items. The last cluster is education computing (yellow) with only 1 item.

Considering the density of these keywords, there are many oppotunities on new topics rarely investigated by other researchers. By using the following desity visualization, the study found which topics are rarely and frequently studied. This visualization allows user to see the most topics frequently studied and the other ones. The bright color or nearly red shows the topics having widely studied while the blue one is otherwise. By considering this visualization, the new topics are easier to be found.

This analysis found 2,775 keywords. With a limitation of 10 keywords on same documents, the analysis obtained 38 keywords. They are divided into 8 clusters based on the relation between keywords. From three keywords (education, technology, and entrepreneurship), entrepreneurship the most dominant one. There are also some keywords with pretty strong cluster, including entrepreneurship education, entrepreneurial intention, education, technology, technology transfer, and higher education
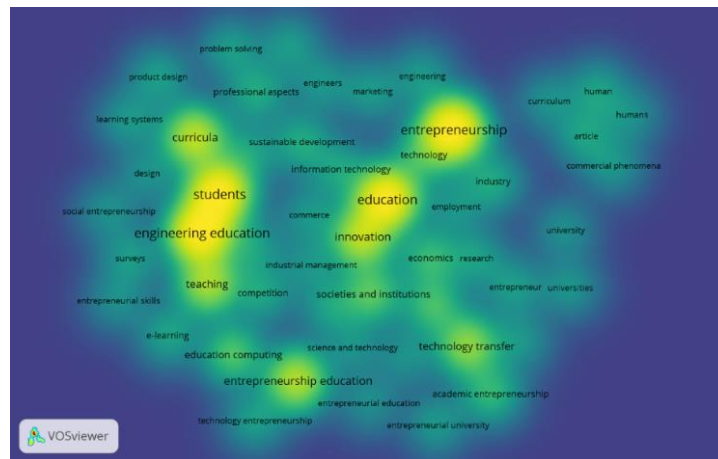
Fig 6a. Density Visualization of "Edu-technopreneurship" Topic

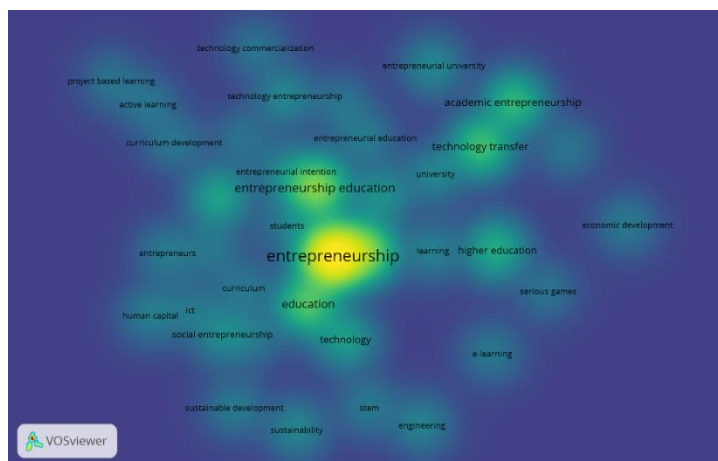Meanwhile, the co-occurance analysis based on author keywords is shown in Figure 6b.

Fig 6b. Density Visualization of "Edu-technopreneurship" Topic

In a consequence, the "edu-technopreneurship" topic is dominated by technique, economy, education, and technology. However, the entrepreneurship education becomes the focus of this study. In the education field, some terms frequently appearing are enterpreneurship education ecosystem (Bhat & Khan, 2014), learning process of social entrepreneurship (Voronkova et al., 2019), mapping of students' entrepreneurial competence (Hasan et al., 2019), education program on entrepreneurship (Matetskaya, 2015), or review on entrepreneurship education in general (Bakar et al., 2015; Deveci & Seikkula-Leino, 2018). From the entrepreneurship education selected, there is one issue that is of great interest to researcher, that is entrepreneurial intention (Al-Jubari et al., 2019; Asghar et al., 2019; Cao & Ngo, 2019; Fatoki, 2019; Khalifa & Dhiaf, 2016; Okręglicka et al., 2017).

Viewed from the education levels, the higher education becomes the first level to be used as the object of the research. It is in line with the keywords found such as university,

entrepreneur university, entrepreneurial university, and higher education. Two issues in relation to the "edu-technopreneurship" topic on higher education levels based on the number of citations are university issue (Ensley & Hmieleski, 2005; Powers & McDougall, 2005; Shah & Pahnke, 2014); and spin-off university issue (Fini et al., 2011; Franklin et al., 2001; Rasmussen & Wright, 2015; Wennberg et al., 2011). Meanwhile, some opinions on learning model, learning evaluation model, entrepreneurial intention are also included in the entrepreneurship education study.

Beside education, other fileds frequently discussed in relation to the "edu-technopreneurship" topic are technique, economy, and technology. The technique field is related to industrial and machine. The economic field is frequently in discussion because the entrepreneurship is included as the economy field. The technology field is in connection to its function as tool to support entrepreneurship.

With respect to entrepreneurship, language (and literature) is mostly used as a means than an object. It indicates that language tends to be a means to execute entrepreneurial activities. It is represented in an article on the role of language in international business (Tenzer et al., 2017), language tools as a means of communication in business (Ribeiro et al., 2015), student's communication ability in inter-cultural communication context for business (Klimova et al., 2019) or language as one of the things needed in the development of entrepreneurial competence (Adejimola, 2008). The only article assuming that language is able to be explored for entrepreneurship is on learning language as linguistic entrepreneurship (De Costa et al., 2016).

Based on the explanation above, there is no disscussion about language, literature, and literacy in connection with the "edu-technopreneurship" topic. It indicates that opportunities on investigating the "edu-technopreneurship" topic in connection to language, literature, and literacy is considered a new thing and rarely conducted by many researchers. There are many business opportunities on language, literature, and literacy fileds, for instance organizing self publishing, event organizer, building writing networks or communities, and so forth. The presentation of entrepreneur midset building-oriented materials need to be conducted in learning process, by not only studying theorie but also implementing them practically. The key of this learning process is more to build entrepreneur soul in students than to create aspiring entrepreneurs in language, literature, and literacy. Henceforth, this edupreneurship is not merely profit oriented, but leads to graduates with edupreneur competence. This edupreneur competence is the distinguishing characteristic that will improve Indonesian language graduates' competence.

Conclusion

Based on the investigation, the study concluded that the "edu-technopreneurship" topic begins to be widely investigated. This topic strategically improves by the year, particualrly in 2000. Between 2001 and 2020, there are 1,383 documents in scopus discussing about this topic. Since 2015, this topic increases significantly. It indicates that there is a need on developing this topic. The "edu-technopreneurship" topic is closely related to economy, technique, technology, and education. However, this topic is rarely found in accordance with language, literature, and literacy. This becomes opportunities as well as challenges for researcer to relate the "edu-technopreneurship" topic with language, literature, and literacy. As opportunities, it is assumed that there are some novelty potentials related to this topic. On another hand, this topic is also give huge challenges due to the absence of literatures to support the exploration on this topic. Nevertheless, the fields of language, literature, and literacy as choices in the development of entrepreneur sector is an interesting issue that need to be stand up optimally.

Declarations

Author contribution	:	Chafit Ulya is responsible for all writing processes. He also led the writing of the manuscript and collaboration with the other author. The second, third, fourth, fifth, and sixth authors contributed to data collection and data analysis
Funding statement	:	This research did not receive any funding.
Conflict of interest	:	All authors declare that they have no competing interests.
Ethics Approval	:	Information on Ethical Consent and informed consent statements are required for all articles published on BAHASTRA since 2023.
Additional Information	:	No additional information is available for this paper.

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