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Scientific developments in educational innovation research in Indonesia and Malaysia: a scientometric review

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ABSTRACT
Educational innovation, in its early days, aims to improve educational quality. Active and experiential learning, as well as authentic assessment, are examples of educational innovation. The goal of high-impact practices is to make education more intentional, coherent, developmental, and transformative. This paper examines the evolution of educational innovation research conducted globally based on the Scopus and WoS database. The parameters considered in this study embrace the growth of publications, suubject areas, source titles, countries, institutions, author and authors' keywords. Another intriguing finding concerns the source title; the Journal of Physics: Conference Series leads 18 publications. In addition, this study indicated that Putra A.B.N.R., of the Universitas Negeri Malang in the Indonesia, is the most active author, having published 6 documents. Other databases, such as PubMed and Google Scholar, can be used to obtain more detailed metadata. Our research contributes to future research trends by providing visualisation and cutting-edge knowledge of educational innovation.

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INTRODUCTION

Education is part of life therefore humans can grow and develop individually and in groups to coexist with each other in managing the world. Education, as a social institution servicing societal demands, is essential for society's survival and growth (Serdyukov, 2017). The world of education faces numerous challenges, including how educational innovations in the Society 5.0 era are able to solve various challenges, issues, and global social problems related to schools, educators, students, education systems, and the social dynamics of education's impact. Society 5.0, as proposed by Japan, is the inevitable future. The decision on what kind of education is needed in Society 5.0 era will differ from country. This decision will probably change the future of each country (Masami, 2021). Educational innovation is the application of an idea that produces planned change in processes, services or products that generate an improvement in the training objectives (Sein-Echaluce et al., 2017).

A large body of research demonstrates that educational investments benefit students in the long run (Chetty et al., 2014; Deming & Walters, 2017; Jackson et al., 2015). However, the role of education in encouraging entrepreneurship and innovation is less well understood (Biasi et al., 2021). Utilizing the development of science and technology has been carried out in various aspects of life, including educational aspects by conducting educational innovations (Efendi et al., 2020). Teachers, for example, must be able to

use and benefit from current technological developments in every learning activity carried out in order to improve students' abilities and skills. Aside from technological skills, one must be able to manipulate these skills into profits of any kind through any means possible. All of these future theories and expectations exist, but one thing hasn't changed–education will continue to be responsible for whatever happens in the future, regardless of technological advances (Fındıkoğlu & İlhan, 2016). However, one of the main problems of educational innovation is that the teachers have no trails or guidelines to plan, measure and spread it. All of those facts lead to difficulties for academic institutions (regional, national and international) to recognize the innovative work (Fidalgo-Blanco et al., 2018). The lack of connection between the political and professional environments, on the one hand, and educational innovation, on the other, does not generate resources for improvement, thereby obstructing reform (Cohen & Ball, 2006).

The desire to innovate and adapt to the unstable environment, as well as the requirement to follow the field's standards, creates a conflict in educational innovation (Tubin, 2009). When a critical mass of people are sufficiently motivated to initiate change, the process of educational innovation begins (De Graaff & Cowdroy, 1997). Every nation's educational system, as a social institution, is critical to the survival and well-being of society's needs. Education should not only be extensive, affordable, and of high quality, but it should also be constantly evolving to meet the demands of a rapidly changing and volatile globalized environment (Fuad et al., 2020). Educational innovation occurs, and the policy frameworks that shape these contexts are viewed as part of the transformation process and are challenged to change (Jacobs, 2000). Planned modifications aimed at improving teaching and learning processes are referred to as educational innovation. These modifications aim to improve learning and teaching by introducing new ways of thinking and acting to educational situations (Moreira et al., 2020).

Malaysia and Indonesia are allies, according to Rumpun Melayu (Othman, 2016). Both of these countries were once colonized by the West (Yazid, 2014). Following their independence, Malaysia and Indonesia rose to develop their own countries by utilizing natural resources and human resources (Kirkpatrick, 2012). Faced with the challenge of 21st-century education, both countries are attempting to change the curriculum in order to increase the number of human resources prepared to face 21st-century challenges (Dube, 2017; Rizal et al., 2019). Comparative studies on Indonesia and Malaysia have been conducted many times. Two examples of works that were found are: education in Islamic's perspective (Hamayotsu, 2002); and in politics issues (Rodan & Hughes, 2014). However, this particular work aims to find the efforts of these two neighbouring countries to maintain their national identities knowledge to bachelor degree students (Irawaty & Sumadi, 2018). It was important to execute improved strategies that would allow them to stand out in terms of technology and innovation, using criteria for good science and technology investment practices to stand out and be generators of educational innovation (Yangari & Inga, 2021).

Despite the importance of educational innovation, there has been little research into scientometrics in this field. As a result, the following research questions are being considered for this study: What are the top source titles, countries, and authors' keywords? This article helps readers, teachers, coaches, athletes, and policymakers in a country improve the quality of education by providing a better understanding of the most recent trends in educational innovation research. This study will look at: (1) popular subject areas, source titles, representative countries, and key institutions in the field of educational innovation research; (2) the author and author's keyword base, as well as trending topics in educational innovation; and (3) how the primary author keyword has evolved over the last few decades in various education innovation fields.

METHODS

The number of publications in any field of study aided in persuading scholars to collect relevant data (Abd Aziz et al., 2021). From a scientometric standpoint, this study employs information framework mapping methods to examine the research situation and organize the current theoretical structure (Abdullah, 2021) in

order to properly understand the patterns of sport and fitness research. It is critical to define the research objectives early on in this review (Abdullah & Abd Aziz, 2021). The ScientoPy software was used to perform the scintometric analysis. ScientoPy is a one-of-a-kind program for analyzing bibliographic documents. It is a Python script that generates a list of the top topics by author, author, and country keywords, as well as related documents (Pabon et al., 2020), and eliminates the possibility of bias in individual studies (Ruiz-Rosero et al., 2017). Throughout this study, scientometric indicators pertaining to publication trends and progressions, topics, source titles, and citations were examined (Li et al., 2016). The scientometric methodology is used to analyze large amounts of bibliographic data ((Martynov et al., 2020). The first step in carrying out a scientometric study is to locate and extract papers on a research-related topic (Malakoutikhah et al., 2021). However, because of the possibility of name similarity, analysis of author names (such as a primary list of authors) may introduce bias into the study. This review's authors acknowledge and caution about possible similarities in the names of the document's authors, which is one of the limitations of bibliometric studies.

Pre-Processing of Data

Determination of the Dataset. The dataset is displayed in this section, along with the tools used to process the data. Because it is the source of information processing, it is critical to define this data as the first step in this process. Next, the search criteria used for the database are displayed based on *TITLE: ("educat* innovat*" OR "educat*" AND "innovat*") AND LIMIT TO (AFFILCOUNTRY "Indonesia" OR "Malaysia")*. On April 7, 2022, retrieval data was obtained. Other, more well-known topics and fields, for example, have large amounts of published data. The conjunction "OR" has also been used to discover articles in which the writers did not utilize the acronym educational innovation in terms that were consistent with the terminology. The total number of documents discovered in the Scopus and WoS databases is shown in Table 1.

Duplicating and simplifying. The total number of documents displayed in the dataset section is almost certainly duplicated. In data pre-processing, Scientopy software can remove all duplicate articles. Another function of pre-processing is to shorten author names. Inconsistency between the author's first and last name is a common issue in published works. ScientoPy can simplify names, accents, and abbreviations through pre-processing. Because name abbreviations or simplifications are common in other topics such as countries, keywords, and institutions.

Table 1 shows a ScientoPy-generated quick pre-processing table. This table describes the input data set, including the number of publications per database after and before the duplicate removal filter in the second column (number) and relative percentages in the third column (percentage) (see table description for detailed information on these percentages). The total number of documents loaded from the Scopus database is represented by the loaded documents. The number of papers omitted by document type is the number of documents that do not meet the default document type filter (including conference papers, articles, reviews, proceedings papers, and printed articles only). After the omitted document is removed, the number of documents in the default document type filter is the paper. The number of papers loaded from Scopus is the total number of documents from each database after deleted documents are removed. The number of discovered and deleted duplicate documents is the number of discovered and deleted duplicate documents. The number of duplicate documents removed from Scopus is equal to the number of documents deleted from each database after duplications have been removed. The total number of documents after double deletion equals the total number of documents after duplicate deletion pre-processing. Finally, the Scopus document represents the total number of documents after duplicates have been removed. The delete-duplication filter in ScientoPy is based on a DOI match or if the DOI is not in the document title and the first author's last name matches.

Table 1. Presents the pre-processing data

Data Retrieval	Number	Percentage
Loaded papers	272	
Omitted papers by document type	13	0,48
Total papers after omitted papers removed	259	
Loaded papers from WoS	98	3,78
Loaded papers from Scopus	161	6,22
Duplicated removal results:		
Duplicated papers found	51	1,97
Removed duplicated papers from WoS	0	0
Removed duplicated papers from Scopus	51	3,17
Duplicated documents with different cited by	24	4,71
Total papers after rem. dupl.	208	
Papers from WoS	98	4,71
Papers from Scopus	110	5,29

Source: (Results of ScientoPy software analysis)

RESULTS AND DISCUSSION

The researcher conducts and presents a process analysis in this section to help the reader understand the current research situation in the field of educational innovation, as well as the expected publication trends that will be useful for future research.

The growth of educational innovation publications

The fluctuating publications for the Scopus and WoS databases are depicted in Figure 1. Scopus has 108 documents, whereas WoS has 98. This encourages researchers to continue investing in ways of thinking and perspectives related to the study of educational innovation, so that thinkers, researchers, and educational practitioners can have an open dialogue. With 28 documents published, 2019 was the most prolific year for publication.

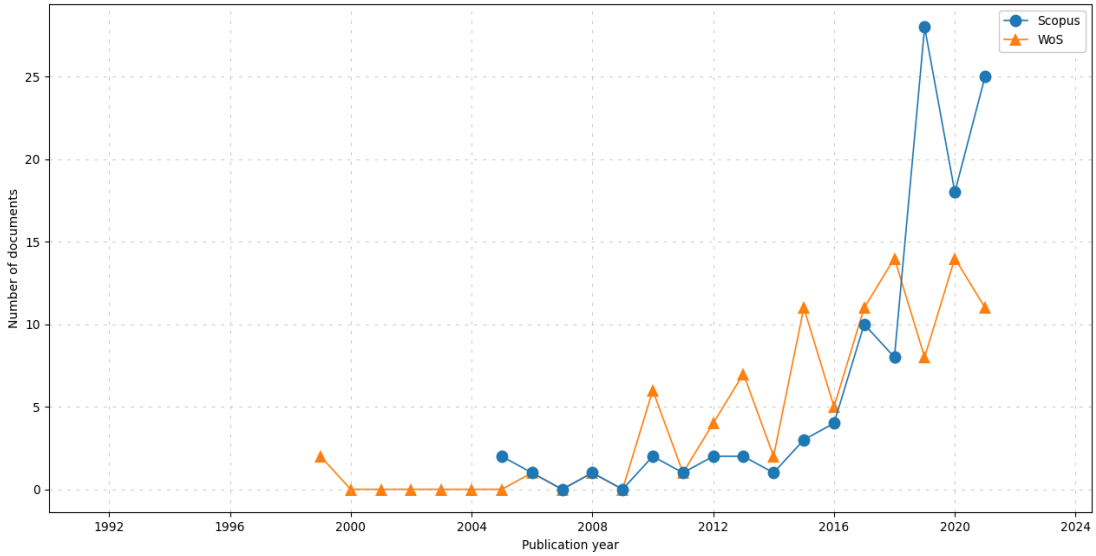

Figure 1. The growth of educational innovation publications in Scopus and WoS databases (Source: Results of ScientoPy software analysis up to April 7, 2022)

Document Type

Figure 2 depicts the various document types that can be traced using ScientoPy. This type of document represents research with a high SJR (Scimago Source Title Rank) and JCR (Journal Citation Rank) (Source title Citation Reports). It is forbidden to publish book chapters, brief surveys, letters, notes, books, editorials, erratums, reports, retracted documents, meeting abstracts, corrections, software reviews, and hardware reviews. However, by modifying the ScientoPy global settings file, we can change the filter for this document type.

Articles are the most tracked document type with a total of 106 publications, with an AGR of 0.5, this indicates that the number of documents published on a topic experiences a positive trend or increasing growth. This means that the type of article document experiences a difference in the average number of documents issued per year with the previous year. Proceedings paper is the second largest type of document with a total of 59 manuscripts. Followed by the third, fourth and fifth types of documents, namely conference presentations with 38 articles, review articles as many as three and book chapters as many as one.

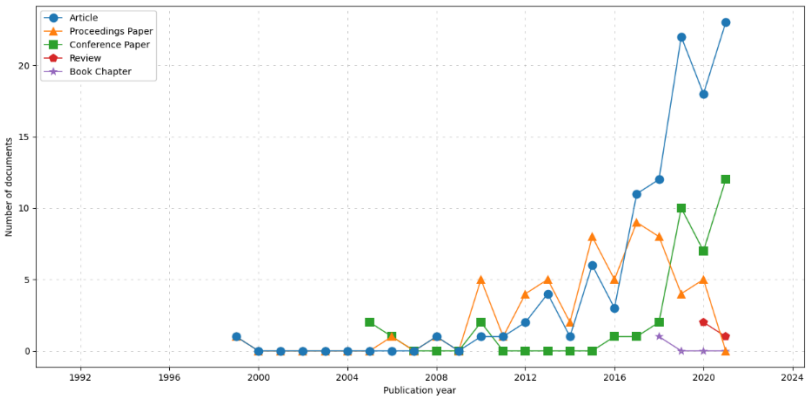

Figure 2. Documents related to educational innovation that have been tracked
(Source: Results of ScientoPy software analysis up to April 7, 2022)

Top 10 subject areas

Top 10 subject areas in educational innovation publications. Education & Educational Research topped the list with 36 documents, with an AGR of -1.5, indicating that the number of documents published on a topic is experiencing a negative trend or declining growth. This means that the Education & Educational Research subject area experiences differences in the average number of documents issued per year with the previous year. Table 10 describes additional topics in the field of educational innovation.

Table 2. Top 10 subject area

Rank	Subject	Total	AGR	ADY	PDLY
1	Education & Educational Research	36	-1.5	2.5	13.9
2	Business & Economics	23	1.0	3.0	26.1
3	Engineering	11	-0.5	0.5	9.1
4	Social Sciences - Other Topics	11	0.0	1.0	18.2
5	Computer Science	10	0.5	1.0	20.0
6	Science & Technology - Other Topics	9	0.0	1.5	33.3
7	Physics	4	-1.0	0.0	0.0
8	Public Administration	4	0.0	0.0	0.0
9	Materials Science	3	0.5	0.5	33.3
10	Dentistry, Oral Surgery & Medicine	2	1.0	1.0	100.0

The most active countries in the publication of articles

A list of countries with the highest number of related publications has been compiled. Figure 3 depicts the top ten countries as ranked by educational innovation publications. Country analysis identifies which countries are actively conducting research on the topic of educational innovation.

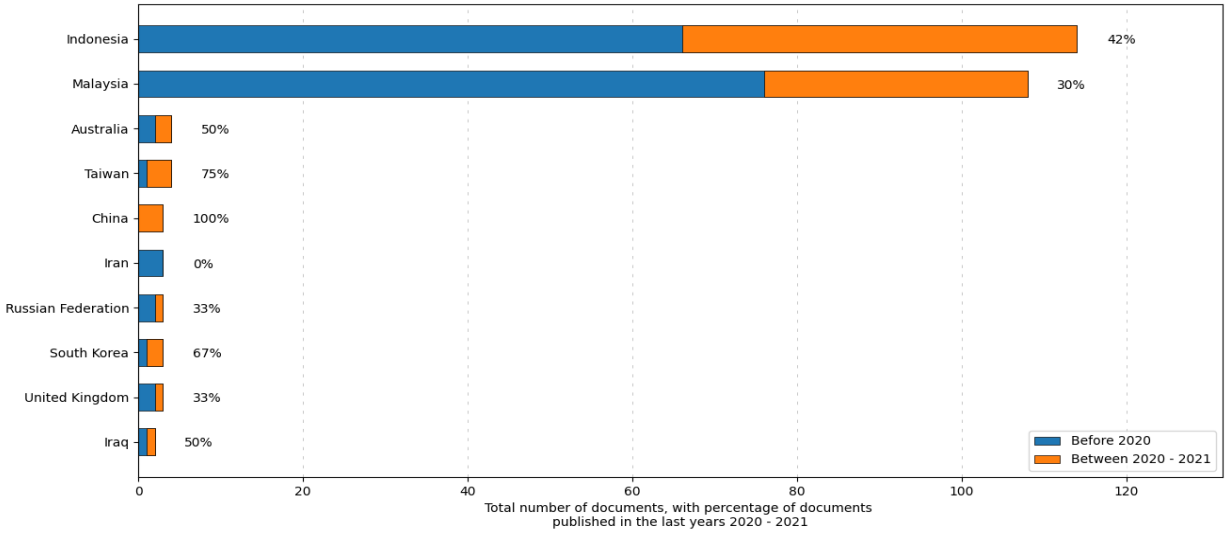

Figure 3. The 10 most active countries in the field of educational innovation
(Source: Results of ScientoPy software analysis up to April 7, 2022)

Most active institution publication of educational innovation

This analysis boosts the institution's reputation and encourages others to continue publishing it in order to achieve a high ranking. Table 3 depicts the most institution publication on the topic of educational innovation that have been published. Universiti Kebangsaan Malaysia and Universiti Teknologi MARA, both from Malaysia, became the most active institutions in publishing manuscripts related to the theme of educational innovation with an AGR of 0.0. This means that there is no growth or decline in publications with the previous year.

Table 3. Top 10 institutions

Pos.	Institution with Country	Total	AGR	ADY	PDLY	H-Index
1	Universiti Kebangsaan Malaysia, Malaysia	5	0.0	0.0	0.0	1
2	Universiti Teknologi MARA, Malaysia	5	0.0	0.0	0.0	3
3	Universitas Indonesia, Indonesia	4	0.5	0.5	25.0	3
4	Universiti Malaya, Malaysia	4	1.0	1.0	50.0	1
5	Universiti Sains Malaysia, Malaysia	4	0.5	0.5	25.0	1
6	Universitas Negeri Padang, Indonesia	3	0.0	0.5	33.3	0
7	Universitas Negeri Semarang, Indonesia	3	-0.5	0.0	0.0	0
8	Universiti Tun Hussein Onn Malaysia, Malaysia	3	0.0	0.0	0.0	1
9	Yogyakarta State University, Indonesia	3	-1.0	0.5	33.3	1
10	Universiti Putra Malaysia, Malaysia	2	0.5	0.5	50.0	1

Most active scientific sources

Identifying which institution is the most representative in the educational innovation area can assist researchers in selecting a research source or participating in some of their academic programs or research projects. the primary scientific sources on the topic of educational innovation that have been published. With 18 documents, Journal of Physics: Conference Series is the scientific source with the most published article

manuscripts. Figure 4 depicts information about other scientific sources found in the top ten most popular journals and the primary scientific sources on the topic of educational innovation that have been published

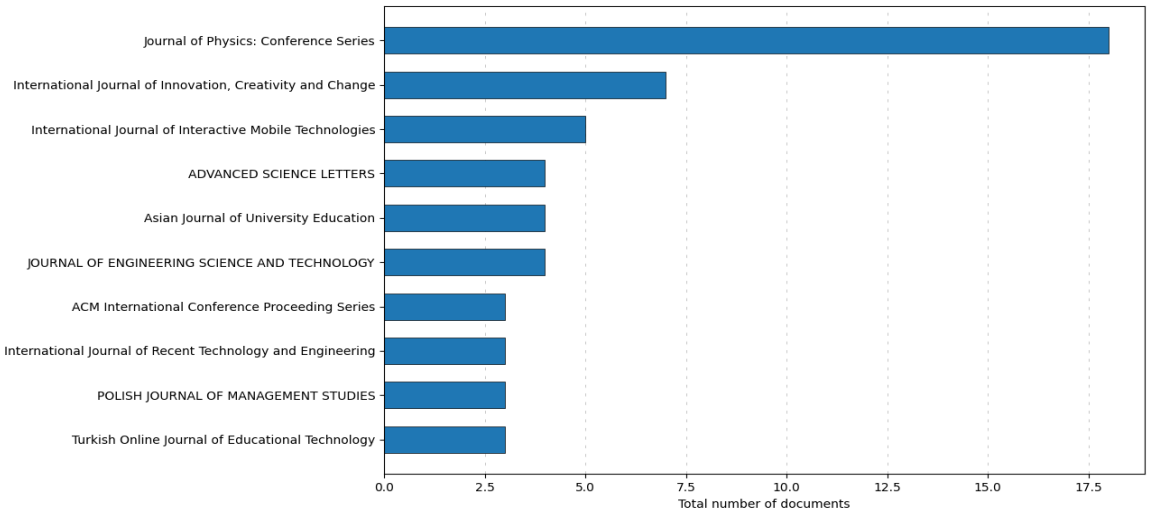

Figure 4. The 10 most active scientific sources
(Source: Results of ScientoPy software analysis up to April 7, 2022)

The top 10 most active author in educational innovation publications

ScientoPy can also help researchers find the most representative authors on their topics so that they can cite them in their contributions or have references for related works. Table 4 lists the top ten most active authors in terms of contributions to educational innovation, with at least 2 publications. The table also calculates each person's AGR and h-index. The ability to cite important authors in our investigation aids in both dissemination and scientific recognition. Putra A.B.N.R, of the Universitas Negeri Malang in the Indonesia, is one of the lead authors, with a total of 6 documents published. The average growth rate (AGR) per year is 1.5, indicating that the number of documents published for a topic does grow significantly, implying that the author experiences a difference in the average number of documents published per year compared to the previous year, but with a growrt increase trend. The average document per year (ADY) is 3.0, a positive trend, indicating that the average number of documents issued within a certain period of time has an increasing trend. The percentage of documents in recent years (PDLY) is 100.0, indicating that there is a very positive trend. Table 4 lists additional authors in the area of educational innovation.

Table 4. Top ten active auhtor

Name	Total	AGR	ADY	PDLY	H-Index
Putra A.B.N.R.	6	1.5	3.0	100.0	3
Mukhadis A.	4	1.0	2.0	100.0	2
Sallu S.	4	-2.0	0.0	0.0	1
Basri, N.E.A.	3	0.0	0.0	0.0	1
Kiong T.T.	3	1.5	1.5	100.0	1
Puspitasari P.	3	1.0	1.5	100.0	1
Subandi M.S.	3	0.5	1.5	100.0	1
Zain, S.M.	3	0.0	0.0	0.0	1
Feroz, F.S.	2	0.0	0.0	0.0	0
Mukminin, A.	2	1.0	1.0	100.0	0

Author's keywords

Figure 5 shows another way to graphically represent using a ScientoPy tool called WordCloud, which generates random word clouds of varying sizes. This section will go over the main terms used to define educational innovation. The WordCloud displays 100 keywords. "Innovation" is a frequently used keyword, appearing 41 times. With 15 occurrences, "Higher Education" was the second most frequently used keyword. Figure 5 depicts a WordCloud with additional keywords.

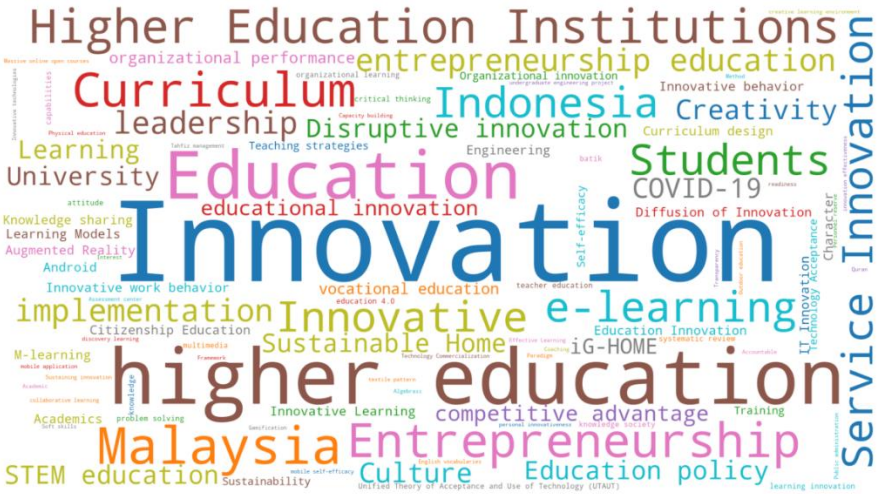

Figure 5. Keywords that often appear are used by the author
(Source: Results of ScientoPy software analysis up to April 7, 2022)

Trending Topic

ScientoPy can identify trending topics by examining the top author's keywords with the highest AGR (as described in the section "Topic growth indicators"). Figure 6 depicts a plot of the evolution of the most popular trending topics in sports and fitness. This evolution plot plots the cumulative number of documents (on a logarithmic scale) versus the year of publication on the left side. Thus, the first row on the X-axis represents the year the topic research began, and the last line on the Y-axis represents the total number of documents published for each topic. The Y-axis on the right represents each topic's AGR for the 2020–2021 period, and the X-axis represents the PDLY. We can use this graph to determine which topics have a higher AGR and a higher PDLY. As a result, the trending topic with the greatest absolute growth is "higher education," while the trending topic with the greatest relative growth is "e-learning".

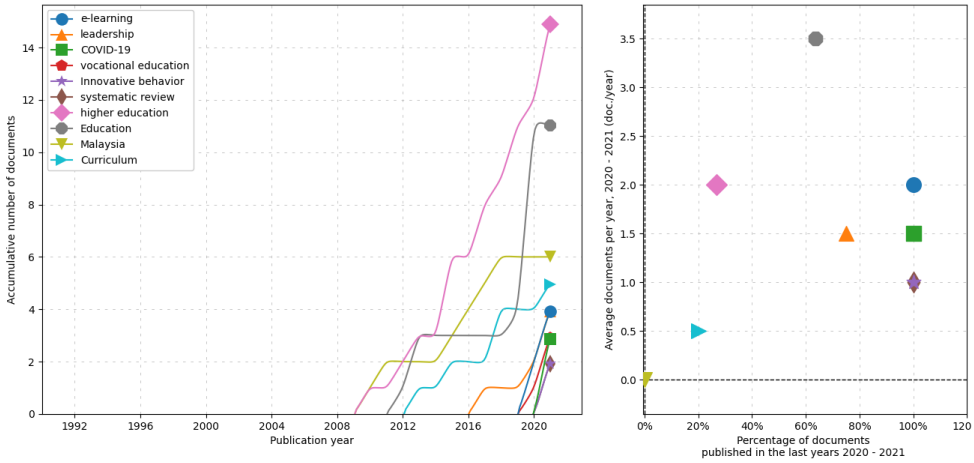

Figure 6. Top 10 trending topics based on the author's keyword
(Source: Results of ScientoPy software analysis up to April 7, 2022)

CONCLUSION

This paper's aim is to propose a scientometric analysis of educational innovation. The primary goal of this study is to identify and categorize scientific articles using source title subject categories, country keywords, and author keywords. This analysis, however, is only one approach that could be supplemented by a more thorough examination. The obtained results can provide a theoretical perspective, map the state of the art in the field, and easily identify gaps in scientific research. This scientometric analysis is intended to be a resource for future work in the development of educational innovation science on topics such as e-learning.

To find the most popular topics within a specific research category, we can use wildcard searches. To be used in the case study of educational innovation. The following are the primary distinctions between ScientoPy and other tools: (a) the ability to find topics using search wildcards; (b) trend analysis using AGR, ADY, and PDLY; and (c) a command line user interface that allows us to create a single batch script that performs all of the operations required for our analysis with a single command or command execut

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