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Factors Influencing the Success of Students' Learning through Online Learning/Distance Education : A Bibliometric Analysis of Scopus Database

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Abstract: This study aims to examine the co-occurrence of several topics linked to factors that influence student learning success and explore the motor themes related to factors that influence student learning success. This study used the literature review method with data analysis using R Studio and VOSViewer software. Data analyzed were exported from the Scopus website from 2013 to 2023 of 383 documents. The research data analysis techniques used network mapping analysis of VOSviewer results (network visualization) and content analysis within the keywords and studies. The findings of this study presented the keywords (most frequent words, trending topics), co-occurrence network (thematic map and thematic evolution), and discussion of topics related to factors that influence student learning success. The basic themes identified were higher education and Covid-19. Meanwhile, gender and self-efficacy are motor themes that could be researched further as those can influence student learning performance in online learning. The findings of the bibliometric analysis were intended to reveal unique insights into the factors that determine student learning performance in distant learning and contribute to previously unexplored issues.

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Introduction

Education is a basic need for every individual, and therefore, the government must ensure that education is equally distributed and affordable to all citizens. Schools or colleges have provided face-to-face educational facilities. However, due to several constraints, some students still require assistance to attend classes in person. Distance learning advances arose because of these circumstances. Distance learning is one of the alternatives available to students who need help to attend class in person (Pacheco, 2009).

Distance learning continues to grow increasingly popular in Indonesia. School closures during the Covid-19 pandemic were among the triggering causes, accelerating the adoption of online learning (Afkar & Yarrow, 2021). Schools and colleges are running against the time to make up for students' learning losses by organizing online learning. As individuals searched for more flexible and accessible education options, users/students began adopting online learning modes (Culajara et al., 2022) and thought about further studies, especially for higher education with remote learning. Online learning has various potential advantages, including time, place, and, most significantly, pace flexibility (Salas-Pilco et al., 2022).

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However, schools and colleges must continually ensure online learning quality to determine whether students have successfully participated in learning. Teachers, lecturers, and researchers conduct studies on the advantages and disadvantages of online learning/distance learning to uncover the contributing factors. Many studies have begun to address the effectiveness of online learning/distance learning (Hongsuchon et al., 2022; Kuswoyo et al., 2022), the implementation challenges (Paudel, 2020; Richards & Thompson, 2023; Turnbull et al., 2021), best practices for online learning/distance learning (Baldwin & Trespalacios, 2017; Dumford & Miller, 2018; Lockman & Schirmer, 2020), and the factors that influence student learning success in online learning/distance learning. The research undoubtedly evolved in response to the needs and the current conditions.

Bibliometric study by Haddar (2023) investigated the impact of online learning and analyzed keywords relevant to the topic. Based on the research results, further research is needed on the factors that contribute to student success in online learning. It is necessary to conduct a bibliometric analysis to see the research distribution related to factors influencing student success in online learning. By understanding the recent development on this topic, this study will provide an overview of the state of the art of subsequent research and offer themes that can be developed further (emerging trends and patterns) related to FSSO. This study can be used as a reference for future scholars interested in further investigating the discoveries that will be mentioned.

Based on the previous explanation, the research questions in this article are as follows. RQ 1: What are the thematic trends related to factors influencing student success in online learning/distance education (FSSO) in the Scopus database?. RQ 2: What are some of the topics as basic themes and motor themes related to factors that influence student learning success in online learning/distance education (FSSO)?

Research Method

This study used the literature review of bibliometric analysis. The data analyzed was metadata exported from the Scopus website. It is a comprehensive, multidisciplinary database that offers a variety of tools and bibliometric indicators for performing bibliometric analysis and covers a wide range of study topics (AlRyalat et al., 2019; Tsilika, 2023). The search procedures to obtain the metadata to be analyzed are: (1) searched through Scopus website using the query: "TITLE-ABS-KEY (factor influencing AND student OR college AND success AND online OR learning OR distance OR education OR lms)", (2) exported all data into a.csv file, and (3) cleaned the data by removing 15 metadata entries without author information.

The 383 selected metadata were then analyzed using R software with the bibliometric package (biblioshiny). An overview, sources, authors, documents, conceptual and social structures are all included in biblioshiny result. The overview contains main information, annual scientific production, and average citations per year. Sources provide information about the most relevant and local cited sources, while the author's section contains the most relevant authors and most relevant affiliations. The most global cited documents, most frequent words, wordcloud, treemap, and trending topics are all revealed by document analysis. Conceptual structure analysis results in co-occurrence networks, thematic maps, and thematic evolution.

This study used the VOSviewer program to do a bibliometric analysis as well. VOSviewer places a strong emphasis on the bibliometric maps' graphical depiction (van Eck & Waltman, 2010). For this analysis, we used the type of co-occurence with author keywords as the unit of analysis. VOSviewer provides three keyword visualization options: network

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visualization, overlay visualization, and density visualization (Moral-Muñoz et al., 2020). Network visualization presents keyword mappings as circles connected by lines and labels. Keyword clusters are grouped by color. The volume of the circle and the label's size indicate the keywords' importance (e.g., a larger circle and label indicate the keyword is more important).

For this study, the research data analysis techniques include network mapping analysis of VOSviewer result (network visualization) and content analysis within the keywords and studies. The unit of content analysis include main information of biblioshiny, most frequent words, trend topics, thematic map, thematic evolution, and network visualization which describe the linkage between keywords that related to FSSO.

Results and Discussion

Overview

Main information

The description of the dataset used for bibliometric analysis will be covered in this section (see Figure 1). The database under analysis consisted of 383 documents with an average document age of 4 years, published from 2013 to 2023. 303 sources contributed to the database. A total of 1298 authors participated in writing documents, of which 52 were authors of single-authored documents. 15.4% of the total number of documents involve international collaboration between co-authors. Average per document written by three other co-authors. Each document has an average of 10.57 citations, which is significant. This citation number indicates that the article is still relevant to be referred to as a source in research on the variables affecting students' success in online/distance learning (FSSO).

Figure 1. Main Information

Documents

Words

We will discuss the keywords that often appear related to FSSO. The unit of analysis used is author keywords rather than keyword plus to broaden the conceptual structure of the domain being studied (Oluwadele et al., 2023). Based on Figure 2, "higher education" is the keyword that appears most frequently (28 times). "e-learning" comes next, which appears 18 times, followed by "education" which appears 12 times, the same number of the word "students" does. The keywords "covid-19" and "covid-19 pandemic" are mentioned 16 times. The term "gender" appeared nine times. The keyword "academic success" appears seven times. Two keywords appear six times: "distance learning" and "self-efficacy". Overall, some keywords can be grouped based on the subject of interest, such as "e-learning" with "distance learning" as a learning method, "higher education" with "students" and "academic success", "gender" with potential "self-efficacy" that could lead to FSSO.

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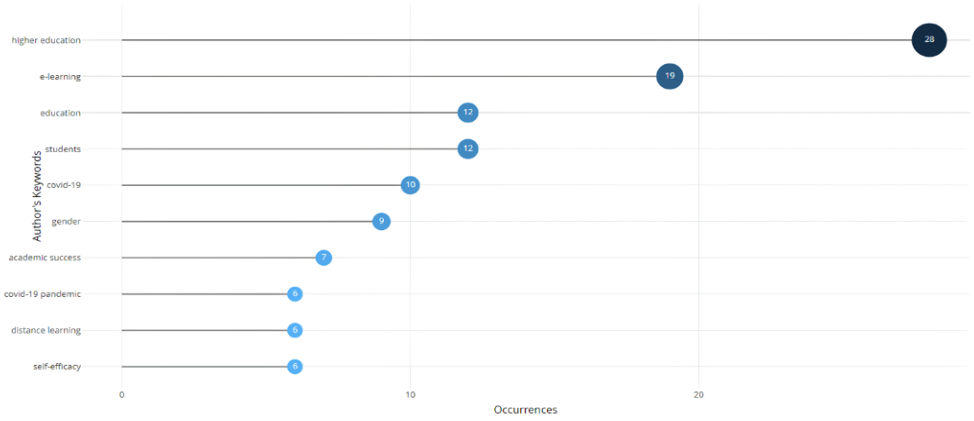

Figure 2. Most Frequent Words

Trend topics are provided to identify trends from 2015 to 2023 (see Figure 3). The period is observed from the corner points of the lines representing each term, while the blue circle represents the frequency of occurrence of these terms each year. From 2015 to 2021, "academic performance" will continue to be a subject of interest. The term "e-learning" emerged for the first time in 2016 and is still being discussed until 2022. The popular topic in 2017 was "gender," which persisted through 2021. Three crucial topics emerged in 2018: "e-learning", "mobile learning", and "medical education". "E-learning" appears more frequently than the other three. 2019 marked two keywords emerged: "students" and "self-efficacy". In 2020, "education" and "academic success" – both of which emerged in 2018, as well as "university," which only debuted that year – would be the prominent keywords. Starting in 2021, "higher education" – along with "online education" and "academic performance" – became the most popular term among all other keywords of the year. The keywords "covid-19", "covid-19 pandemic", and "distance learning" start to lead research discussions in 2022 and will mainly continue in 2023 afterward.

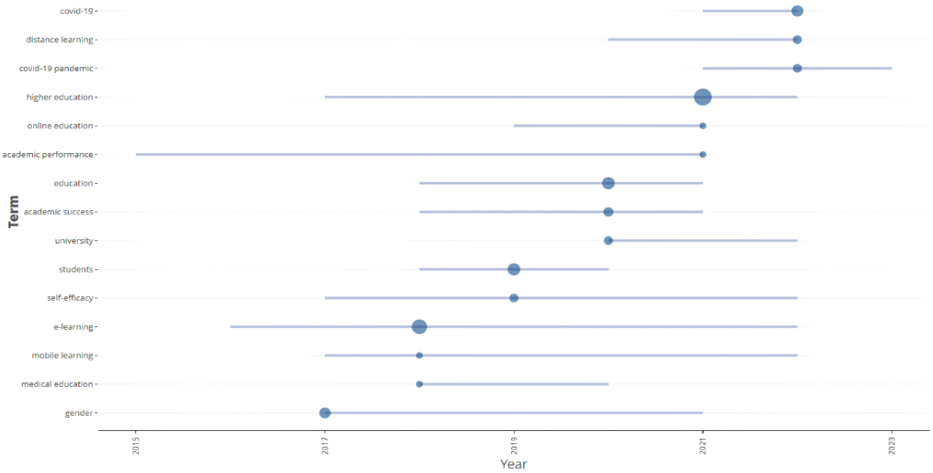

Figure 3. Trend Topics

RQ 1: The Result of Thematic Trends Related to FSSO

Conceptual structure

Thematic map

Thematic maps are presented in a strategic diagram of the density and centrality of keywords (see Figure 4). Keywords are scattered over four quadrants: the first quadrant is for motor themes, the second is for niche themes, the third is for emerging or declining themes, and the fourth is for basic and transversal themes (Giannakos et al., 2020). Motor themes

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indicate that keywords in this quadrant are classified as central and developed. Both their centrality and density are high. In other words, the themes in this quadrant have the potential to be researched and developed in the future. The keywords included in quadrant one were "students", "gender", and "self-efficacy". Aside from the three, some of them are "tam", "attitude", "depression", "moocs", "race/ethnicity", "anxiety", and "awareness". Some keywords "research", "residency", and "training" are located between quadrants one and two. These keywords are categorized as developed but isolated themes yet also have the potential to be evolved. In the discussion section, we will deepen the discussions of some of the second and third most occurrence motor themes as potential factors that affect student success in conducting online learning/distance learning, mainly about "gender" and "self-efficacy".

There are more keywords in quadrant two than in the one on motor themes. These are grouped into four clusters, the first cluster consisting of "mooc", "self-regulated learning", and "engagement". The second cluster contains the keywords "influencing factors", "physical education", and "adolescents". The third cluster consists of "academic success", "entrepreneurial intentions", and "resilience", while the fourth one consists of "medical education", "admissions", and "medical students". The keywords in the four clusters are all classified as niche themes, which means that they are all focused on a single theme from a single field/discipline and were developed based on the bibliometrics theme.

Three keywords in the third quadrant are associated with emerging or declining themes. The three keywords are "art education", "biomedical research", and "purchase intention". Meanwhile, there are four clusters in the fourth quadrant as basic themes. The keywords included in the basic themes are significant topics that provide an in-depth understanding of the bibliometric themes, given that this quadrant has a high centrality but a low density. These include "covid-19 pandemic", "covid-19", "success", "teachers", "higher education", "university", "academic performance", "education", "factors", "technology", "e-learning", and "distance learning". These themes are occasionally categorized as underdeveloped themes because they are the fundamental themes of FSSO.

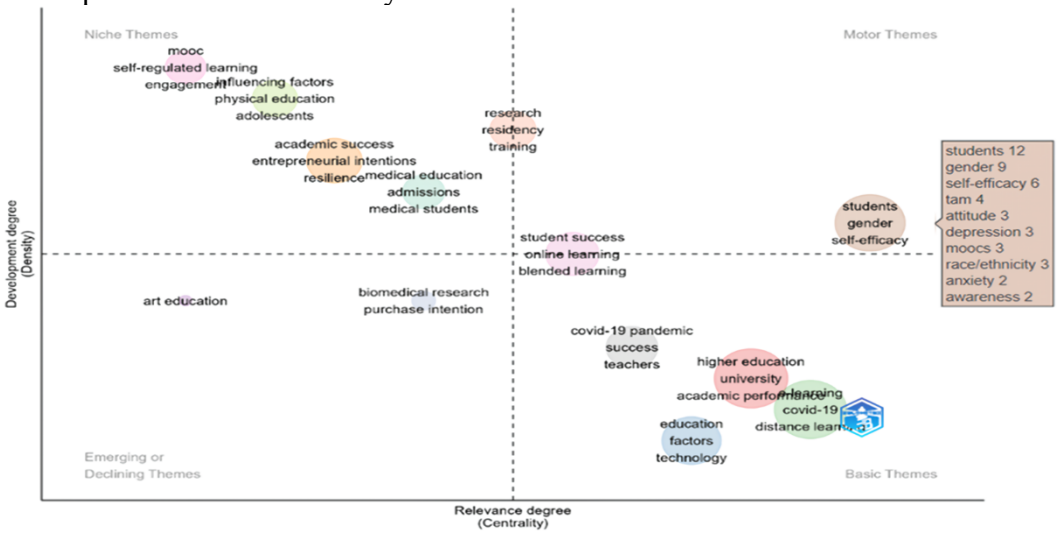

Figure 4. Thematic Map

Thematic evolution

Thematic evolution is presented with a Sankey diagram (see Figure 5). This diagram shows the interrelationships between past themes and how they shift into new ones in the future. A rectangle illustrates each theme, and its size indicates how frequently the theme is present. The clearer and thicker the lines, the stronger the connection between the two themes was. The timeline is divided into three parts: From 2013 to 2016 as time slice 1, from 2017 to

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2020 as time slice 2, and from 2021 to 2023 as time slice 3. Time slice 2 has a more diverse theme than the others. Themes do not necessarily develop and transform into other themes. For example, "motivation" in time slice 1 is still relevant in time slice 2. The theme of education, for example, can change into the themes of "education" and "gender" in time slice 2 and then again into three themes: "mobile learning," "learning," and "academic achievement" in time slice 3. From time slice 1, "higher education" evolved into two themes, namely "e-learning" and "higher education". It is interesting to note that the four topics in time slice 2, namely "influencing factors", "education", "e-learning", and "higher education" have evolved into "higher education" theme in time slice 3. A unique finding is also seen in the linkage between "students" in time slice 1 and 2, which formed into "gender" in time slice 3. The theme "distance learning" began to appear between 2017-2020 and is connected to the term "covid-19 pandemic" in time slice 3. Several keywords in time slice 3 can be referred to as developing or constructing themes in the future.

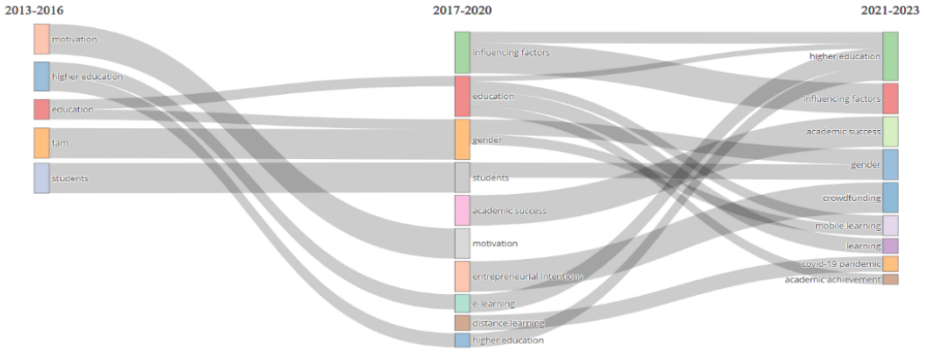

Figure 5. Thematic Evolution

RQ 2: Topics as Basic Themes and Motor Themes related to FSSO.

The following section will cover more specific linkages to the chosen keywords. VOSviewer provides a feature that allows us to select one keyword and see how it relates to other keywords. The keywords discussed further in this section include several keywords on basic themes and motor themes. On the basic theme of the thematic map (see Figure 4), we are interested in exploring deeper into the keywords "higher education" and "covid". According to the motor theme quadrant, the keywords "gender" and "self-efficacy" appear the most in the second and third order, respectively. Even though "student" is the most frequently used keyword on motor themes, we decided not to discuss it further because the focus of our future research is to explore internal (e.g., student attributes) or external (e.g., technological design) factors that have the potential to influence student learning success.

Topics related to the keyword "higher education"

According to Figure 6, "higher education" is associated with several keywords both within and across clusters, including "academic performance", "students", "self-efficacy", "covid-19", "gender", "retention", "university", "satisfaction", "entrepreneurship", and "e-learning". The keywords that appear have a high association with "higher education", while the keywords and lines that do not appear imply that these keywords are unrelated to the chosen keywords. Many FSSO research has been conducted at the higher/tertiary education level, with university students participating as research subjects, e.g., Huang (2023), Ouajdouni et al. (2021), and Yawson & Yamoah (2020). Online learning or distance learning is conducted using e-learning. At the same time, the keyword "covid-19" is emerging on this topic, indicating that e-learning is widely used as an alternative to learning during the pandemic. The Covid-19 pandemic has pushed many schools and educational institutions to continue conducting learning activities, from face-to-face mode to distance learning.

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Satisfaction, entrepreneurship, and e-learning are included in a cluster related to higher education (marked in purple). More precisely, satisfaction is one of the user success factors of e-learning (Al-Fraihat et al., 2020). The level of user satisfaction indicates the success of the information system (Andrade et al., 2020). Furthermore, students' satisfaction with campus and online courses correlates with their course completion in previous studies (Shaikh & Asif, 2022). In other words, students who have high satisfaction with the campus (system) and courses taken through online learning will have a greater chance of completing their studies. The term entrepreneurship appears to be associated with research on online learning/distance learning, primarily on the relationship between entrepreneurship education and to improve students' entrepreneurial success rate (Wu, 2017).

Another cluster (in blue) has the keywords retention, gender, and self-efficacy, all of which are closely related to higher education. Retention is a process by which students survive to continue studying and complete the study program. Several studies have found that students' success as measured by persistence, learning, or completion appears lower when conducted in online courses (Hamann et al., 2021). Apart from retention, numerous studies have looked at the gender as a student demographic variable that has the potential to influence student success in online learning (Yu, 2021), although it has only a small effect (Yawson & Yamoah, 2020). The following keyword is self-efficacy. Self-efficacy in online learning is a person's belief in his/her ability to complete online learning, persist in his/her studies, and achieve the goals, which include achieving better learning outcomes (Bubou & Job, 2022).

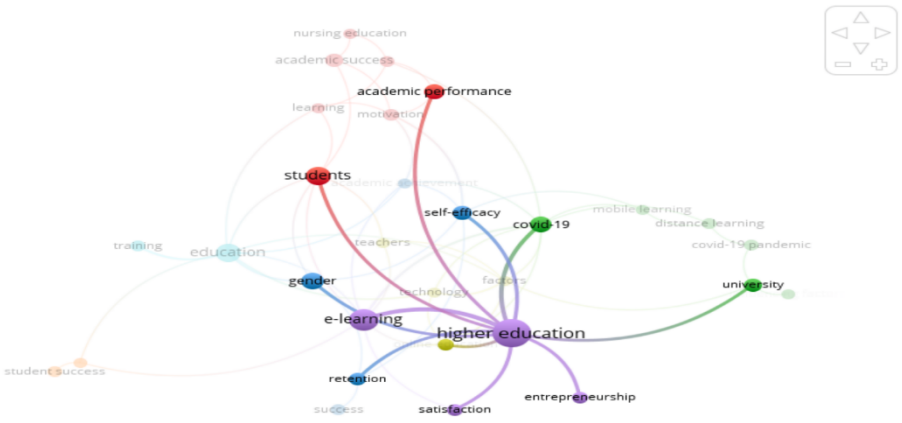

Figure 6. Topics related to "higher education"

Topics related to the keyword "covid-19"

Covid-19 is one of the keywords that has become a driving theme in research related to FSSO. Five clusters are directly related to the keyword "covid-19", marked in green, purple, yellow, blue, and red (see Figure 7). Several keywords belong to one cluster with the keywords "covid-19", such as "mobile learning" and "distance learning". These two keywords are examples of learning methods and systems developed during the Covid-19 pandemic. Research conducted related to e-learning during and after the pandemic included the studies by Almaiah et al. (2022), Voicu & Muntean (2023), and Gharaibeh & Gharaibeh (2020), while studies on distance learning during and after the pandemic are done by Amir et al. (2020), Churiyah et al. (2020), Rizun & Strzelecki (2020), and Afshan & Ahmed (2020). Some of these studies are mostly done on undergraduate and graduate students at several Indonesian universities and abroad.

Next is the purple cluster, which consists of the keywords "e-learning" and "higher education". In line with the previous cluster, FSSO research conducted during the Covid-19

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pandemic was closely related to the higher level of education. According to the bibliometric analysis, past studies generally used students and campuses as research subjects. Higher education has established a widely used e-learning system, allowing learning to occur within the system. That way, many studies related to e-learning have been carried out, especially the success of e-learning carried out in higher education during the Covid-19 pandemic (Sugandini et al., 2022), the factors that influenced e-learning during the Covid-19 pandemic (Adzovie & Jibril, 2022), challenges for students in participating in e-learning during the Covid-19 pandemic, students' perceptions of e-learning during the pandemic (Khan et al., 2020), and so on.

The keyword "academic achievement" is directly related to "covid-19". As we all know, the pandemic has resulted in a shift in learning implementation from face-to-face to online/through e-learning. As a result, many studies have been conducted to determine whether there are differences in student academic achievement in e-learning, factors that influence student academic achievement in e-learning (Park et al., 2022), the relationship between academic achievement and other variables that affect student readiness in e-learning (Yavuzalp & Bahcivan, 2021), the potential impact of school closures during the Covid-19 pandemic on student academic achievement (Kuhfeld et al., 2020), motivational factors that influence student academic success (Weiler & Murad, 2022), and other research. Aside from using the term academic achievement, some researchers adopt other compatible words, such as academic performance and academic success.

The keywords "technology", "factors", and "online education" in the yellow cluster are all directly related to "covid-19". Technology is inseparable from the online/distance learning process (Almarashdeh & Alsmadi, 2016). Interactions between teachers and students using digital communication tools, both software and hardware, demonstrate simple technology usage. Furthermore, several education institutions have developed their learning management system (LMS) that is accessible internally at schools/campuses. Indeed, the system requires the mastery of both students and teachers/instructors. The keyword "factors" in this cluster indicates that many studies have been conducted to investigate the factors that influence the use of technology in online learning/distance learning, the use of technology in higher education (Mesquita et al., 2018), the perceptions of college students towards technology use (Marzilli et al., 2015), and so on.

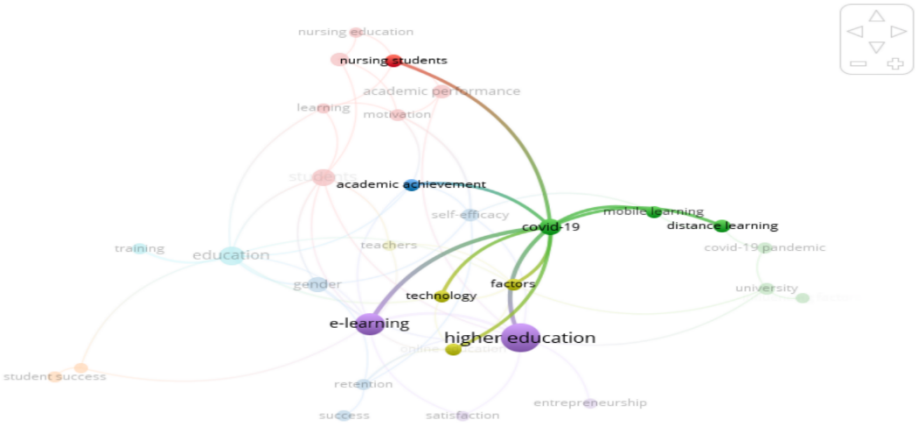

Figure 7. Topics related to "covid-19"

Topics related to the keyword "gender"

The first attribute that influences the extent to which students are successful in their learning, where the learning is facilitated through distance education or online learning, is "gender" (see Figure 8). The keyword "gender" has become a keyword in the motor themes

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quadrant, indicating that gender issues are still evolving and are important for future research in distance education and online learning practices. Figure 8 shows the relationship between the keyword "gender" and other keywords that form four clusters, suggesting that gender issues are still relevant in distance education for higher education students (Cho et al., 2022). More specifically, this gender issue involves self-efficacy and retention. These findings indicate that there are differences in self-efficacy – how confident a student is in the knowledge and competencies he must be able to complete a task or achieve a specific goal successfully – and retention in understanding or pursuing learning among students who take part in distance education or online learning are influenced by gender differences. Given that the keyword "education" is related to "gender" and "gender" is related to "self-efficacy" and "retention", distance education or online learning organized by higher education institutions is expected to be able to accommodate every student regardless of their gender to have adequate self-efficacy and retention. When these two things can be accommodated for, every student, regardless of their gender, is expected to have a greater opportunity to be successful in their education.

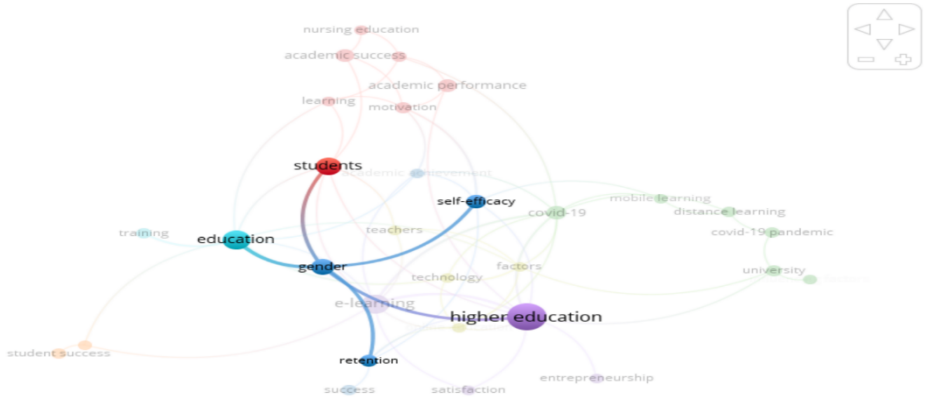

Figure 8. Topics related to "gender"

Topics related to the keyword "self-efficacy"

The last keyword in the motor themes quadrant that is the focus of this study is "self-efficacy". In Figure 9, self-efficacy forms linkages with the keywords in the four clusters; the blue cluster includes "gender", "retention", and "academic achievement", the purple cluster includes "higher education", the green cluster includes "mobile learning", and the red cluster includes "motivation". The previous section discussed the relationship between self-efficacy and gender, showing that these two issues are related. Furthermore, whereas the prior section shows that self-efficacy and retention are not directly associated with one another, Figure 12 shows that they are, and many previous studies explored this relationship. Studies on distance education or online learning have also revealed a relationship between self-efficacy and academic achievement (Li, 2020; Masrun & Rusdinal, 2022). This relationship shows that students' belief in their ability to achieve specific goals through online learning design or distance education can promote academic success.

The next cluster shows a relationship between self-efficacy and mobile learning (see Figure 9). The relationship between these two things implicitly shows that students' self-efficacy when involved in distance education or online learning may not be separated from the quality of the technology used in learning. Using appropriate, high-quality, and easy-to-use mobile technology can increase student self-efficacy, especially when the education provided by tertiary institutions also supports this in general. Conversely, self-efficacy can be one of the external factors which influence a person's acceptance of technology (Huang, 2023), e.g. internet of things (IoT) (Alzahrani, 2023), e-learning (Al-Adwan, 2020; Sholikah

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& Sutirman, 2020), and learning management system (LMS) (Buabeng-Andoh & Baah, 2020).

In this study, we have also found that previous studies have explored the relationship between self-efficacy and motivation as a result of the relationship between the two (Abdolrezapour et al., 2023). Students' motivation can stimulate them to have good self-efficacy, and conversely, the excellent self-efficacy that students have can enable them to strive to succeed in studying online or in distance education. Previous studies have found that motivation and self-efficacy are potent predictors of satisfaction for distance learning students (Younas et al., 2022). This finding implicitly confirms that one of the most essential actions higher education institutions can take to improve student satisfaction with remote education or online learning is providing instruction that can increase student motivation and self-efficacy. Again, this increase in motivation and self-efficacy, concerning the context of distance education or online learning, cannot be separated from the selection of appropriate technology, learning strategies, and how to organize learning content.

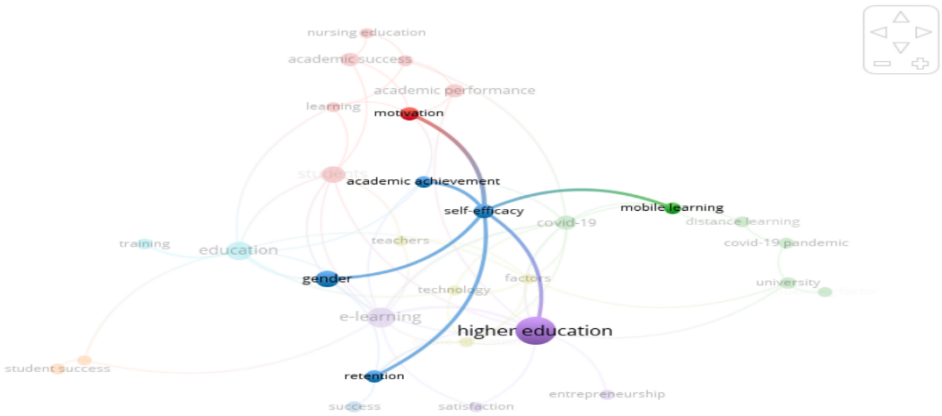

Figure 9. Topics related to "self-efficacy"

Conclusion

Even though the database used is limited to the Scopus database, this study provides a bibliometric analysis of documents and keywords related to factors influencing student success in online learning/distance learning, as well as the co-occurrence network. By analyzing 383 documents, the study categorizes higher education, Covid-19, and factors as the basic themes. At the same time, gender and self-efficacy are identified as motor themes with potential for future research. They can be interpreted as the factors influencing students' success in online learning. The results of this bibliometric analysis provide insights into the factors that influence student success in online and distance learning and highlight interesting issues that require further exploration.

Recommendation

After conducting this bibliometric analysis, some recommendations have emerged for further research. Firstly, it is suggested to use other databases or combine several databases instead of relying solely on Scopus to produce a broader and more representative mapping. Secondly, further research is needed on the topics related to motor themes that still influence student success in online learning/distance education. Thirdly, performing bibliometric analysis over a longer period is necessary because the topic of FSSO was not introduced suddenly in 2013 but was applied much earlier. Finally, higher education, as the facilitator of online learning,

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can explore, develop, and evaluate innovative and engaging subject courses that can cater to the diverse learning styles, preferences, and needs of online learners.

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