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What is The Correlation Between Chemical Engineering and Special Needs Education from The Perspective of Bibliometric Analysis Using VOSviewer Indexed by Google Scholar

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A B S T R A C T

Chemical engineering is a field of study that focuses on increasing the values of one form of material to the other via chemical processes. Its typical activities cover research and development, feasibility studies, engineering designs, plant operations, and improving plant performances. The goal of this research is to analyze "Chemical Engineering Special Needs" by combining mapping analysis and the VOSviewer app. The Publish or Perish app is also used to support and find articles that are relevant to keywords used for searching. Thus, "Chemical Engineering" and "Special Needs" were used as the keywords for this study. There are 800 relevant articles published between 2018 and 2022, based on the search results. The number of publications on "Chemical Engineering Special Needs" has declined, according to the research findings, notably in 2021. This study should aid researchers in conducting and deciding on a research topic regarding the correlation between special needs and chemical engineering.

1. INTRODUCTION

Chemical engineering is a technique related to the study of design, chemical plant operations and related to learning about methods to increase the amount of production (Melton, 2005). In addition, chemical engineering is also referred to as a branch of engineering that studies processes and processes how to convert chemicals and raw materials into materials that have a higher value. These changes take advantage of chemical processes, such as chemistry and biochemistry reactions, and take advantage of changes in the physical and chemical properties of the raw materials (Nandiyanto *et al.*, 2021).

People who need special care or special help, for example, because they have a disability, are called people with special needs (Dolan, 2013). Disability is a condition that causes a person to have difficulty doing activities or interacting with people around him (Devile & Kastenholz, 2018). Children with special needs can be caused by two factors, namely internal factors, and external factors. Internal factors are due to permanent abnormalities in children. Meanwhile, external factors are due to temporary disability (Maryanti *et al.*, 2021).

Research on Bibliometrics using VOSviewer has been done by many previous researchers, including: Digital learning (Al Husaeni & Nandiyanto, 2022), computer science (Al Husaeni & Nandiyanto, 2023a), vocational school (Al Husaeni & Nandiyanto, 2023b), high school (Al Husaeni & Nandiyanto, 2023c), covid-19 research (Hamidah *et al.*, 2020), scientific publications (Mulyawati & Ramadhan, 2021), chemical engineering (Nandiyanto *et al.*, 2021), materials research (Nandiyanto & Al Husaeni, 2021), special needs education (Al Husaeni *et al.*, 2023a), publication of techno-economic education (Ragadhita & Nandiyanto, 2022), engine performance (Setiyo *et al.*, 2021), dataset portrays decreasing number of scientific publications (Nandiyanto *et al.*, 2020a), application in robotic hand systems (Castibalnco *et al.*, 2021), research effectiveness in a subject area among top class universities (Nandiyanto *et al.*, 2020b), educational research (Al Husaeni *et al.*, 2023b), management bioenergy (Soegoto *et al.*, 2022), magnetite nanoparticle (Nugraha, 2022), nanocrystalline cellulose production research (Fauziah, 2022), nano metal-organic frameworks synthesis (Shidiq, 2023), titanium dioxide nanoparticle synthesis (Nugraha & Nandiyanto, 2022), nanocrystalline cellulose (Maulidah & Nandiyanto, 2022), carbon nanotubes (Aldhafi & Nandiyanto, 2021), nano-sized agricultural waste brake pads (Deni & Nandiyanto, 2022).

The purpose of this research is to conduct bibliometric chemical engineering special needs research by combining the mapping results using the VOSviewer application. This research is expected to help and become a reference for researchers in conducting and determining topics that would be taken by other researchers who would conduct research, especially understanding the correlation between special needs education and chemical engineering.

2. METHODS

The article data used in this research was based on research publications indexed by Google Scholar due to its free access. The phrase "chemical engineering special needs" was used as the search term in titles, keywords, and abstract requirements. As a result, 800 articles were gathered and evaluated based on the chosen topic. The publications chosen were published between 2018 and 2022. After that, the articles are stored in *.ris format. Then, the data is analyzed using a bibliometric map and visualized in 3 different ways namely network visualization, overlay visualization, and density visualization.

3. RESULTS AND DISCUSSION
3.1. Research Development in the Field of Chemical Engineering Special Needs

A bar chart showing the reducing number of publications from 2018 to 2021 is shown in **Figure 1**. A significant decline is observed in 2021.
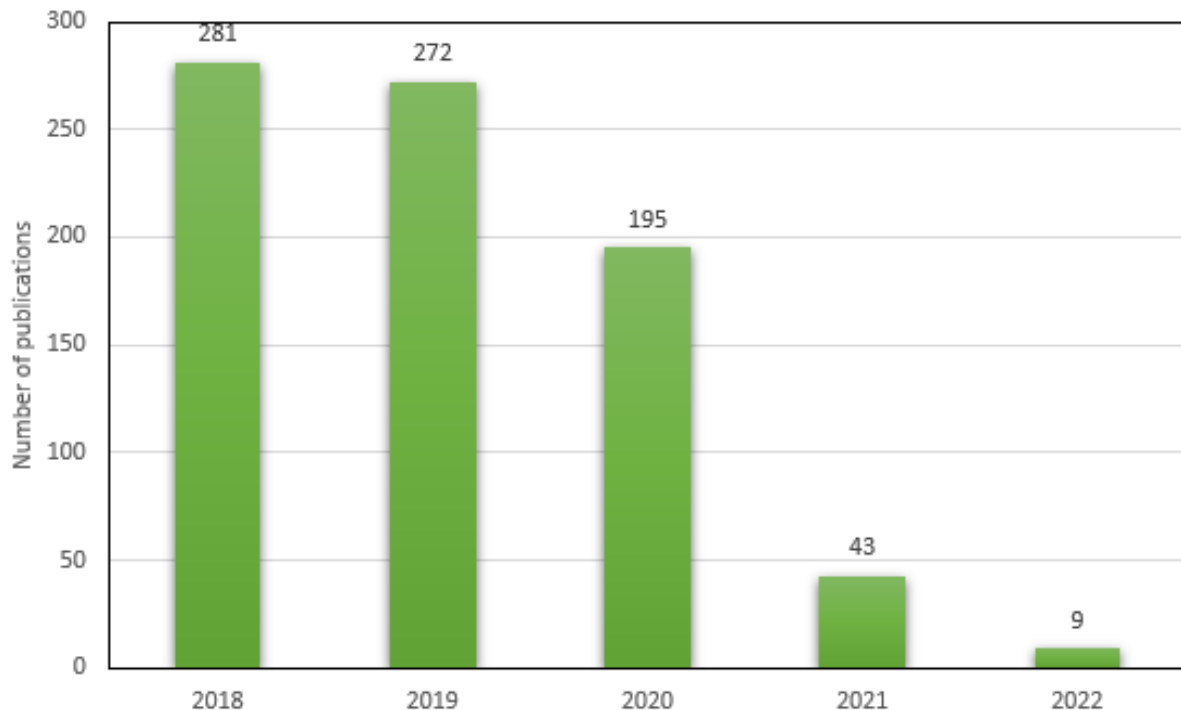

Figure 1. Developmental level of research on chemical engineering special needs.

3.2. Clusters Resulting from The VOSviewer Mapping with The Keyword of Chemical Engineering Special Needs

Further elaboration using the VOSviewer is by dividing the results into four clusters based on the analysis data.

3.3. Visualization Chemical Engineering Special Needs Topic Area Using VOSviewer

VOSviewer supports three types of visualization: (i) Network visualization (**Figure 2**), (ii) Overlay visualization (**Figure 3**), (iii) Density visualization (**Figure 4**).

Figure 2 depicts network visualization of chemical engineering and special needs keywords. This informs the correlation between the keywords.

Figure 3 depicts the overlay visualization's shape. The result in **Figure 3** is basically the same as **Figure 2**. But this figure shows the visualization by year.

Figure 4 depicts the density visualization method. The brighter color shows a higher number of publications concerning the word shown in the figure.
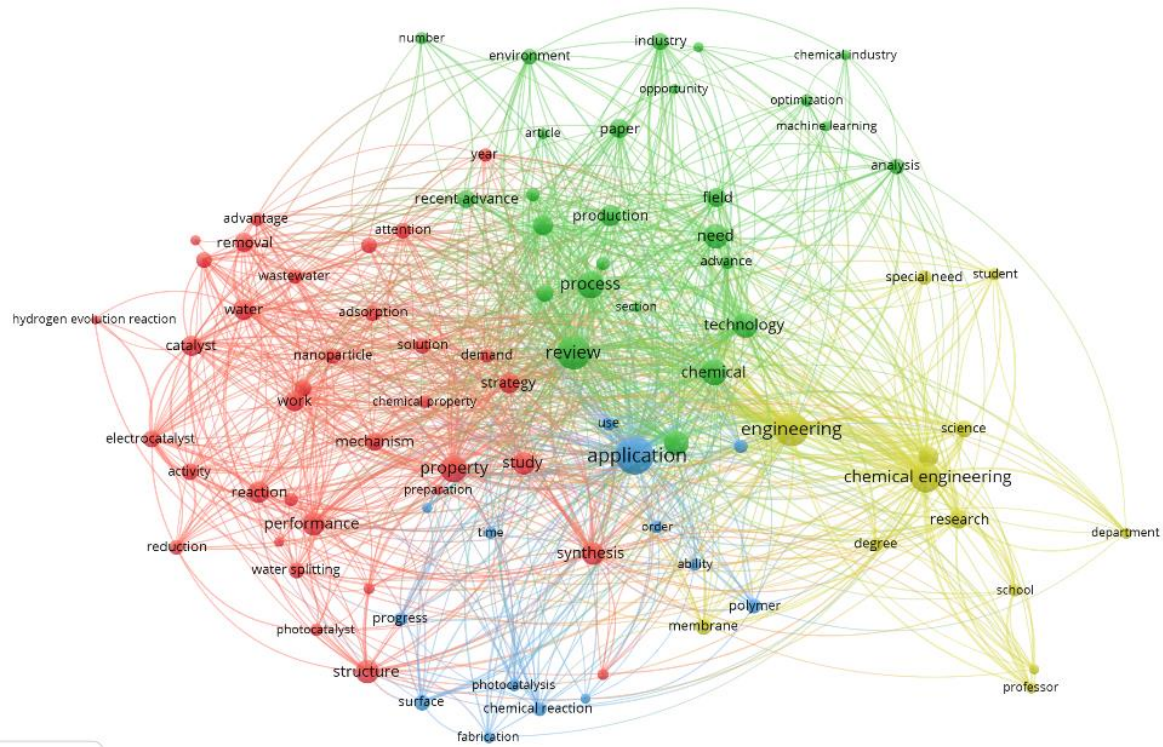
Figure 2. Network visualization of chemical engineering and special needs keywords.
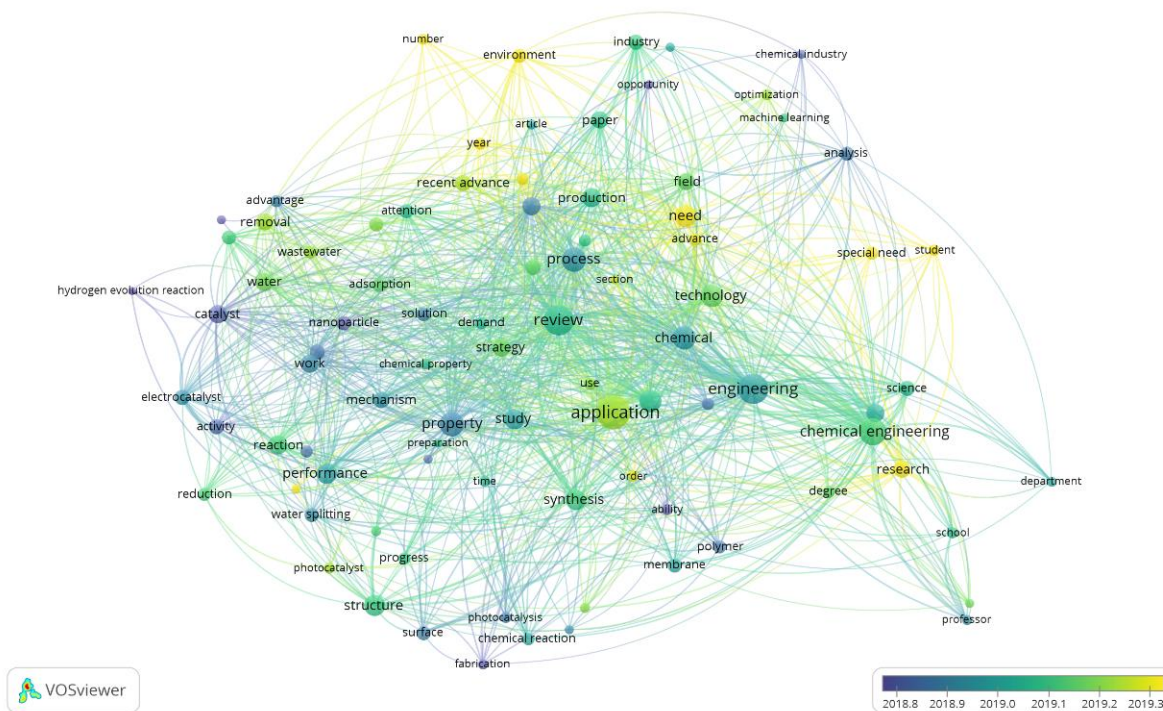

Figure 3. Overlay visualization of chemical engineering and special needs keywords.
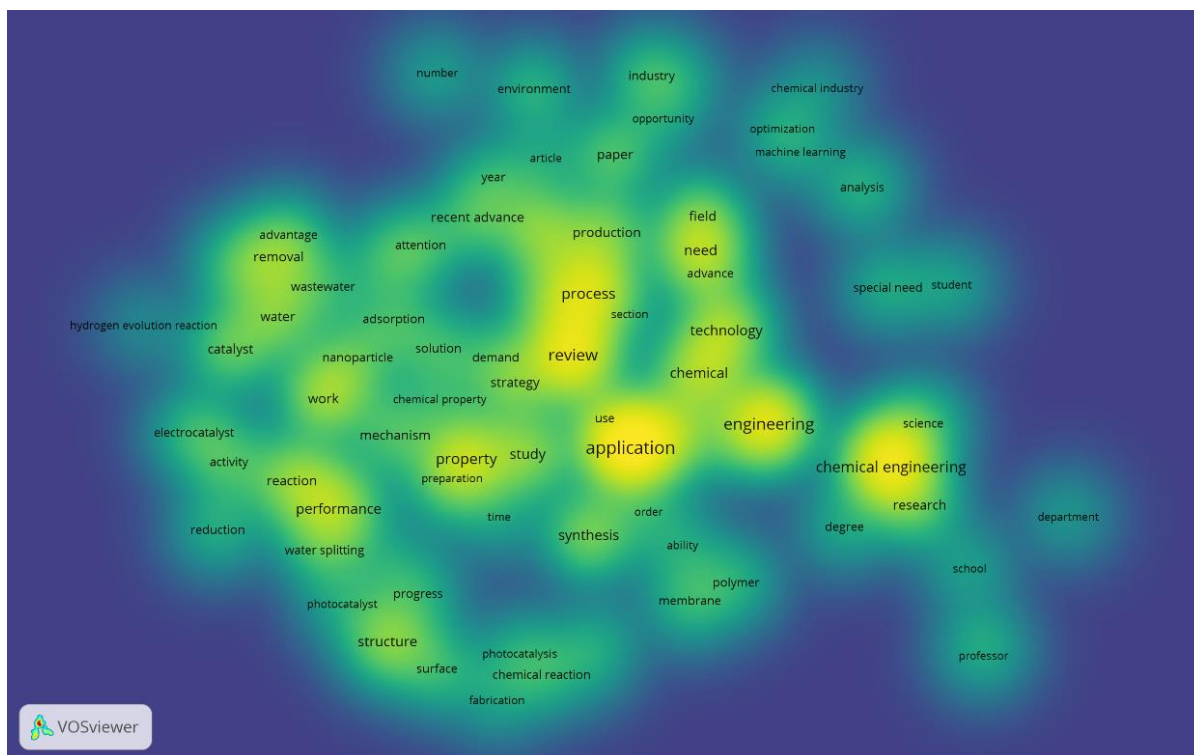
Figure 4. Density visualization of chemical engineering special needs keyword.

This study is to open information for the linkage between special needs and chemical engineering. But further analyses are still required to understand more.

According to the findings of this study, the number of articles on "Chemical Engineering Special Needs" has declined year after year. This seems to indicate the correlation getting weak. The possible reason is that the condition of the Covid pandemic, making society do not make linkage for a while as well as any support for special needs people to work in the chemical engineering area.

4. CONCLUSION

The goal of this research is to correlate the VOSviewer application's mapping with the terms "Chemical Engineering" and "Special Needs." The data for this study was gathered using the Publish or Perish reference manager tool to support the VOSviewer. 800 relevant articles published between 2018 and 2022 are found to match the keyword "Chemical Engineering Special Needs" in the titles, keywords, and abstracts. According to the findings of this study, the number of articles on "Chemical Engineering Special Needs" has declined year after year. This seems to indicate the correlation getting weak. The main reason is that the condition of the covid pandemic, making society do not make linkage for a while as well as any support for special needs people to work in the chemical engineering area.

5. AUTHORS' NOTE

The authors declare that there is no conflict of interest regarding the publication of this article. Authors confirmed that the paper was free of plagiarism.

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