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# FACTORS INFLUENCING ELEMENTARY SCHOOL STUDENTS' DIFFICULTIES IN LEARNING SCIENCE: ANALYSIS OF SYSTEMATIC LITERATURE REVIEW AND BIBLIOMETRIC

Nur Rohmatillah<sup>1,2\*</sup>, Serafin Wisni Septiarti<sup>3</sup>, Hermanto<sup>4</sup>, Farida Risky Aminah<sup>5</sup>, Lany Syahnia<sup>6</sup>, Arifah Suryaningsih<sup>7</sup>, Tri Wardati Khusniyah<sup>8</sup>, Ika Damayanti<sup>9</sup>, Megi Regina Wasfle<sup>10</sup>, Imroah Laina Retno Mukti Kusuma<sup>11</sup>, Muhammad Misbahul Munir<sup>12</sup>, Herlin Lusiana Sae<sup>13</sup>, Kitaman Hutapea<sup>14</sup>, Tri Apniani Sunarsih<sup>15</sup>, Diaz Astiza<sup>16</sup>, Sunaryo Romli<sup>17</sup>, Mukhammad Aji Fatkhurrohman<sup>18</sup>, Muhammad Andre Juliano<sup>19</sup> and Diana Ayu Rostikawati<sup>20</sup>

<sup>1</sup>Universitas Negeri Yogyakarta, Yogyakarta, Indonesia. Email: rohmatillah.irma@gmail.com; nurrohmatillah.2022@student.uny.ac.id

<sup>2</sup>Universitas Islam Al Ihya, Kuningan, Indonesia

<sup>3</sup>Universitas Negeri Yogyakarta, Yogyakarta, Indonesia. Email: swisni@uny.ac.id

<sup>4</sup>Universitas Negeri Yogyakarta, Yogyakarta, Indonesia. Email: hermansp@uny.ac.id

<sup>5</sup>Universitas Negeri Yogyakarta, Yogyakarta, Indonesia. Email: faridarisky.2025@student.uny.ac.id

<sup>6</sup>Universitas Negeri Yogyakarta, Yogyakarta, Indonesia. Email: lanysyahnia.2025@student.uny.ac.id

<sup>7</sup>Universitas Negeri Yogyakarta, Yogyakarta, Indonesia. Email: arifahsuryaningsih.2022@student.uny.ac.id

<sup>8</sup>Universitas Negeri Yogyakarta, Yogyakarta, Indonesia. Email: triwardati.2022@student.uny.ac.id

<sup>9</sup>Universitas Negeri Yogyakarta, Yogyakarta, Indonesia. Email: ikadamayanti.2024@student.uny.ac.id

<sup>10</sup>Universitas Sebelas Maret, Surakarta, Indonesia. Email: megibasfle40@gmail.com

<sup>11</sup>Universitas Sebelas Maret, Surakarta, Indonesia. Email: imroahlaina@gmail.com

<sup>12</sup>Universitas Negeri Yogyakarta, Yogyakarta, Indonesia. Email:

muhammadmisbahul.2022@student.uny.ac.id

<sup>13</sup>Universitas Negeri Semarang, Semarang, Indonesia. Email: herlinsae23@gmail.com

<sup>14</sup>Universitas Sebelas Maret, Surakarta, Indonesia. Email: kitamanhttp@gmail.com

<sup>15</sup>Universitas Negeri Yogyakarta, Yogyakarta, Indonesia. Email: triapniani.2022@student.uny.ac.id

<sup>16</sup>Universitas Islam Negeri Sunan Kalijaga, Yogyakarta, Indonesia. Email: diazastiza92@gmail.com

<sup>17</sup>Universitas Pendidikan Indonesia, Bandung, Indonesia. Email: sunaryoromli@upi.edu

<sup>18</sup>Universitas Pendidikan Indonesia, Bandung, Indonesia. Email: ajifatkhur@upi.edu

<sup>19</sup>Universitas Negeri Jakarta, Jakarta, Indonesia. Email: muhammadandrejuliano@gmail.com

<sup>20</sup>Universitas Pendidikan Indonesia, Bandung, Indonesia. Email: dianaayu89@upi.edu

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Corresponding Author: Nur Rohmatillah

(rohmatillah.irma@gmail.com; nurrohmatillah.2022@student.uny.ac.id)

**ABSTRACT**

*This study investigates the factors influencing elementary school students' difficulties in learning science through a systematic literature review and bibliometric analysis of publications indexed in the Scopus database from 2013 to 2023. The study aims to identify dominant research trends, key contributing factors, and effective instructional strategies related to science learning difficulties at the elementary education level. Bibliometric data were analyzed using VOSviewer, Biblioshiny, and RStudio to map publication growth, research themes, country contributions, and keyword co-occurrence patterns. The findings indicate that students' difficulties in learning science are influenced by a combination of internal and external factors. Internal factors include learning habits, motivation, cognitive limitations, and misconceptions, while external factors encompass home learning environments, parental involvement, teaching methods, and access to learning resources. Furthermore, the review highlights several effective strategies to address these challenges, such as constructivist and inquiry-based learning approaches, the use of interactive learning media, and the integration of advanced educational technologies, including augmented reality and digital learning platforms. The bibliometric results show a consistent increase in research output over the past decade, with major contributions from the United States, China, and Indonesia, indicating growing global attention to this issue. Overall, this study provides a comprehensive overview of science learning difficulties among elementary school students and offers valuable insights that can inform future research directions and instructional practices in science education.*

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**KEYWORDS:** Bibliometric Analysis; Learning Science; Student's Difficulties; Systematic Literature Review.

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## 1. INTRODUCTION

Elementary science education has a crucial role in establishing the foundation of pupils' knowledge and critical thinking abilities. Education in schools encompasses not only literacy and numeracy but also aims to optimally prepare pupils intellectually, socially, and personally for active self-development. Science education equips students with foundational scientific principles while simultaneously cultivating their analytical, observational, and problem-solving abilities (Hodson, 2014). Natural sciences, as an academic discipline, seeks to empower students to engage proficiently with their environment (Maryani & Amalia, 2018; Mustika, 2022). This subject is expected to develop students' skills in solving problems through logical reasoning and systematic analysis (Hodson, 2014).

However, in science learning there are various challenges that can affect its effectiveness. Many students experience difficulties in learning science which results in low interest and learning outcomes. This has implications for the way science is taught (Westwood, 2016). Challenges in acquiring scientific knowledge are affected by multiple internal and external influences (Legault, 2020). Internal factors include students' cognitive abilities, interest in science subjects, and their perception of material difficulties (Deci & Ryan, 1990). Meanwhile, external factors include teaching methods, teacher competence, availability of facilities and infrastructure, as well as support from the family and school environment. According to research by Erdogan & Campbell (2008), a primary reason of students' challenges is the deficiency in conceptual comprehension resulting from a pedagogical method that emphasizes memory over conceptual investigation.

Another factor that is often stated is the competence of teachers in delivering science material. Research by Arnold (2011), indicating that teachers who are less trained in science teaching methods tend to use traditional approaches that are less actively involved with students. By understanding the tasks and stages of student development, teachers can anticipate developmental efforts and adjust developmental tasks accordingly with Student Phase (Khaulani et al., 2020). The availability of facilities such as science laboratories, teaching aids, and educational technology also plays an important role. Study by Margot & Kettler (2019), revealing that students who study in an environment with adequate facilities tend to have a better understanding compared to those who do not have such access. In addition, the support of parents and their involvement in the child's learning process are also determining factors for the success of science learning (Gruchel et al., 2022). A profound comprehension of these characteristics is crucial for devising more effective

and inclusive educational techniques.

On the other hand, the word "learning difficulties" indicates something different, because of its association with stigma and prejudice. Learning difficulties in students are situations where students are unable to learn as they should. This should not be left unattended and must be immediately handled by educators because the difficulties experienced by students if left unattended will be a barrier to achieving optimal learning goals (Arifin, 2020). Students' attitudes towards science learning have an impact on their willingness to continue learning science. There is broad agreement that the basic value is the critical years for the formation of scientific interest (Shapiro, 1994). Opportunities for learning can be created to guarantee that children with learning disabilities also gain from their science education (Bell, 2002).

Bibliometric analysis includes bibliographic studies conducted by researchers (Karakus et al., 2019). This method leads to an approach that aims to identify the publication trend of a variable through a statistical approach (Thompson & Walker, 2015). This investigation employs a quantitative methodology to investigate publication trends, including subjects, authors, citations, titles, and other pertinent factors (Li & Zhao, 2015). R-Biblioshiny is an online tool utilized via R-Studio for the analysis of bibliometric data. The VOSviewer software processes data, and the visualization outcomes are assessed to identify trends among related variables (Puspita et al., 2023).

This study aims to examine the factors affecting elementary school pupils' challenges in studying science. **The study was guided by the subsequent research questions:**

1. What are research trends regarding the factors influencing elementary school students' difficulties in learning science ?
2. What are the main themes and emerging areas in learning science difficulties research as identified through factorial analysis?
3. What are the factors that affect the difficulties of elementary school students in learning science?

## 2. METHOD

### 2.1. Study Design

This study seeks to investigate research trends concerning problems in scientific learning by bibliometric analysis from 2013 to 2023. Bibliometric analysis, utilizing the Preferred Reporting Items for Systematic Reviews and Meta-analyses (PRISMA) framework, is the preferred methodology due to its capacity to handle extensive research data across diverse subjects, facilitating descriptive quantitative analysis

(Donthu et al., 2021). This study is classified as quantitative research due to its analysis and interpretation of data based on year, author, geographical location, and document type produced (Kadirhanogullari & Kose, 2024; Martínez-López et al., 2018).

**2.2. Data Collection Tools**

The stages carried out at PRISMA go through 3 stages, namely (1) Identification, (2) Screening and (3) Including. In the identification phase through various sources, including Scopus with the help of the Publish or Perish (POP) software developed by Anne-Wil Harzing (2006), the researcher obtained more than 300 relevant papers, but after being identified again more deeply using the keywords "Learning Difficulties" OR "Learning Barriers" AND "Learning Sciences", the researchers obtained about 161 research papers that discussed

learning difficulties and science learning. The next step is to carry out the second process for the 161 papers mentioned earlier. In an effort to limit the number of references, researchers have excluded some papers. Specifically, we only used studies published between 2013 and 2023, which eliminated about 30 papers from the consideration phase.

This special time frame was chosen because it is felt to represent scientific advances made in the field of study devoted to studying the difficulties of learning science. At the screening stage, about 80 articles were obtained, of which about 50 papers were discarded for several reasons, including not containing the required data, not meeting the criteria and the unavailability of full-text articles. After the screening stage, around 21 articles were obtained that met the requirements and met the criteria needed in this study related to the difficulty of learning science. A clearer level of article collection and filtering can be seen in Figure 1 below.

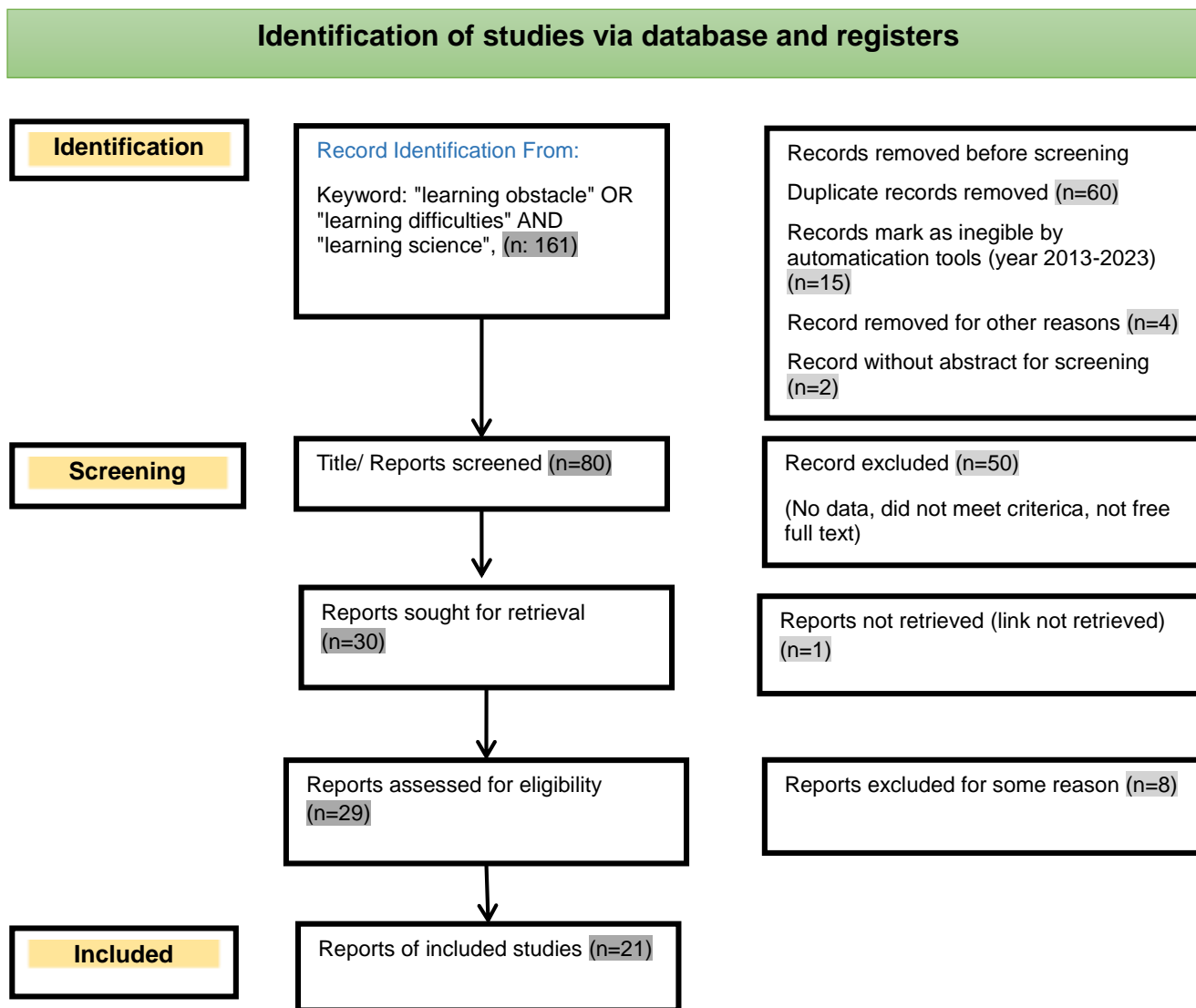


Figure 1: PRISMA Flowchart.

### 2.3. Data Analysis

This research intends to review and analyze various publications pertinent to the research issue from 2013 to 2023. A systematic literature review is a research methodology that emphasizes the identification, analysis, evaluation, and synthesis of all pertinent research findings to inform solutions to varied issues (Ananda et al., 2020). Bibliometric analysis was selected as the most suitable study method due to its capacity to manage extensive and widely distributed research material on intricate subjects. The primary benefit of this methodology is

its capacity to deliver contemporaneous statistical descriptive interpretations of data, consistent with the paradigm established (Donthu et al., 2021; Linnenluecke et al., 2019; Marzi et al., 2024). This study will offer comprehensive insights into the evolution and diversity of research on scientific learning issues by examining characteristics such as publication year, author, geographical origin, and publication type. This methodological approach aligns with the recommendations of Sampieri & Torres (2019) and Jiménez & Landero (2018) to enhance comprehension of the dynamics and patterns in pertinent research.

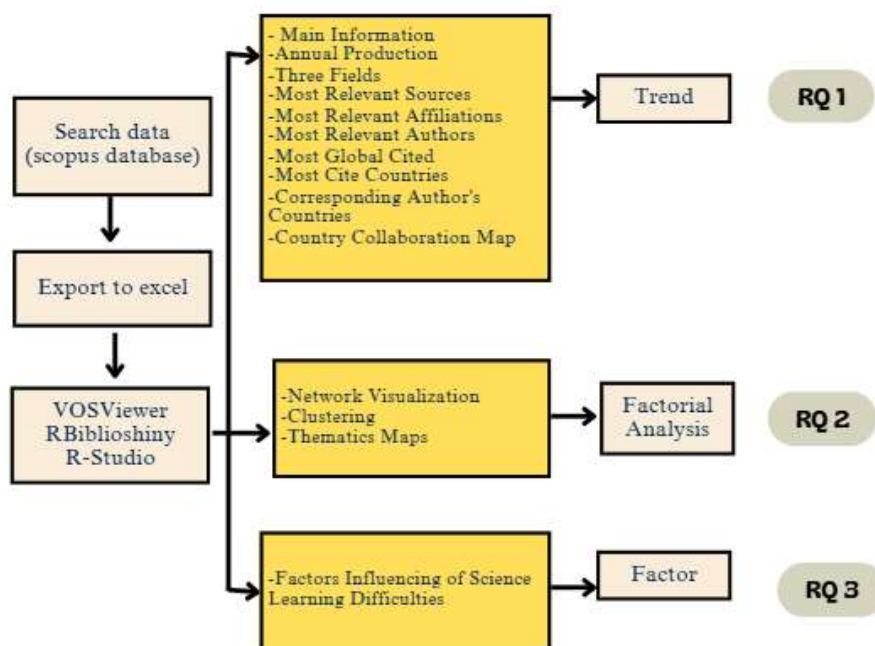


Figure 2: Data Analysis Technique.

### 3. RESULT

The comprehensive dataset in this investigation,

along with a summary of the principal characteristics of the acquired data, is shown in Table 1.

Table 1: Summary Of The Data Obtained.

Description	Results
<b>Main Information About Data</b>	
Timespan	2013:2023
Sources (Journals, Books, etc)	128
Documents	161
Annual Growth Rate %	6,29
Document Average Age	5,12
Average citations per doc	8,876
References	6373
<b>Document Contents</b>	
Keywords Plus (EN)	999
Author's Keywords (DE)	526
<b>Authors</b>	
Authors	476
Authors of single-authored docs	32
<b>Authors Collaboration</b>	

Single-authored docs	32
Co-Authors per Doc	3,06
International co-authorships %	13,66
<b>Document Types</b>	
Article	85

### 3.1. Annual Science Mapping Production

Science mapping seeks to illustrate the structure and dynamics of a study topic (Ramadhan et al., 2024). Science mapping is advantageous for delineating extensively discussed themes. Science mapping also offers insights into underexplored themes, enabling researchers to investigate them

more thoroughly (Aria & Cuccurullo, 2017). Science mapping analysis encompasses trend topics, highly cited works, three-field analysis, co-occurrence, clustering, conceptual mapping, and thematic mapping. This study is confined to journals published from 2013 to 2023. The study's results are illustrated in the below figure.

Table 2: Annual Production.

Year	Articles
2014	4
2015	8
2016	28
2017	24
2018	21
2019	21
2020	8
2021	13
2022	13
2023	21

The table shows the scientific production that occurred in 2013-2023. The increase occurred in 2016 with a total of 28 articles. Then it decreased again in 2020 which amounted to 8 articles. This shows that there is a significant change in the production of articles in that time span.

### 3.2. Three Fields

Three-Field Plot Diagrams, or Sankey diagrams, serve as an effective visualization method for illustrating the distribution of research subjects according to keywords, countries, and affiliations (Guleria & Chakma, 2023). These diagrams offer a thorough depiction of the interconnections among these parts and can aid in comprehending patterns and trends in the scientific literature (Federico et al., 2017).

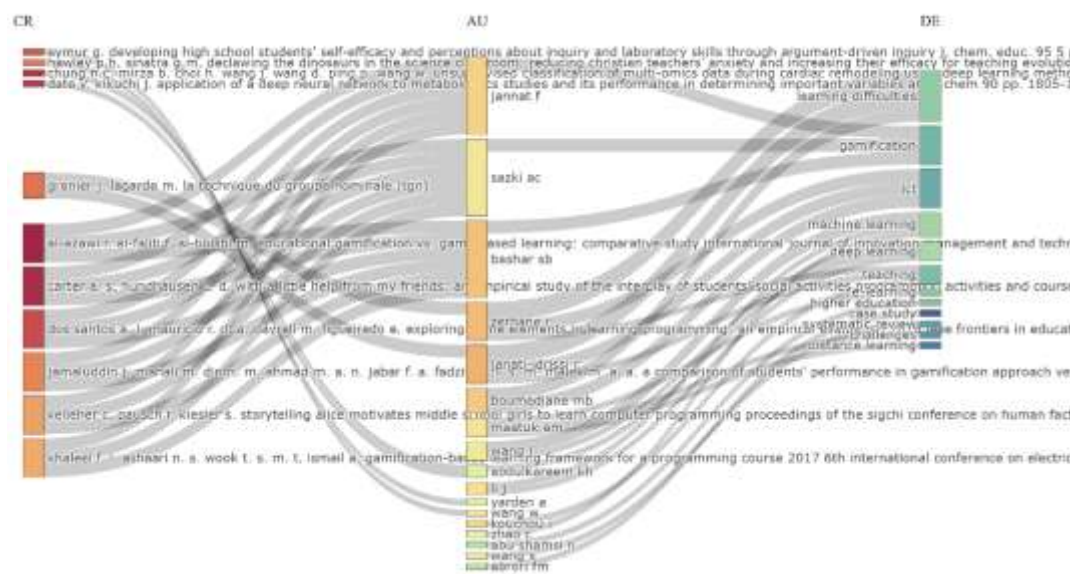


Figure 3: Three Fields Plot (Cited References, Authors And Documents).



The data indicates that several universities have substantial publications about Science Learning Difficulties. Universitas Pendidikan Indonesia has the first position with eight publications. Hassan II University and Sidi Mohamed Ben Abdellah University follow closely, both with 7 publications. The subsequent position is held by King Saud University and Universitas Pendidikan Indonesia Serang Campus, with a cumulative total of 6 publications. Subsequently, the Affiliated Hospital of

Zunyi Medical University, University of Aveiro, University of Michigan, and University of Texas at Austin each produced an equal number of articles, totaling 5. The City University of New York occupies the final spot with four publications. The picture illustrates the distribution of publications on Science Learning Difficulties across several universities.

**3.5. Most Relevant Authors**

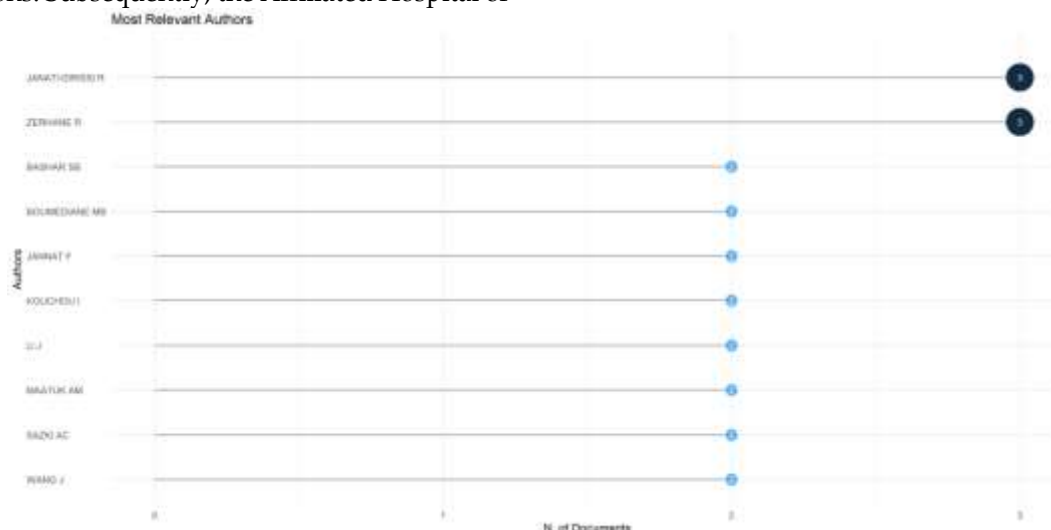


Figure 5: Most Relevant Authors.

This image shows a list of authors who have published articles related to science learning difficulties, along with the number of articles published. The authors with the highest number of publications are Janati-Idrissi R and Zerhane R with 3 articles. Followed by Bashar SB, Boumediane MB,

Jannat F, Kouchou I, Li J, Maatuk AM, Sazki AC, Wang J, who have published 2 articles each. The authors in this image have produced between 2 to 3 articles about this study.

**3.6. Most Global Cited**

Table 4: Most Global Cited.

Paper	Total Citations
Ansari D, 2012, Neuroethics	123
Mikkonen K, 2016, Int J Nurs Stud	104
Castonguay Lg, 2010, Psychotherapy	70
Prediger S, 2008, Learn Instr	63
Tibell Lae, 2017, Sci Educ	61
King D, 2008, Res Sci Educ	61
Grauslund J, 2022, Diabetologia	50
Halim As, 2018, Cbe Life Sci Educ	49
Badrloo S, 2022, Remote Sens	47
Planas N, 2014, Educ Stud Math	43

An analysis of the number of global citations in several papers related to science learning difficulties, it can be seen that the paper that was cited in large numbers was the paper 'Ansari D' with a total of 123 citations. It was followed by 'Mikkonen' with 104 citations. Meanwhile, other papers have a number of citations that range from 43-70 citations. The paper

'Ansari D' shows the focal point in the research on science learning difficulties. While other papers show that it has an important role in research and discussion in this field, although it has a different level of significance.

**3.7. Most Cited Countries**

Table 5: Most Cited Countries.

Country	TC
USA	310
Canada	141
Finland	104
Germany	83
Spain	80
China	70
Australia	64
Sweden	61
Israel	53
Denmark	50

In table 5 the USA is the most cited country, with a total of 310 citations. This shows that research originating from the USA has a high impact on this literature. Next is the country of Canada with 141 total citations. Followed by Finland, Germany, Spain,

China, Australia, Sweden, Israel, and Denmark with a total of 104-50 citations.

Corresponding Author's Countries

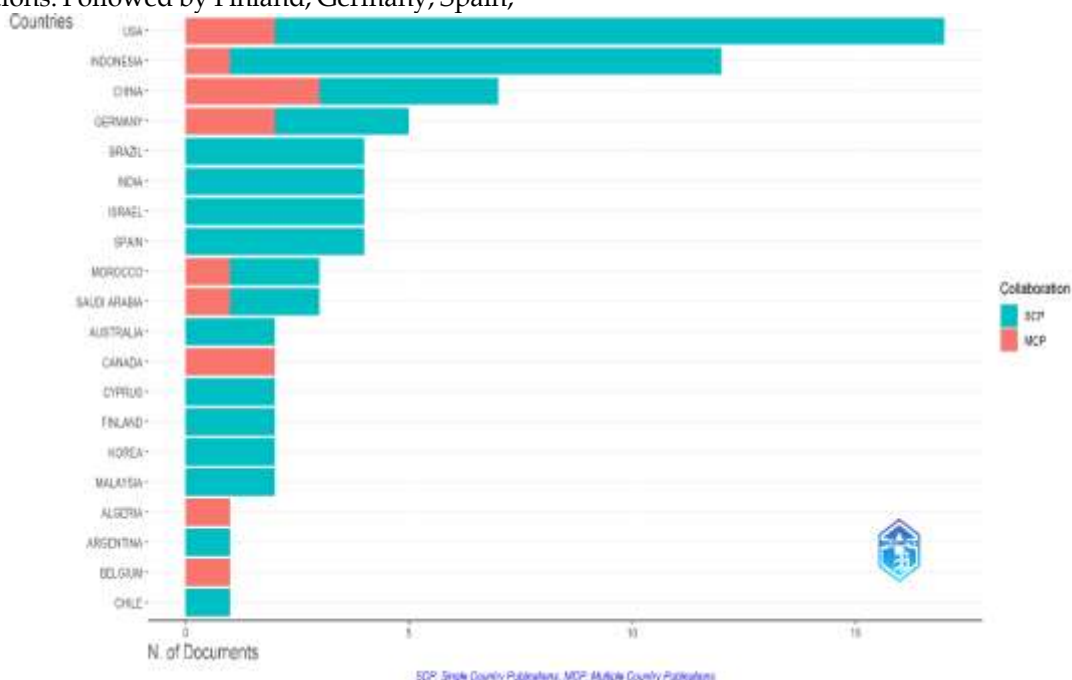
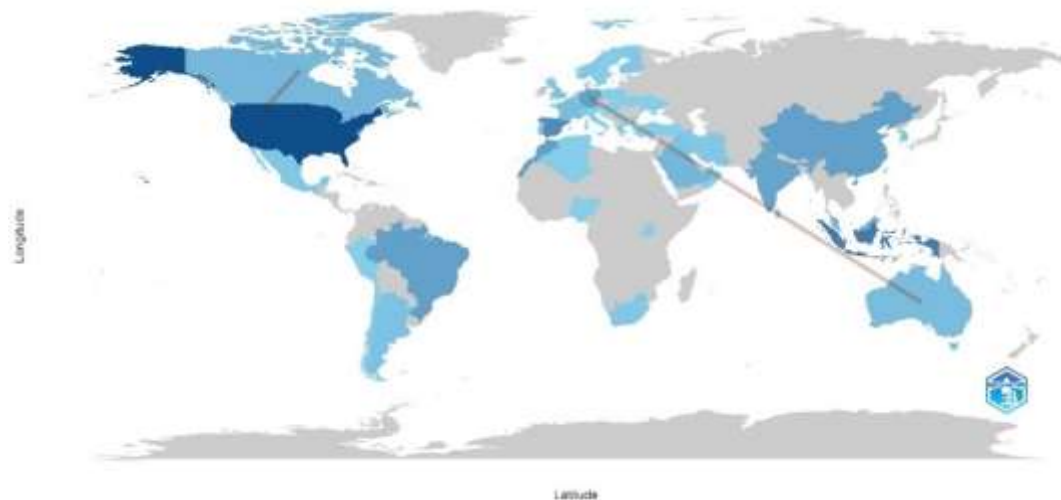


Figure 6: Corresponding Author's Countries.

This figure illustrates the quantity of research documents categorized by the nation of origin of the corresponding author, with collaboration classified into two types: Single nation Publication (SCP) and Multiple Country Publication (MCP). MCP is shown by red, signifying partnership among nations. The USA has a large contribution to the research of science learning difficulties with the highest number of documents. Indonesia is ranked second with SCP-

dominated documents. This shows that Indonesian researchers are active but the level of international collaboration of MCP is low. Other countries such as China, Germany, Brazil and India also showed significant levels. Thus, this research is dominated by developed countries, namely the USA and Germany, as well as developing countries, namely Indonesia and China.

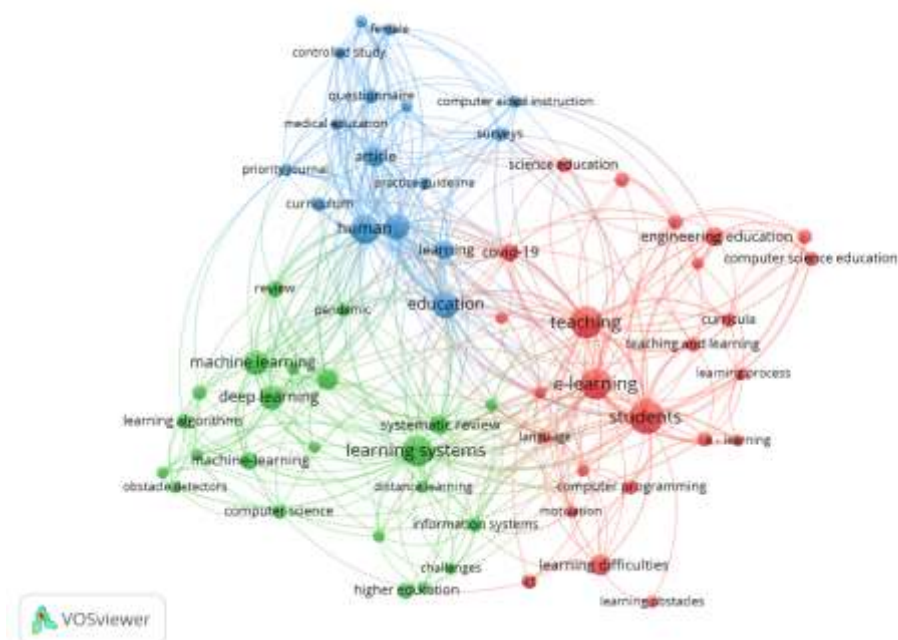


**Figure 7: Country Collaboration Map.**

Figure 7. shows collaboration between countries related to science learning difficulties research. Countries that have dark colors like America show a high level of collaboration compared to other countries. Various European nations, like Germany and the United Kingdom, alongside Asian countries such as China and India, exhibit a tendency of collaboration between developed and emerging nations. Then there are several red lines that are the

connecting lines between countries. This line signifies collaboration in the form of joint publications between countries such as the relationship between the United States, Europe and Asia shows a wide network of collaboration in this study.

### 3.8. Conceptual Structure



**Figure 8: Network Visualization.**

The image displays a network map that shows the relationships between different themes or keywords. Cluster 1 in red which has the main themes of *teaching*, *e-learning*, *students*, and *learning difficulties* is very relevant to learning technology and methods.

Cluster 2 in green with the main themes of *machine learning*, *learning systems*, *deep learning*, and *systematic review* shows that technology can make the education system more efficient. Cluster 3 in blue has the main themes of *human*, *education*, *learning-covid-19*, and

medical education, showing a significant impact on adaptation in science learning difficulties.

3.9. Factorial Analysis

Cluster refers to the process of grouping objects or entities into groups based on similarities in certain characteristics or attributes. The purpose of clustering is to identify natural patterns in the data that may not be directly visible.

Table 6: Keywords Within Each Cluster.

Cluster 1	Cluster 2	Cluster 3
Child Computer programming Computer science education Covid-19 Curricula e-learning Education Computing Engineering Computing Gamification Ict language learning difficulties learning obstacles learning process linguistics motivation Science Education STEM students teacher education teachers' teaching Teaching and Learning Thematics Analysis	Artificial intelligence Bioinformatics Challenges Computer science Data science Deep learning Distance learning Feature extraction Forecasting Higher education Information science Information system Learning algorithms Learning systems Machine learning Machine-learning Obstacle detection Obstacles detectors Online learning Pandemic Reviews Software engineering Systematic review	Article Computer aided instruction Controlled study Curriculum Education Female Human Humans Implementation science Learning Male Medical education Practice guideline Priority journal Questionnaire Surveys

A thematic map is a visual tool used to display the distribution of academic articles or scientific publications in different regions or countries (Agbo et al., 2021). This thematic map helps in visualizing the distribution of scientific articles based on certain

variables, such as the number of articles or the level of research activity within each region (Andriani et al., 2023; Kismoyo et al., 2023). The vertical axis represents density, whereas the horizontal axis denotes centrality (Pai et al., 2022).

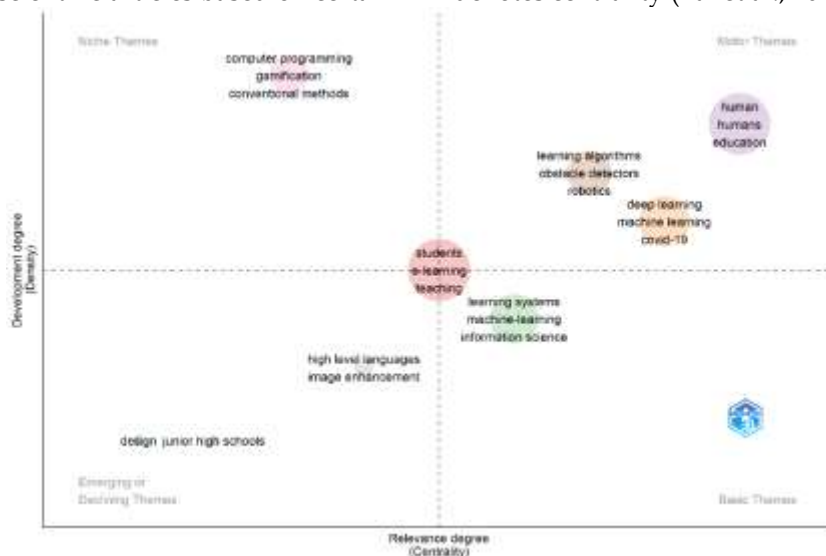


Figure 9: Thematics Maps.

The figure shows the relationship between the themes in this study based on 2 dimensions, namely

centrality (relevance) and density (level of development). The quadrant of motor themes in the

top right shows high relevance and high density. The main themes in this quadrant, namely human, humans, education, deep learning, machine learning, covid-19, learning algorithms, obstacle detectors and robotics are very relevant and show that this area has a big role. The Niche Themes quadrant, located at the upper left position, exhibits low relevance and high density. The themes of computer programming, gamification and conventional methods fall within this quadrant. Furthermore, the basic themes quadrant is in the bottom right, showing high relevance but low density. The themes contained in

this quadrant are learning systems, machine learning, and information science. The quadrant at the lower left position, representing developing or declining themes, indicates low significance and density. This quadrant encompasses themes of junior high school design, high-level programming languages, and image enhancement. These subjects have minimal growth. The key themes encompass students, e-learning, and teaching, indicating that this theme is the primary focus and significantly impacts the surrounding themes.

**Table 7: Factors Influencing Of Science Learning Difficulties And Extent Of Significance.**

	Factors	Researcher	Levels of statistical significance	Effects
1.	Learning Strategies and Interventions	(Sabaylah & Muhammad, 2023)	Constructivist-based teaching strategies have high significance in improving student learning with learning difficulties	Positive
		(Figueiredo & García-Peñalvo, 2022)	HT Programming tools significantly support programming learning.	Positive
		(Akram et al., 2022)	Science can improve student understanding through a more structured approach	Positive
		(Turan & Atila, 2021)	AR technology improves learning outcomes and student engagement.	Positive
		(Maryani, 2019)	Guided inquiry-based magazines are significantly effective in improving student understanding.	Positive
2.	Technological Tools in Learning	(Jian, 2022)	Eye-tracking tools help students understand the material better.	Positive
		(Nahas et al., 2021)	Online learning is not effective in supporting students.	Negative
		(Young-joon et al., 2016)	Flipped learning is more effective	Positive
3.	Learning Difficulties in Science	(Santos, 2022)	External factors and assignment instruction cause student difficulties. The average score of difficulty based on factors such as subject matter (M = 3.79) and home environment (M = 3.57) was statistically analyzed.	Negative
		(Novianti et al., 2022)	Physical (internal) and community (external) factors have a great influence on students' learning difficulties.	Negative
		(Simatupang, 2020)	Factors such as study habits and motivation have a moderate impact, while interests and learning resources have a high impact.	Negative
		(Hanum, 2020)	36% of students showed interest in learning, and 70% had difficulty understanding concepts.	Negative
		(Prabha, 2020)	70.22% of students experienced conceptual difficulties, and 97% suggested more activities in class.	Negative
		(Manik, 2018)	The cognitive aspect (remembering, understanding, evaluating) is the main obstacle.	Negative
		(Oyoo, 2017)	Language barrier	Negative
4.	Adaptation Strategies in Learning	(Relano et al., 2022)	Students' adaptation strategies are high, so they are able to help students face learning difficulties.	Positive
		(Kim & Linan-Thompson, 2013)	Self-regulation supports student learning	Positive
5.	Parental Influence and Environment	(Chi et al., 2017)	Interests, parents' work, and learning difficulties are significantly related to student competence.	Positive
		(Fitria, 2022)	Lack of attention and ability to solve problems results in difficulties	Negative
6.	Role of Inquiry-Based Learning	(Espino, 2017)	Educational orientation improves student understanding	Positive
		(Sadiqin et al., 2017)	Problem-solving-based teaching is effective.	Positive

The results of the research in the table show various factors that affect student learning, including *learning strategies and interventions, technological tools in learning, learning difficulties in science, adaptation strategies in learning, parental influence and environment, and role of inquiry-based learning.*

## 4. DISCUSSION

### 4.1. Trends In Factors Influencing Elementary Students' Science Learning Difficulties.

Through bibliometric analysis, research trends

show that topics related to factors that affect students' difficulties in learning science in learning have been growing in recent times. This study delineates the strong correlation among authors from diverse institutions, highlighting the utilization of significant keywords such as learning methodologies, student challenges, and science education. This research is predominantly led by countries such as the United States, China, and Indonesia. Key themes include technology adaptation in learning, constructivist-based interventions (Sabaylah & Muhammad, 2023), and the role of the social environment (Chi et al., 2017; Fitria, 2022). In addition, emerging areas involve the exploration of adaptive learning (Relano et al., 2022), the application of advanced technology (Jian, 2022), and collaboration-based methods to overcome student difficulties.

#### **4.2. Main Themes And Emerging Areas In Learning Science Difficulties Through Factorial Analysis**

Factor analysis revealed predominant themes included gamification, integration of information and communication technology (ICT), machine learning, and inquiry-based methodologies. Inquiry is a methodical process employed to generate questions and examine natural facts or occurrences (Antonio & Prudente, 2021). Each inquiry process is an essential element because it plays a role in directing students towards a more functional learning process and supporting them in understanding the material in depth (Opstal & Daubenmire, 2017). Gamification and information and communication technology (ICT) have demonstrated efficacy in enhancing student engagement, whilst machine learning facilitates the personalization of the educational experience. Moreover, inquiry-based methodologies and peer cooperation are essential in enhancing comprehension of intricate scientific concepts. The analysis highlights not just significant topics but also emerging areas of focus, including the application of artificial intelligence (AI), environmental science education, and the incorporation of neuroscience to comprehend students' cognitive load. Hybrid and blended learning models are also the focus of research as a flexible solution to support students with diverse learning preferences.

#### **4.3. Factors Affecting The Difficulties Of Elementary School Students In Learning Science**

Investigations utilizing learning methodologies and interventions demonstrated consistently

favorable results. Utilizing constructivist-based methodologies, technologies like HT Programming and Augmented Reality (AR) positively enhance science learning among students. Constructivist learning strategies (Sabaylah & Muhammad, 2023) and learning using magazines *guided inquiry* (Maryani, 2019) proven to be effective in improving student understanding. These results show the importance of using active teaching methods. In addition, technologies such as AR (Turan & Atila, 2021) and HT Programming tools (Figueiredo & García-Peñalvo, 2022) also contribute to positive learning outcomes. This shows that learning using innovative approaches and planned interventions can help students better understand the material effectively.

Technological tools are proven to provide varied results. Eye tracking tools (Jian, 2022) and flipped learning approach (Young-joon et al., 2016) showing a positive impact on students' learning comprehension. However, online learning (Nahas et al., 2021) In his research, he concluded that it was less effective, which indicated the need for further innovation in technology-based learning to be more relevant to student needs. The integration of technology tools in learning needs to be adapted to the local context and challenges in order to optimize its benefits. This underscores the need of utilizing technology that aligns with students' requirements to enhance the efficacy of the learning process.

Learning difficulties factors, especially in the field of science, show a dominant negative effect. Obstacles come from external factors such as the home environment (Santos, 2022) and internal such as interest and motivation of study habits (Simatupang, 2020) contribute to student difficulties. Cognitive impairment (Manik, 2018) and difficulty understanding the concept (Hanum, 2020; Prabha, 2020) is also a major challenge. The data shows that more than 70% of students have difficulty understanding concepts, indicating the need for a more structured and exploratory approach to learning. Language barrier (Oyoo, 2017) It also needs to be considered, especially in the context of students studying science in a foreign language. This study states the importance of a holistic approach in overcoming these various obstacles, both through the mentoring role by teachers, the support provided by parents and the interest and motivation of learning in the students themselves.

Adaptation strategies such as self-regulation and student abilities (Kim & Linan-Thompson, 2013) helping students overcome learning challenges. This strategy has a positive effect on learning. Research

shows that students who have a good adaptation strategy are better able to face academic challenges and obtain better results.

The influence of parents and the environment also has a significant impact. Parents' interest and attention play an important role in supporting student learning in school (Chi et al., 2017). However, lack of parental attention (Fitria, 2022) can further make students experience difficulties and motivation to learn. Therefore, there is a need for intervention to increase parental involvement in the child's learning process.

The inquiry-based approach (Espino, 2017) and troubleshooting (Sadiqin et al., 2017) have been demonstrated to enhance students' comprehension of challenging subjects. Inquiry-based learning substantially enhances the development of critical thinking skills. This method promotes student engagement in the exploration and comprehension of scientific subjects.

## 5. CONCLUSION

This study seeks to examine the factors influencing the challenges faced by elementary school pupils in learning science through a systematic literature review and bibliometric analysis. The primary objective of this study is to ascertain the challenges and impediments encountered by students, both intrinsic and extrinsic, and to assess the efficacy of techniques and technology implemented to surmount these

challenges. This study seeks to present a comprehensive review of global trends in scientific education research, particularly concerning learning at the elementary school level. Various factors were found to have a significant influence on the difficulty of learning science. Internal factors such as study habits, motivation, and cognitive barriers, as well as external factors such as home environment, parental attention, and lack of learning resources, have proven to be the main culprits. Constructivist learning tactics, augmented reality technology, and inquiry-based methods have demonstrated a beneficial effect on enhancing student learning results. The association among authors from diverse universities demonstrates robust collaboration, featuring prominent keywords such learning methodologies, student challenges, and science education. The research is mostly led by the United States, China, and Indonesia, all of which have advanced novel methodologies in science teaching. Key themes include technology adaptation, inquiry-based learning, and constructivist-based interventions. These findings can spur the development of new innovations in learning strategies, expand access to educational resources, and increase the active role of parents and teachers in supporting the student learning process. Future research is expected to integrate these insights with broader empirical data, resulting in more comprehensive solutions to improve science learning at the primary school level.

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