Harmony in Education: An In-Depth Exploration of Indonesian Academic Landscape, Challenges, and Prospects Towards the Golden Generation 2045 Vision

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Abstract **– Education stands as the bedrock of individual growth and a defining force in shaping a nation's identity. Serving as a fundamental pillar for societal advancement, it emerges as a paramount investment for cultivating a golden generation marked by prosperity, health, and equitable communities. In the expansive landscape of global education, Indonesia boasts one of the largest systems, with a resolute commitment from the government evident in high budget allocations. However, despite these endeavors, Indonesia grapples with challenges, reflected in its low international education ranking, currently standing at 6th from the bottom. This study meticulously explores the core challenges embedded in the Indonesian educational system. Using bibliometric analysis following the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines, the authors scrutinized 367 high-quality articles from the Scopus database spanning from August 2000 to 2023. The findings reveal 12 central issues, including curriculum dynamics, persistent educational inequalities, teacher shortages, infrastructure limitations, the specter of corruption, escalating dropout rates, and more. These insights guide policymakers, educators, and researchers committed to navigating and transforming Indonesia's educational landscape toward a brighter future.**

Keywords **– Education challenges, teacher training, educational technology, inclusivity, curriculum, educational inequality, golden generation.**

DOI: 10.18421/TEM133-71
https://doi.org/10.18421/TEM133-71

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Received: 03 February 2024.
Revised: 04 June 2024.
Accepted: 19 June 2024.
Published: 27 August 2024.

1. Introduction

Education emerges as the cornerstone of Human Resource Development (HRD), functioning as a pivotal force in crafting a resilient, dynamic, and technologically adept workforce through collaborative efforts with industries and the global talent pool [1], [2], [3]. The right to education finds its foundation in various international documents, with the Universal Declaration of Human Rights, a landmark text adopted by the United Nations in 1948 that articulates this right in Article 26 [4]. This declaration emphasizes the accessibility of free education, particularly in the elementary and fundamental stages [5], [6].

Further emphasizing the importance of education as a fundamental human right, the International Covenant on Economic, Social, and Cultural Rights, also endorsed by the United Nations, mandates that each participating state guarantees access to quality education, supports a universal education system, and promotes higher education [7], [8].

Aligned with this global commitment, Sustainable Development Goal #4, part of the 2030 Agenda for Sustainable Development, aims to ensure inclusive, equitable, and high-quality education [9].

By 2030, it seeks to guarantee that every child and youth has access to free, fair, and excellent education at all levels. This goal prioritizes lifelong learning opportunities and emphasizes equal access to education for all, regardless of gender, social background, disability, or other characteristics [10].

Within the national development agenda for 2020-2024, a key objective is to enhance the quality and competitiveness of the country's human resource [11]. This strategic initiative aims to shape the next generation into exemplars of health, intelligence, adaptability, innovation, skill, and strong ethical character. Education thus stands as the primary instrument to forge elite and competitive human resources, aligning with the broader global commitment to sustainable development and equitable educational access [12], [13].

In Indonesia, the bedrock of state activities lies in the Pancasila principles, encompassing five universal core values: belief in the one and only God, humanity, unity in diversity, democracy, and social justice [14]. These principles serve as the moral and ethical compass for the nation, guiding educational initiatives. Envisaging its 2035 education system as a source of lifelong learners who continually evolve and uphold moral values, Indonesia's educational roadmap, guided by the 2020-2035 vision, intertwines Indonesian cultural values and Pancasila principles into the educational fabric for the golden generation [15].

Designed with meticulous foresight, the roadmap anticipates and addresses disruptions caused by global technological, social, and environmental changes. In an era of transformative shifts, cultivating highly competitive human resources becomes imperative to strengthen Indonesia's resilience and pave the way for greater prosperity. Education, which plays a pivotal role in this mission, goes beyond imparting knowledge in science and technology. It aspires to instill critical thinking, foster a strong character, nurture tolerance, encourage independence, promote critical reasoning, inspire creativity, and cultivate a spirit of collaboration [16], [17].

The COVID-19 pandemic has significantly impacted the Indonesian education sector, disrupting traditional in-person learning opportunities for nearly two years. Amidst suboptimal in-school learning processes, urgent recovery efforts are needed, including adapting educational facilities and infrastructure to changing circumstances [18]. In response to the challenges posed by the pandemic, information, and communication technology (ICT) has emerged as an essential tool despite encountering limitations.

Various technological innovations have been applied in learning, such as augmented reality (AR) [19], virtual reality (VR) [20], computer-assisted instruction [21], blockchain, and artificial intelligence (AI) [22].

Additionally, learning management systems (LMS) have also played a crucial role in supporting online or blended learning processes [23]. As the world transitions from the pandemic to the post-pandemic phase, a fundamental transformation in the learning process is imperative, moving from predominant home-based learning to a diversified approach encompassing in-person instruction and blended learning strategies [24], [25], [26].

However, Indonesia faces persistent educational challenges, which hinder efforts to improve the quality and accessibility of education. Despite substantial budget allocations, the impact of education on the gross domestic product (GDP) remains relatively low at around 3.9%. A uniform curriculum across the nation contrasts sharply with significant disparities in educational facilities between schools [27]. The multiple iterations of the curriculum, including KBK (2004), KTSP (2006), and K-13 (2013), indicate a struggle to align with present-day realities, evident in Indonesia's high unemployment rate and the critical need for reforms to address school disparities. The introduction of the Merdeka curriculum in 2021 represents a significant governmental initiative for educational recovery [28]. Emphasizing project-based learning and soft skill development, the curriculum aims to align with the Pancasila learner profile. However, its impact remains limited due to teacher readiness and unequal availability of facilities, exacerbating educational disparities between rural and urban areas [29], [30].

The state of education in Indonesia raises concerns, and data from the 2018 Program for International Student Assessment (PISA) reveal that Indonesian students scored below the OECD average in reading, mathematics, and science [31], [32]. PISA, a triennial survey assessing the proficiency of 15-year-old students, underscores the need for comprehensive reforms to align the education system with current needs, address rural-urban disparities, and nurture critical thinking skills essential for meeting the challenges of the modern world [32], [33].

The results of the PISA test, presented in Table 1, reveal that the Indonesian education system has not yet achieved the objective of cultivating students with robust critical thinking, literacy, and numeracy skills. Notably, Indonesia's PISA test scores lag behind those of Malaysia and Brunei Darussalam within the ASEAN context, signaling a critical imperative for substantial enhancements in the national education system [34].

These results emphasize the pressing need for reforms aimed at elevating the overall quality of education, raising proficiency levels among students, and bridging the gap with international standards.

Effectively addressing these challenges is paramount to preparing Indonesia's future generations to maintain competitiveness in the ever-evolving global landscape.

Table 1. Indonesia's PISA rankings [34]

No.	Year	Rank	Number of Countries	Score	Mean Score (International)
1.	2000	39	41	367	500
2.	2003	38	39	360	500
3.	2006	50	57	391	500
4.	2009	61	65	371	496
5.	2012	64	65	375	494
6.	2015	63	70	386	490
7.	2018	73	79	379	489

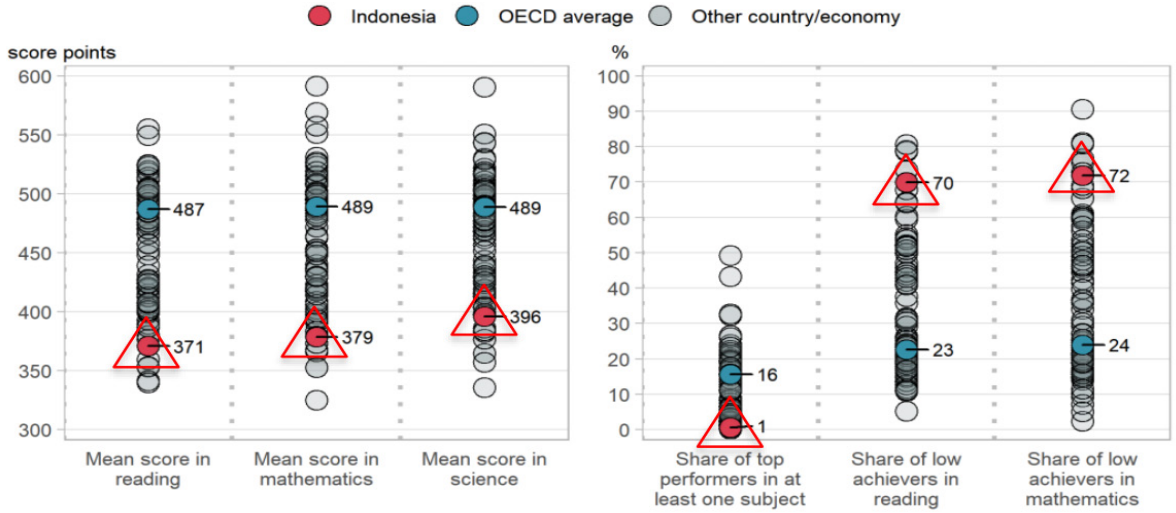


Figure 1. Snapshot of performance in reading, mathematics, and science

In the PISA 2018 evaluation, Indonesian students secured an average score of 379 (Figure 1). While this score was lower than the achievement in PISA 2015, which reached 402 points, it is noteworthy that in PISA 2018, Indonesia attained the second-highest average score in science across all periods of PISA assessments. Specifically, in science, Indonesia achieved an average score of 396 in PISA 2018, marking a 3-point increase compared to the initial PISA evaluation conducted in 2000. The lowest point in the average science scores was recorded in PISA 2012 at 382 points (Figure 2) [32].

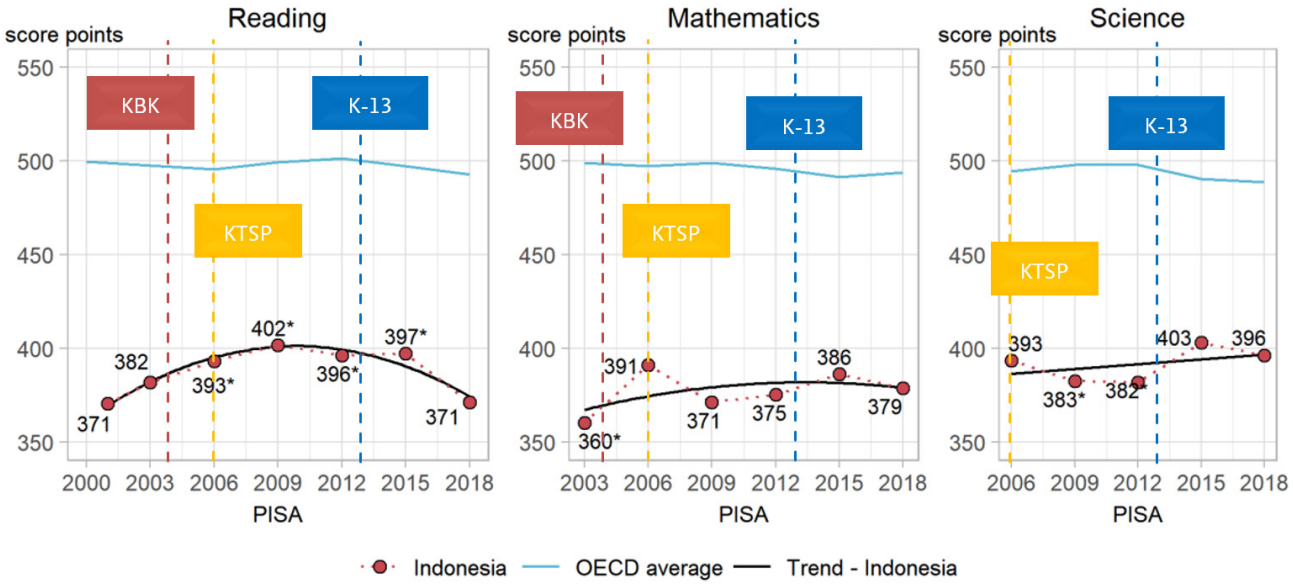


Figure 2. Trends in performance in reading, mathematics, and science

The results of the 2018 PISA survey placed Indonesia in the 73rd position of 79 countries, ranking sixth from the bottom. Subsequently, in 2023, worldtop20.org released its ranking of world education systems, covering 20 countries, where Indonesia landed in the 67th spot among 203 nations, failing to make the coveted list [35]. Despite more than 95% of Indonesians reporting happiness at school, surpassing even Shanghai, known for its strong performance in mathematics and science, the educational ranking discrepancy persists.

Indonesia has significant opportunities in the education sector, with a historic allocation of 612.2 trillion rupiah in the 2023 national budget (APBN) [36]. As Indonesia approaches its 100th anniversary in 2045, coinciding with a demographic dividend, the pressing question remains: why does Indonesia's education ranking lag behind? This paradox underscores the intricacies of Indonesia's education landscape, where substantial investment and a promising demographic advantage face challenges in translating resources into improved educational outcomes.

The primary objective of this study is to unveil insights into the challenges within the Indonesian education system, delving into why educational outcomes have not met expectations. Using a two-pronged approach, this research combines the methodological rigor of a PRISMA review with bibliometric analysis. The PRISMA framework ensures a systematic and transparent examination of existing literature, identifying and synthesizing key findings and emerging trends [37], [38].

Simultaneously, bibliometric analysis utilizing the Scopus database provides valuable insight into the evolving research landscape related to educational challenges in Indonesia. This comprehensive approach aims to shed light on recurring themes, knowledge gaps, and emerging concerns while identifying influential works, prolific authors, and prominent outlets for scholarly discourse [39], [40]. The ultimate goal is to offer a valuable resource for diverse audiences, including educators, policymakers, and scholars, equipping decision-makers with well-informed information to contribute to positive transformations within Indonesia's educational sphere.

2. Materials and Methods

This study adhered to the PRISMA guidelines for systematic reviews and meta-analyses, ensuring a rigorous and high-quality review process, as shown in Figure 3. A two-pronged approach, integrating statistical methods with bibliometric analysis to achieve comprehensive results was employed. Bibliometric analysis, known for its effectiveness in exploring and analyzing scientific data, was central to our research [41]. Our analytical toolkit included RStudio, VOSviewer, Python, and MS Excel, which facilitated both data analysis and visualization.

The research methodology encompassed a meticulously planned sequence of steps: 1) formulation of precise research questions, 2) systematic search and compilation of datasets, 3) meticulous selection of pertinent studies for inclusion, 4) extraction and compilation of relevant data, 5) execution of rigorous data analysis, 6) visualization of key findings, 7) thoughtful interpretation of results, and 8) comprehensive reporting of the findings. This methodological rigor ensures the reliability and validity of the study, providing a solid foundation for deriving meaningful insights into the challenges within the Indonesian education system.

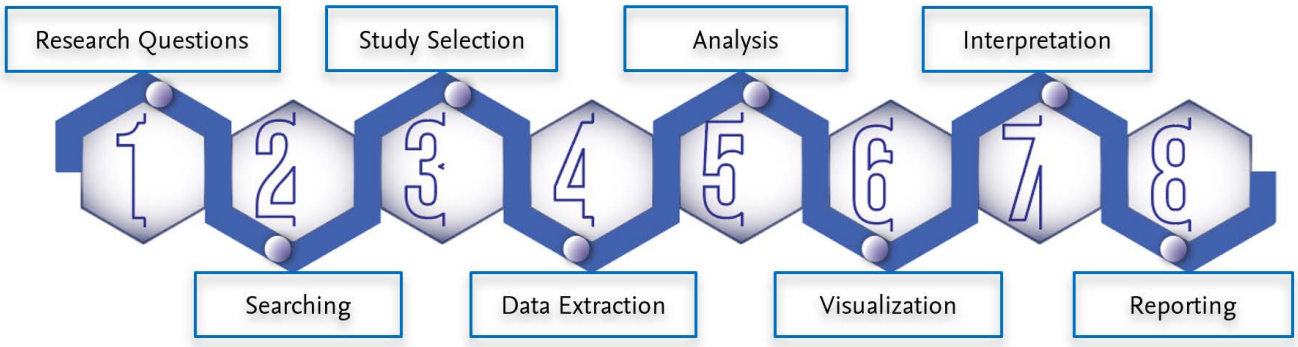


Figure 3. Research procedure

Initiating the research process began with a precise definition of the research questions or objectives. This study systematically addresses the following key inquiries:

1) What are the current research trends in Indonesian education?
2) What are the key factors causing the ongoing educational challenges in Indonesia?

After formulating the research questions, the next step was to identify a relevant dataset or data source aligned with the research objectives. The Scopus database was selected for this study, as shown in Figure 4. The data retrieval query was carefully designed as follows:

(TITLE-ABS-KEY ("Education") AND TITLE-ABS-KEY ("Indonesia") OR TITLE-ABS-KEY ("Challenges") AND TITLE ("Education in Indonesia") OR TITLE-ABS-KEY ("Quality") AND TITLE ("Education") AND TITLE ("Indonesia")) AND PUBYEAR > 1999 AND PUBYEAR < 2024 AND (LIMIT-TO (DOCTYPE , "ar") OR LIMIT-TO (DOCTYPE , "cp")) AND (LIMIT-TO (SRCTYPE , "j") OR LIMIT-TO (SRCTYPE , "p")) AND (LIMIT-TO (LANGUAGE, "English")).

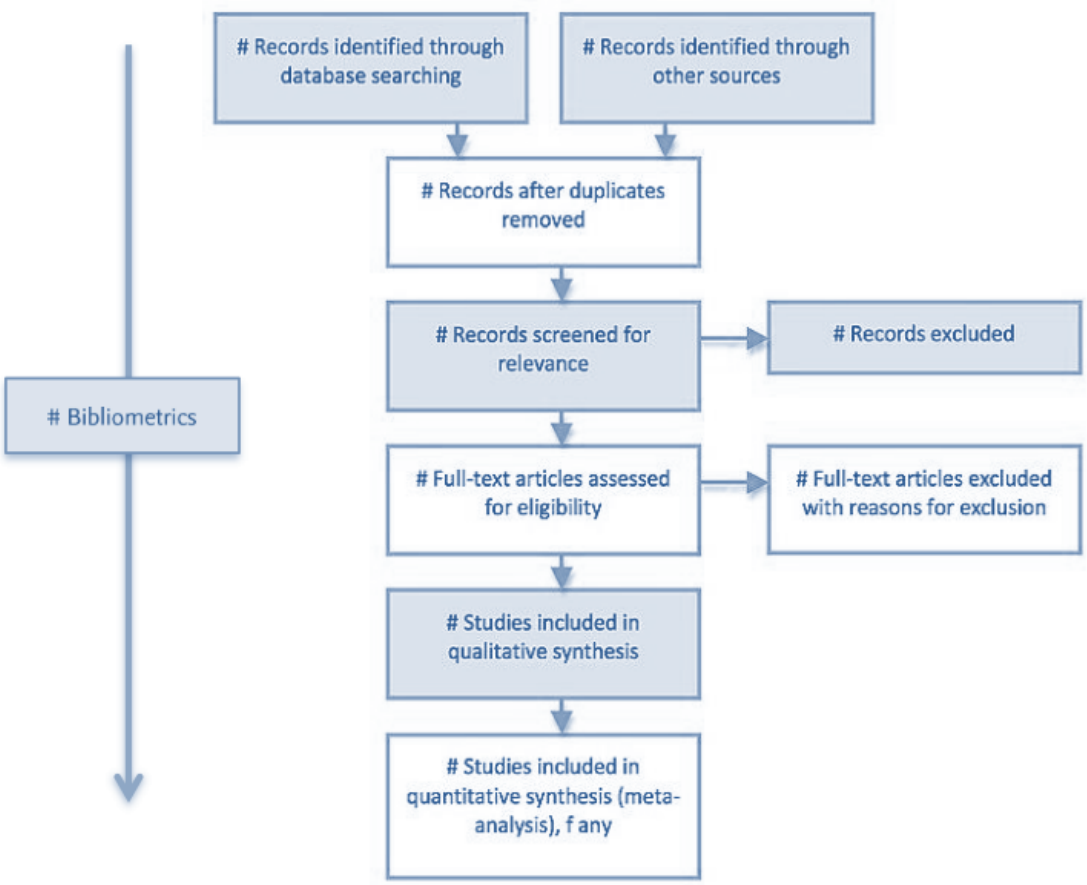


Figure 4. The PRISMA flow diagram

After identifying the dataset or source, studies or data relevant to the research questions were systematically selected using specific inclusion and exclusion criteria. The inclusion criteria were: 1) English-language articles; 2) journal articles and conference proceedings; 3) publications from 2000 to 2023; 4) studies focused on the educational research area; and 5) articles addressing educational challenges in Indonesia. Conversely, the exclusion criteria were: 1) non-English articles; 2) duplicated and redundant articles; and 3) articles unrelated to educational challenges in Indonesia. This meticulous approach ensured that the curated data were both relevant and high-quality.

The data extraction phase involved the thorough collection of relevant information, variables, and indicators from the carefully selected dataset or source.

Ensuring metadata completeness was crucial during this phase, as it supports meticulous documentation and effective utilization of data for subsequent analysis and interpretation.

Following data collection, bibliometric data analysis was conducted in strict adherence to PRISMA guidelines. This analysis combined statistical and qualitative methods to address the research questions effectively. Data visualization techniques, including graphs and tables, were used to enhance the clarity and impact of the research findings.

After completing the analysis and visualization, the next critical step was interpreting the results to address the research questions. The final phase involved creating a comprehensive research report that encapsulated the findings, discussions, and conclusions derived from the study.

3. Results and Discussion

Efficient information management relies on the completeness and accuracy of bibliographic metadata. These attributes not only facilitate quick access to relevant publications but also ensure proper citation of sources, contributing to the recognition of authors and publishers.

Database providers or publishers typically establish stringent standards for bibliographic data accuracy, with a keen emphasis on the quality and consistency of data entry. However, researchers should exercise due diligence in verifying the accuracy of bibliographic data before incorporating them into their research or for any other purpose.

Table 2. The completeness of bibliographic metadata

Metadata	Description	Missing Counts	Missing %	Status
AB	Abstract	0	0.00	Excellent
DT	Document Type	0	0.00	Excellent
SO	Journal	0	0.00	Excellent
LA	Language	0	0.00	Excellent
PY	Publication year	0	0.00	Excellent
TI	Title	0	0.00	Excellent
TC	Total citation	0	0.00	Excellent
AU	Author	2	0.54	Good
CR	Cited references	4	1.09	Good
C1	Affiliation	6	1.63	Good
DE	Keywords	61	16.62	Acceptable
DI	DOI	73	19.89	Acceptable
RP	Corresponding author	136	37.06	Poor
ID	Keywords plus	268	73.02	Critical
WC	Science categories	367	100.00	Completely missing

Table 2 provides a comprehensive evaluation of the completeness of bibliographic metadata within our dataset. This assessment scrutinizes various metadata elements, delineating their presence or absence and quantifying the extent of missing data.

Notably, a substantial portion of the metadata demonstrates exceptional completeness, encompassing elements such as abstract, document type, journal, language, publication year, title, and total citations. These elements collectively attain an 'Excellent' status, boasting a notable absence of missing entries. Conversely, specific metadata categories, such as authorship information (AU), cited references (CR), and author affiliations (C1), exhibit commendable completeness, earning a 'Good' status despite minor gaps.

However, certain elements, including keywords (DE and ID) and DOI (DI), reveal more substantial deficiencies and have been categorized as "acceptable" and "poor", respectively. Notably, the metadata element with the most significant data gaps is the 'Science categories' (WC), where data are entirely absent.

To facilitate a focused analysis, our examination primarily centers on metadata falling into the categories of 'excellent', 'good', and 'acceptable.'

The initial dataset comprised 466 documents, but after applying predetermined document selection criteria, the dataset was refined to 367 documents, as illustrated in Figure 5.

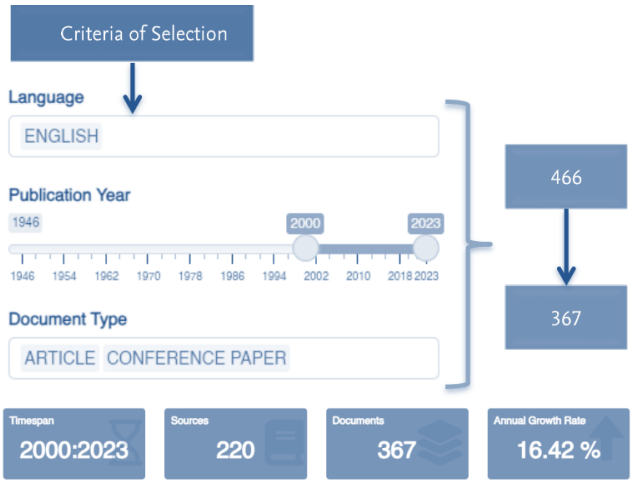


Figure 5. Selection of data by criteria

Table 3 furnishes a comprehensive overview of the essential data results derived from our dataset. The analysis spanned from 2000 to 2023, encompassing a significant timeframe. Our dataset drew from diverse sources, including journals and proceedings, totaling 220 sources.

Within this dataset, 367 documents were meticulously examined. Notably, the dataset demonstrated a substantial annual growth rate of 16.42%, indicative of its dynamic and evolving nature.

Table 3. Data results by main information

Description	Results
Timespan	2000:2023
Sources (journals, proceedings)	220
Documents	367
Annual growth rate %	16.42
Document average age	4.48
Average citations per doc	5.554
References	12331
Keywords plus (ID)	894
Author's keywords (DE)	993
Authors	1015
Authors of single-authored docs	83
Single-authored docs	87
Co-authors per doc	2.96
International co-authorships %	16.89
Article	294
Conference paper (proceedings)	73

On average, each document garnered 5.554 citations, underscoring the academic impact of the materials. The dataset incorporated a substantial reference base, comprising 12,331 references.

Each document, on average, featured 2.96 co-authors, emphasizing the collaborative nature inherent in research within this field. Noteworthy is the prevalence of international co-authorships, constituting 16.89% of collaborations. The dataset comprised 294 articles and 73 conference papers (proceedings), reflecting a diverse range of scholarly outputs.

RQ1: What are the current research trends in Indonesian education?

The data provides a nuanced overview of publication distribution, categorizing materials as either journal articles or conference papers, organized by their respective publication years. This analysis uncovers discernible trends in publication counts spanning from 2000 to 2023.

During the initial years, from 2000 to 2005, there was relatively subdued publication activity, marked by a modest number of articles published annually. However, a pivotal shift occurred around 2006, with a notable surge in scholarly output, a trend that became more pronounced from 2014 onward. The year 2019 emerges as a crucial turning point, witnessing a substantial spike to 63 articles. This surge was followed by consistently high publication counts in subsequent years, indicative of a sustained and prolific research output (Figure 6).

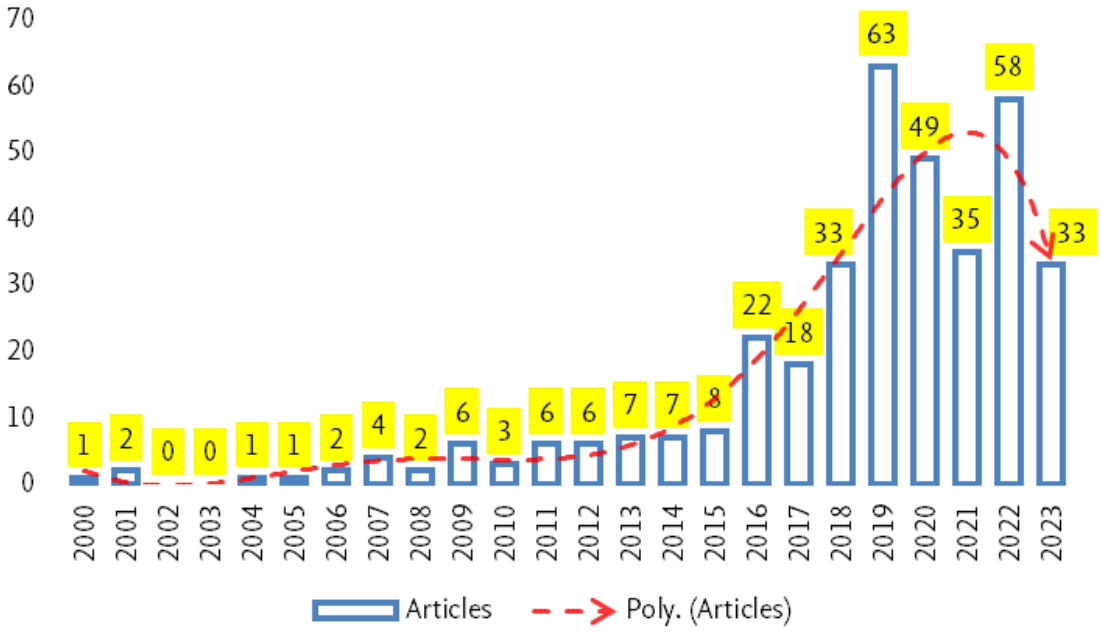


Figure 6. Annual publication (2000–2023)

This discernible trend suggests a growing emphasis on research and academic contributions, potentially mirroring advancements in academic disciplines, research funding, and other influential factors during this period.

Notably, the author making significant contributions to the study of educational issues in Indonesia is Suryadarma D., with several publications [42], [43], [44], [45].

Suryadarma D. emerges as an influential figure, boasting an h-index of 3, indicative of the substantial impact of their work. Since 2012, Suryadarma D.'s four publications have garnered 54 citations, highlighting the widespread recognition of their contributions within the field (refer to Table 4 for additional details on the local impact).

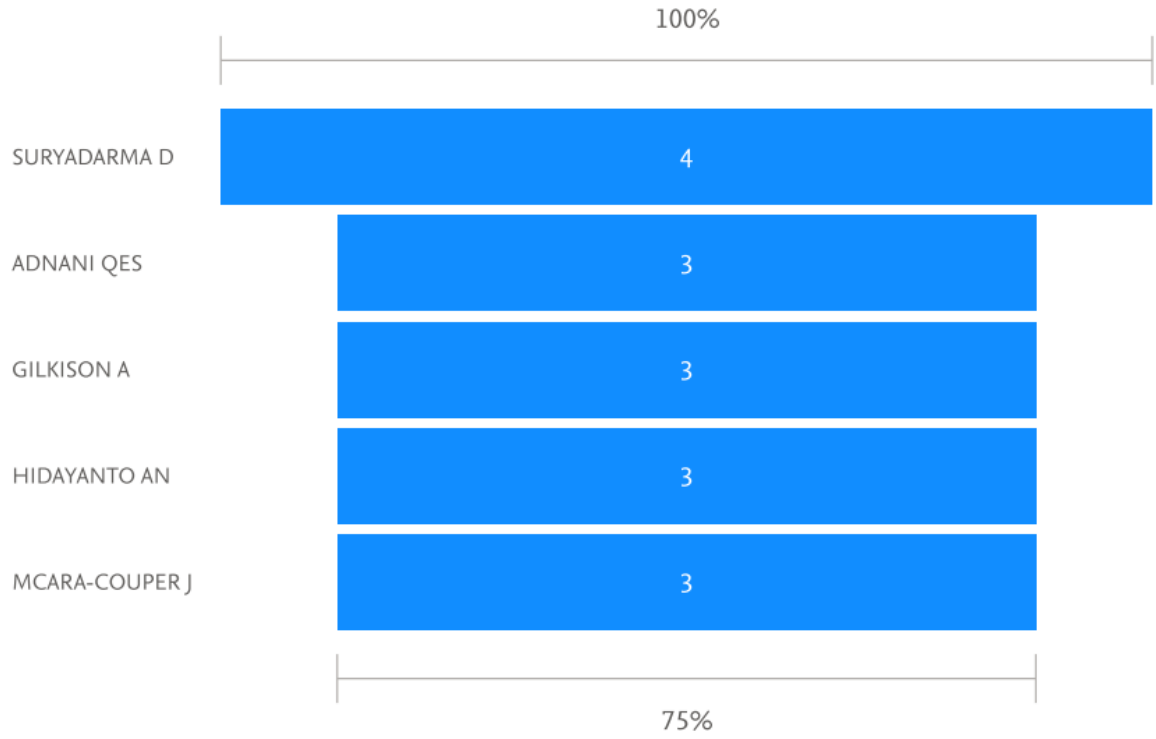


Figure 7. Top 5 authors with the highest number of articles

Table 4. Authors local impact

Author	h_index	g_index	m_index	TC	NP	PY_start
SURYADARMA D.	3	4	0.250	54	4	2012
ADNANI QES.	2	2	1.000	6	3	2022
ARDI Z.	2	2	0.333	23	2	2018
DEWI RS	2	2	0.667	14	2	2021
FAHRURROZI	2	2	0.667	14	2	2021
GILKISON A.	2	2	1.000	6	3	2022
GULIKERS J.	2	2	0.400	14	2	2019
HASAN A.	2	2	0.182	24	2	2013
HIDAYANTO AN.	2	3	0.250	58	3	2016
HIDAYAT H.	2	2	0.333	23	2	2018

Table 5. Authors' production over time

Author	Year	TC	TCpY
SURYADARMA D. [44]	2021	0	0.00
SURYADARMA D. [43]	2020	3	0.75
SURYADARMA D. [45]	2018	11	1.83
SURYADARMA D. [42]	2012	40	3.33

Suryadarma D.'s inaugural article, titled 'How corruption diminishes the effectiveness of public spending on education in Indonesia' [42] and published in 2012, holds prominence as a highly cited work with an impressive 40 citations (Table 5).

This seminal contribution delves into the crucial matter of corruption's influence on education spending, serving as a foundational source for addressing the second research question.

The trend in publications addressing educational issues in Indonesia is noteworthy, particularly in 2001, 2005, and 2006, which exhibited notably high average citations per article. This suggests that articles published during these years have garnered significant attention from other researchers and readers.

Conversely, 2000, 2008, and 2023 had very low average citations per article, indicating that articles from these years received limited recognition or attention.

In recent years (2017-2023), there appears to be a somewhat stable trend, with average citations per article ranging from approximately 0.64 to 10.94. This suggests that the field or publications under consideration have reached a certain level of stability concerning citation rates. The middle years (2010-2016) show moderate variability in average citations, ranging from approximately 3.62 to 17.67. This suggests that during this period, the impact of articles varied more significantly from year to year. The data provides a snapshot of the average citation rates for articles over several years, showing fluctuations and variability in citation patterns (Figure 8).

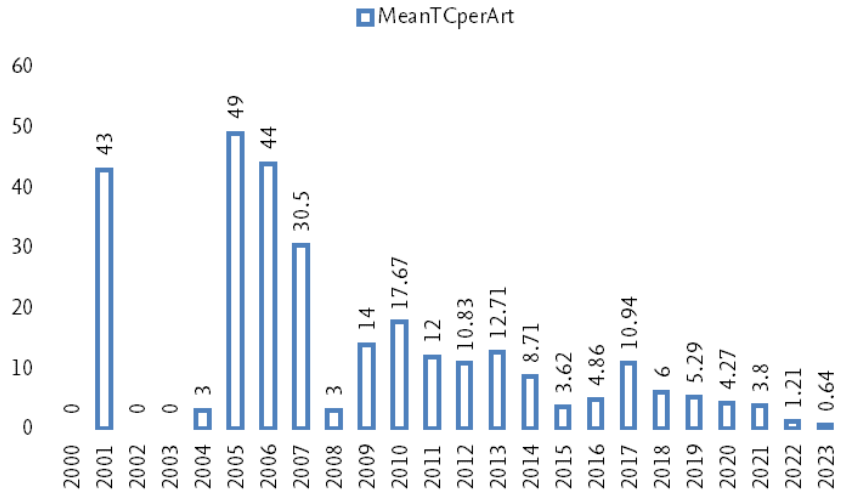
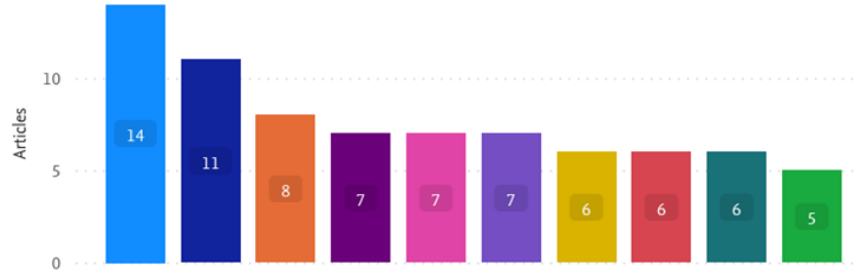


Figure 8. Average citations per year

The highly cited articles from 2001, authored by Lukens-Bull R.A. [46] and Van Der Werf G. [47], provide valuable information on different aspects of education in Indonesia. These works illustrate the multifaceted nature of educational challenges in the country, highlighting the importance of diverse research perspectives within the field. Their impact, as reflected in the number of citations, underscores the enduring relevance and influence of these seminal contributions to the discourse on Indonesian education.

Figure 9 reveals that publications addressing educational issues in Indonesia are predominantly published in the Journal of Physics: Conference Series (14 documents), AIP Conference Proceedings (11 documents), and ACM International Conference Proceeding Series (8 documents). This distribution underscores the diverse outlets contributing to the scholarly discourse on Indonesian education. Moving forward, the aim is to identify the top ten authors with the most cited documents globally.



Sources	Sum of Articles
JOURNAL OF PHYSICS: CONFERENCE SERIES	14
AIP CONFERENCE PROCEEDINGS	11
ACM INTERNATIONAL CONFERENCE PROCEEDING SERIES	8
INTERNATIONAL JOURNAL OF EDUCATIONAL DEVELOPMENT	7
INTERNATIONAL JOURNAL OF INNOVATION, CREATIVITY AND CHANGE	7
JOURNAL OF SOCIAL STUDIES EDUCATION RESEARCH	7
INTERNATIONAL JOURNAL OF SCIENTIFIC AND TECHNOLOGY RESEARCH	6
IOP CONFERENCE SERIES: EARTH AND ENVIRONMENTAL SCIENCE	6
UNIVERSAL JOURNAL OF EDUCATIONAL RESEARCH	6
ADVANCED SCIENCE LETTERS	5

Figure 9. Most relevant sources

Table 6 presents the results, shedding light on influential contributors to the field and their respective impact. Kristiansen S. [48] emerges as a notable contributor with 73 citations and an average TC per year of 4.06. His research focuses on "Decentralizing education in Indonesia," delving into the challenges associated with decentralization reforms in the Indonesian education system. The study highlights issues of transparency, accountability, and the increasing cost of education, revealing social and geographical disparities in access and quality.

Table 6. The top 10 most globally cited documents

No.	Paper	DOI	Total Citations	TC per Year
1	KRISTIANSEN S, 2006 [48]	10.1016/j.ijedudev.2005.12.003	73	4.06
2	LUKENS-BULL RA, 2001 [46]	10.1525/aeq.2001.32.3.350	69	3.00
3	WELCH AR, 2007 [49]	10.1007/s10734-006-9017-5	66	3.88
4	AMRI A, 2017 [50]	10.5194/nhess-17-595-2017	55	7.86
5	MOSTERT S, 2010 [51]	10.1136/adc.2008.154138	52	3.71
6	OLKEN BA, 2014 [52]	10.1257/app.6.4.1	49	4.90
7	ANGELES G, 2005 [53]	10.1086/431261	49	2.58
8	RAHARDJA U, 2019 [54]	10.1109/citsm47753.2019.8965380	43	8.60
9	FAISAL, 2019 [55]	10.1186/s41029-019-0032-0	41	8.20
10	SURYADARMA D [56]	10.1080/00074918.2012.654485	40	3.33

The data underscore Indonesia's significant contribution to the number of published articles, with 325 articles dominating the discourse on educational issues in the country. While this dominance is expected, considering the focus on Indonesia, the research landscape also reflects contributions from other countries such as Malaysia, Australia, the United States, and Japan, surpassing the 367 documents from the final dataset. This indicates a global interest and collaboration in researching educational challenges in Indonesia.

Universitas Pendidikan Indonesia, Universitas Negeri Yogyakarta, and Universitas Negeri Malang stand out in this research, given their Indonesian base and notable emphasis on education in the country. Moreover, a closer examination reveals that issues related to education in Indonesia have garnered significant attention from various countries worldwide, including neighboring nations with historical ties to Indonesia, such as Australia, Malaysia, Japan, and the Netherlands (Figure 10).

Figure 10. The eight top countries with the highest number of articles

The results presented in Figure 11 are consistent and align with expectations, given that the publications predominantly originate from Indonesia. As a result, it is logical that the majority of citations are traced back to Indonesia, constituting 778 citations (55.37%).

To offer a visual representation of the distribution of keywords, a word cloud was created (Figure 12). This visualization provides a snapshot of the most frequently occurring keywords in the dataset, offering insights into the thematic emphasis within the research landscape on educational challenges in Indonesia.

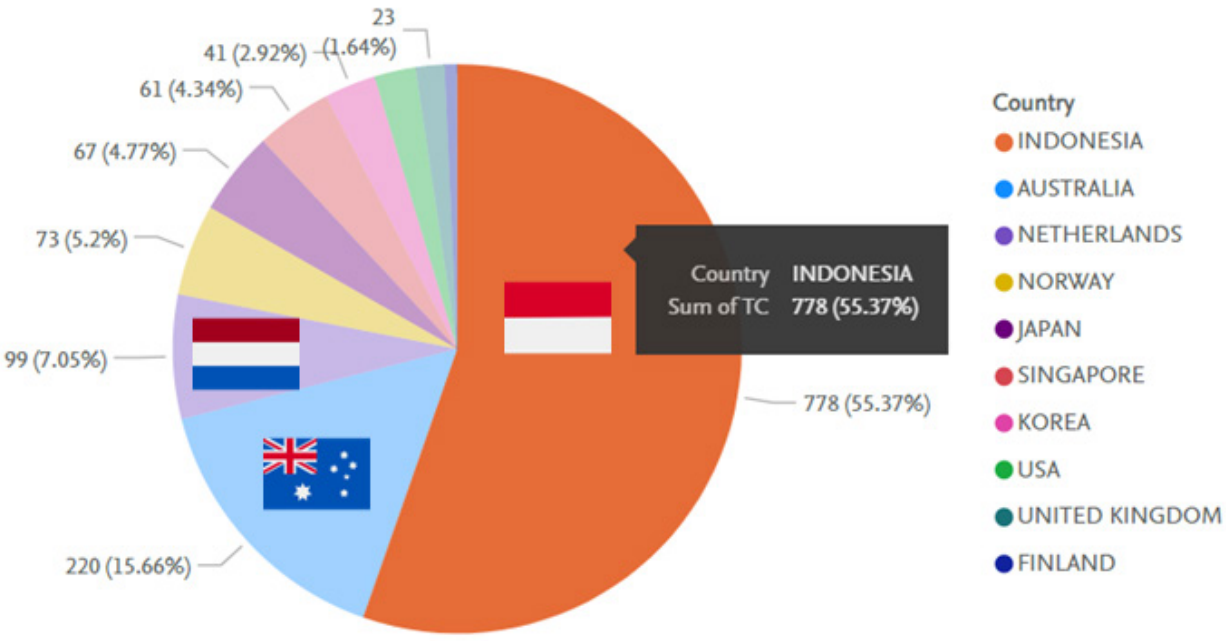


Figure 11. The top 10 most cited countries

Figure 12. Word cloud showing the most frequent terms

The word cloud depicts a comprehensive overview of the most frequently mentioned terms related to educational challenges in Indonesia. The prominence of terms such as “Quality of education”, “Vocational education”, and “Equity in Education” underscores the focus on improving the overall quality of education and addressing issues related to workforce skills, equal access, and opportunities.

Inclusive education, which involves catering to individuals with special needs or disabilities, is highlighted as a critical concern. The emphasis on the preparation and development of teachers reflects their crucial role in improving the quality of education.

Moreover, terms like 'Policy', 'Governance', 'Management', and 'Responsibility' indicate a broader dimension of educational challenges, encompassing regulatory frameworks, administrative aspects, and performance measurement within the Indonesian education system. Collectively, these keywords contribute to a nuanced understanding of the multifaceted issues in Indonesia's educational landscape.

RQ2: What are the key factors causing the ongoing educational challenges in Indonesia?

Suryadarma D.'s research, as published in the Journal of Bulletin of Indonesian Economic Studies in 2012, provides valuable insights into the key factors contributing to ongoing educational challenges in Indonesia. The study specifically focuses on the impact of corruption on the effectiveness of public spending in the country's education sector. Indonesia is recognized as one of the most corrupt countries worldwide, with a corruption perception index (CPI) score of 34, making it the fifth most corrupt country in Southeast Asia.

Corruption, as a pervasive issue, significantly hampers the efficiency and impact of public spending on education. The study employs a regional corruption measure to assess the extent of corruption's influence on the education sector. The CPI, a composite indicator that reflects perceptions of corruption in the public sector, highlights the severity of corruption in Indonesia. Understanding and addressing corruption emerge as critical steps in mitigating ongoing educational challenges and enhancing the effectiveness of public spending in the education sector.

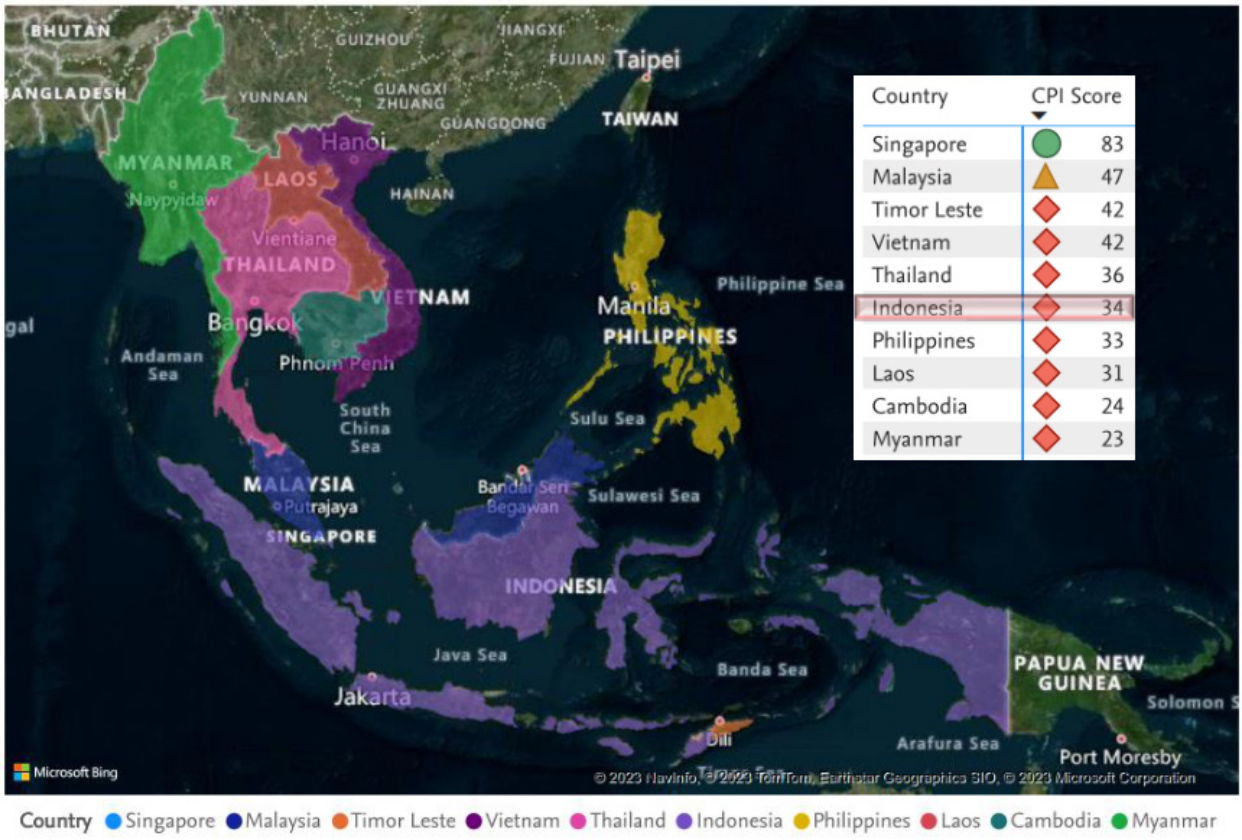


Figure 13. Corruption Perceptions Index (CPI) by ASEAN countries

The comprehensive review of 367 documents has highlighted several key factors contributing to the challenges impeding the achievement of desired educational quality in Indonesia. These complex issues—including corruption, inadequate infrastructure, teacher shortages, disparities, outdated curricula, and a lack of stakeholder collaboration (see Figure 14 or the Appendix (A) for details)—collectively pose significant obstacles to the improvement of the Indonesian educational landscape.

Corruption, in particular, stands out as a pervasive challenge with far-reaching consequences, as evidenced by the persistently low corruption perception index (CPI) score since 2012. The study by Suryadarma D. emphasizes the profound impact of corruption on the education sector, pointing to issues such as budget mismanagement, which subsequently affects the quality of educators and the availability of learning facilities. Weak oversight and law enforcement further contribute to the enduring challenge of corruption in Indonesia, with the education sector ranking among the top five sectors affected by corruption, as identified by the Indonesian Corruption Watch (ICW). Addressing these intricate issues is imperative for enhancing the quality of education and fostering positive transformations in the Indonesian education system.

Figure 14. Educational challenges in Indonesia

The data provides a nuanced overview of publication distribution, categorizing materials as either journal articles or conference papers, organized by their respective publication years. This analysis uncovers discernible trends in publication counts spanning from 2000 to 2023.

The trajectory of education budget allocation, as depicted in Figure 15, reflects a consistent increase over the years, reaching its peak in 2023 at 612.2 trillion rupiah, marking the highest budget allocation in the history of Indonesia. Notably, the draft state budget (*Indonesia*: RAPBN) for 2024 projects a further increase in the education sector budget to 660.8 trillion rupiah.

While these substantial budget increments suggest a commitment to the education sector, the correlation with the expected improvement in educational quality, as indicated by PISA scores, appears elusive. The persistent stagnation in the quality of education, despite escalating budgets, raises concerns about the effectiveness and efficiency of fund utilization. Furthermore, the concurrent rise in corruption trends within the education sector, aligning with increased budgets, underscores the challenges associated with ensuring transparency, accountability, and optimal resource utilization.

Addressing the complex interplay between budget allocation, educational outcomes, and corruption remains imperative to harness the full potential of substantial investments in the Indonesian education system and propel positive advancements.

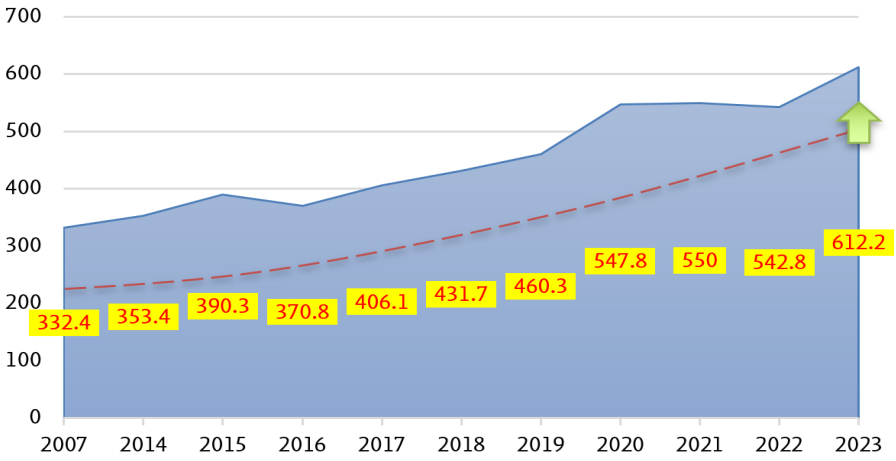


Figure 15. Allocation of APBN in the education sector in trillions

The prevalence of corruption within the Indonesian education sector is a matter of serious concern, as evidenced by a significant number of cases and financial losses over the years. Between 2003 and 2013, there were 296 corruption cases, resulting in a loss of 619 billion rupiahs [27].

Notably, these cases involved misappropriation of School Operational Assistance (*Indonesia*: Bantuan Operasional Sekolah or BOS) funds within educational institutions. Subsequently, from 2006 to 2015, there were 425 corruption cases, with losses totaling 1.3 trillion rupiahs, often related to the BOS and Special Allocation Fund (*Indonesia*: Dana Alokasi Khusus or DAK) [57]. Even during the COVID-19 pandemic, corruption persisted, with four reported cases [58]. Disturbingly, those implicated in corruption cases include school principals, university rectors, and district heads, all of whom are expected to uphold principles of honesty, integrity, and justice [57], [58].

Corruption adversely affects education by leading to misallocation and inefficiency in the use of funds and the recruitment of unqualified teachers. The consequences of corruption are not only financial but also extend to the erosion of the quality of education and the development of human resources [59]. As education plays a pivotal role in shaping individuals' characters and attitudes, the need to combat corruption and enhance governance in the education sector becomes imperative. Implementing measures such as increasing transparency, accountability, and oversight is crucial to mitigating the adverse impacts of corruption on education. This includes reinforcing the obligation of transparency in the management of school operational assistance (BOS) funds and enforcing information transparency through checks and sanctions [60].

Moreover, the role of the curriculum in determining the quality of education cannot be overstated. The curriculum, encompassing learning plans and processes, is intricately linked to aspects like relevance, equality, and precision of evaluation [61]. Various factors, such as implementation agents, implementation locations, and the intended audience, influence the curriculum [62]. Therefore, addressing corruption and improving governance should go hand in hand with comprehensive efforts to enhance curriculum quality, ensuring a holistic approach to educational improvement in Indonesia.

The evolution of Indonesia's curriculum, illustrated in Figure 16, has earned the moniker or label **"**change the minister, change the curriculum**"** among Indonesian netizens (*a term derived from combining "internet" and "citizen." It refers to individuals who actively participate in online communities, discussions, and activities, particularly on the Internet*). Since 1947 (Rentjana Pelajaran 1947), Indonesia has witnessed numerous curriculum changes, reflecting the need for adaptability to technological advancements, shifts in the learning paradigm, and evolving societal trends. The frequent adjustments are essential to ensuring the curriculum remains relevant and predictively designed for the future.

The current Merdeka curriculum, slated for national implementation in 2024, marks a significant advancement over its predecessors. It encourages students to be more active, creative, innovative, and independent learners, integrating crucial 21st-century skills known as the 4Cs (collaboration, communication, critical thinking, and creativity) into the learning process [63]. Despite these positive changes, challenges have arisen. Rapid curriculum changes, while necessary, pose issues related to teacher and student readiness, as adjustments require time, and infrastructure readiness may be lacking [64]. Overcoming these challenges is imperative for realizing the transformative goals of the Merdeka curriculum fully.

Teachers hold a pivotal role in the education system. They are not only tasked with delivering course materials to students but also serve as mentors, inspirations, and role models in shaping students' character and skills [65]. However, several challenges need to be addressed to ensure optimal educational quality. The current generation of students, comprising generation z and alpha, is growing up in a highly technological era [66]. Meanwhile, many teachers belong to the millennial generation or even older cohorts, potentially lacking the same level of technological proficiency [64]. This creates a generational gap in understanding and utilizing technology for learning [67], [68], [69].

Efforts in upskilling or continuous training for teachers are crucial to enable them to effectively integrate technology into their teaching practices [70]. Furthermore, the issue of low salaries among teachers persists as one of the significant challenges affecting the Indonesian education system. This is evidenced in Figure 17, which depicts the salary gap between entry-level teachers with minimum training and those at the top of the scale with maximum qualifications in lower secondary education, underscoring Indonesia's position with one of the lowest teacher salaries globally.

Low salaries can diminish motivation and job satisfaction, as well as hinder the attraction and retention of quality educators. Therefore, conducting a competitive and fair salary review for teachers, along with providing additional incentives to enhance performance and commitment, is crucial. Moreover, professional development is essential to ensure that teachers remain relevant amidst the evolving landscape of education and society.

Training programs, workshops, conferences, and collaborations among teachers can enhance their skills and knowledge in the latest teaching methods, innovative learning strategies, and technology utilization in education.

Collaboration between teachers of different generations is essential. It allows for the exchange of ideas and best practices, facilitating the transfer of valuable knowledge.

Figure 16. Timeline of curriculum in Indonesia (1994 – 2024)

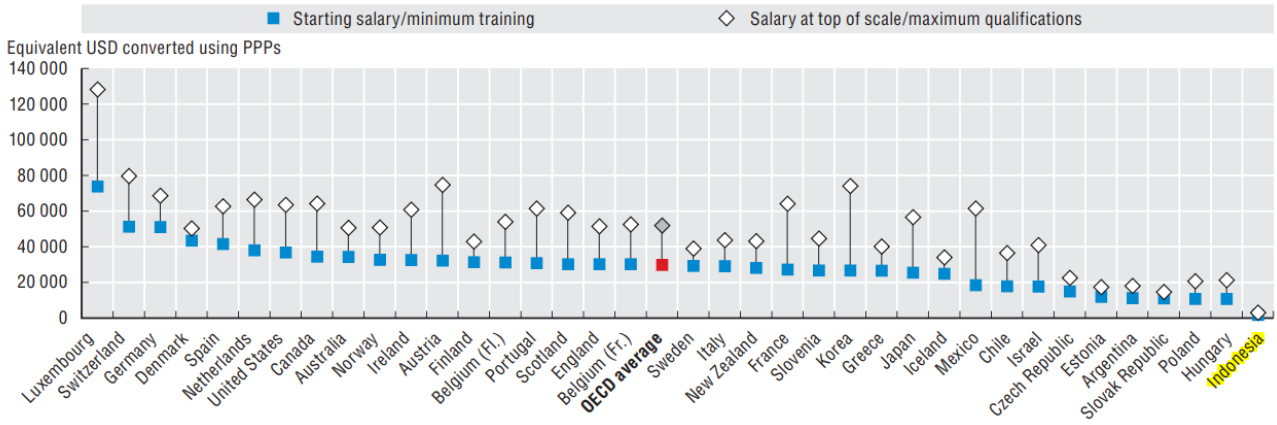


Figure 17. Minimum and maximum teacher salaries [71]

The development of robust infrastructure is imperative for facilitating technological advancement in Indonesia, given its diverse geography and the presence of 38 provinces. According to data from the Central Statistics Agency (BPS), the eastern provinces, including Papua and West Papua, are identified as the poorest. Additionally, provinces like East Nusa Tenggara (NTT), Maluku, Gorontalo, Aceh, Bengkulu, and Central Sulawesi face economic challenges [72]. Addressing this situation is crucial to prevent an infrastructure gap that could hinder educational access, leading to disparities in educational quality. Neglecting these disparities may lead to the progress of urban students, while rural students may face setbacks [73], [74].

The Merdeka curriculum places a strong emphasis on enhancing collaboration among various stakeholders in education. This collaborative approach involves students, parents, teachers, educational institutions, government, industry, media, associations, and the community. It promotes shared responsibility and encourages synergy beyond the traditional Pentahelix model, expanding to the hexahelix. This inclusive approach fosters partnerships with various industries to achieve the objectives of the curriculum [75], [76].

Vocational education is highlighted as a crucial component to bridge the gap between industries and students. Preparing students for employment and equipping them with entrepreneurial skills can encourage them to become job creators [77]. To achieve this, vocational schools must offer comprehensive career guidance, challenging the perception that graduating from such schools only leads to job hunting. Instead, students should be inspired to adopt an entrepreneurial mindset, potentially starting their businesses and contributing to the economy through their skills [78], [79].

The administration of education and political policies by the government significantly impacts educational quality in Indonesia [79].

These policies influence aspects such as access to education, higher education funding, tuition fees, and program development. Furthermore, the credibility and transparency of accreditation bodies play a vital role in assessing educational quality, as emphasized by the Minister of Education, Nadiem Makarim. Ensuring the impartiality of assessors is crucial for maintaining credibility [80], [81].

4. Conclusions

This research illuminates the multifaceted challenges regarding the quality of education in Indonesia. These challenges encompass a diverse range of factors, each uniquely influencing the educational landscape. The curriculum, as an educational cornerstone, necessitates continual adaptation to meet the evolving needs of learners in our rapidly changing world. However, frequent changes can also disrupt the stability of educational systems. Corruption remains a persistent issue, eroding the efficiency and transparency of education funding, thereby hindering the pursuit of quality education. The pivotal role of teachers cannot be overstated, as they bridge the gap between the curriculum and students. Ensuring that teachers are well-equipped to navigate the digital age and meet the diverse needs of today's students is paramount. Furthermore, a robust educational infrastructure, especially in less developed regions, is essential for equitable access to quality education.

Access disparities, high educational costs, and inequalities pose significant challenges that must be addressed to ensure that every Indonesian child has equal opportunities to receive quality education. Synergy among stakeholders, which includes students, parents, educators, institutions, government, industries, and the community, is crucial to driving positive changes in the educational landscape.

Vocational education must evolve to prepare students for employment and foster entrepreneurship and innovation. Political policies greatly influence education, from funding and program development to accreditation and quality assurance.

Transparency and credibility in managing these policies are crucial to maintaining public trust in the educational system.

Anti-corruption culture and law enforcement must be strengthened. Valuable lessons can be gleaned from other developed countries, such as Denmark, Finland, and neighboring Singapore, where the education system ranks among the best globally.

Considering these challenges, it is evident that comprehensive and collaborative efforts are required to improve Indonesia's education quality. Stakeholders must unite in their commitment to positive transformation, accepting change, and innovation. Only through collective and unwavering dedication to improving every facet of the Indonesian education system can the nation hope to provide its youth with the quality education they deserve, opening doors to brighter futures and broader horizons, referred to as the Golden Generation 2045.

5. Limitations

The research draws data from various sources, including surveys and specific inclusion criteria. Bibliometric analysis also relies on the quality and completeness of data available in the selected databases. Some publications may not be listed in the chosen databases, or they may lack complete or accurate metadata. Data limitations may affect the accuracy of the analysis results. For example, the quality and completeness of data in surveys can vary, and there is potential for errors or deficiencies in data collection or reporting. It is also important to be aware of these limitations when using or interpreting bibliometric analysis results and to recognize that bibliometric analysis should be used as a tool for better understanding trends and dynamics in academic literature.

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Appendix A: Educational challenges in Indonesia