The comparison of Chat GPT, Perplexity AI, and Scopus database to capture Indonesian higher education quality in achieving SDGs 2030

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Abstract. Indonesia's higher education sector significantly contributes to achieving the Sustainable Development Goals (SDGs), particularly in the context of quality education. The research aims to (1) analyse the challenges of Indonesian higher education in achieving SDGs 2030 based on data and facts, (2) analyse Indonesian higher education's challenges in achieving SDGs 2030 by making a plan or design, (3) analyse the impact of implementing the design in Indonesian higher education achieving SDGs 2030. Literature reviews using AI tools such as Chat GPT and Perplexity AI are rarely used, especially in discovering remedies to enhance the quality of education in higher education institutions in Indonesia. There has yet to be further research comparing AI tools and the Scopus database to find literature on specific SDG topics. Research shows several challenges in Indonesian higher education in achieving SDGs 2030, with the most discussed being access and equity, quality of education, universities programs, and infrastructure.

1. Introduction

The initial concept of Sustainable Development Goals (SDGs) serves as a global agreement for advancing development on a worldwide scale to shape a sustainable future [1]. Therefore, it is often called SDG 2030. SDGs are more inclusive, involving various parties and society. Because this program applies universally, all countries have a responsibility to reach the targets outlined in these SDGs. SDGs have a balanced role for all developed, developing, and less developed countries [2].

SDGs 2030 offers a comprehensive framework for tackling urgent global challenges and promoting sustainable development with 17 interconnected goals [3]. SDG 4 specifically concentrates on Quality Education, guaranteeing inclusive and equitable education for all while promoting lifelong learning opportunities [4]. There are a lot of higher education institutions in Indonesia, where the latest data shows 4.000 higher education institutions [5]. The contribution of higher education in promoting research and innovation, human resource
capacity building, and knowledge production underscores its significance in underpinning the entire SDG framework [6].

One of the challenges of Indonesian higher education is limited access because the education budget received by Indonesian higher education is lower than that of primary education [7]. Even though the proportion of Indonesian government spending on higher education is higher than that of Japan, Korea, Mexico, and India [8], this financial problem will continue with increasing demand for access to higher education [9].

Improvements in the curriculum sector and the quality of education also influence higher education in Indonesia, which is less relevant to practical aspects where it only focuses on theory [10]. Education quality is also needed in facilities, technology, practice-oriented learning, and self-development [11]. In the challenges of globalization and internationalization, higher education is required to produce graduates who can face global changes [12]. Apart from that, post-COVID-19 challenges, which have changed the learning process in higher education for decades, require higher education to improve the quality of education [13].

Literature reviews using AI tools are rarely used, especially in exploring remedies to enhance the quality of higher education. AI does not undergo a learning process like humans but is considered more consistent and efficient than humans, and information provided by AI cannot be used as a basis for decision-making [15]. Literature review using the Scopus Database involves a systematic review of existing literature to build a strong foundation for research [16]. Decision-makers are often associated with scientists who can build, motivate, and change the representation of problems and challenges [17].

There has yet to be further research comparing AI tools and the Scopus database to find literature on specific SDG topics. This study seeks to contribute to the progression of knowledge and the realization of SDGs. The research problem includes (1) How does Indonesian higher education face the challenges in achieving SDGs 2030 based on data and facts based on AI tools and the Scopus database? (2) How does Indonesian higher education face the challenges in achieving SDGs 2030 by making a plan or design based on AI tools and the Scopus database? (3) How is the impact of implementing the design in Indonesian higher education achieving SDGs 2030 based on AI tools and the Scopus database?

2. Method

The literature review is a comprehensive method consolidating quantitative results from research studies and qualitative investigation [18]. A literature review thoroughly examines academic papers, books, and other sources pertinent to a particular subject, research area, or theory [19]. This research uses AI tools Chat GPT 3.5 (https://chat.openai.com/) and Perplexity AI (https://www.perplexity.ai/) to collect data about improving the quality of education in higher education and compare further knowledge with the Scopus database using "higher education" and "SDGs" keyword.

The literature review can be divided into several steps: identifying pertinent sources, assessing, and synthesizing the gathered information into a coherent and comprehensive overview [20]. It involves researching, reading, analysing, evaluating, and summarizing scholarly literature. It aids the author in understanding the history and nature of their subject, pinpointing research gaps and issues [21]. A literature review is used as a research methodology to assess the existing knowledge on a specific topic and formulate research agendas [22].
Fig. 1. Steps of Literature Review

3. Result

Based on the literature review using two types of chatbots, Chat GPT, Perplexity AI, and Scopus Database, the results are shown in Table 1. 14 problems were found, and each database found several solutions.

<table>
<thead>
<tr>
<th>No</th>
<th>Problems</th>
<th>Chat GPT</th>
<th>Perplexity AI</th>
<th>Scopus Database</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Access and Equity</td>
<td>Scholarship and Financial Aid, Distance Learning and Using Technology, Partnerships</td>
<td>Targeted Scholarships and Financial Aid, Improving Infrastructure and Resources, Expanding Outreach and Community Engagement, Promoting Diversity and Inclusion, Collaboration and Partnerships</td>
<td>E-Learning</td>
</tr>
<tr>
<td>2</td>
<td>Quality of Education</td>
<td>Development programs, Accreditation and Quality Assurance, Continuous Improvement</td>
<td>Curriculum Development, Teacher Training and Professional Development, Quality Assurance and Accreditation, Research and Innovation, Internationalization</td>
<td>Sustainably Course and Integrated STEM Education,</td>
</tr>
<tr>
<td>3</td>
<td>Infrastructure and Resources</td>
<td>Upgraded Facilities and Technology, Public-Private Partnerships, Adequate Resources and Maintenance</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Relevance of Curriculum</td>
<td>Industry-Aligned Curriculum, Advisory Boards, Interdisciplinary Approaches</td>
<td></td>
<td>Educational Programs for Higher Education</td>
</tr>
<tr>
<td>5</td>
<td>Research and Innovation</td>
<td>Research Activity, Collaboration, Research centers and Incubators</td>
<td></td>
<td>Educational Programs for Higher Education</td>
</tr>
<tr>
<td>6</td>
<td>Internationalization</td>
<td>International Partnerships and Collaboration, Exchange Program, Global Perspective Curriculum</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>Problems</td>
<td>Solution</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>Chat GPT</td>
<td>Perplexity AI</td>
<td>Scopus Database</td>
</tr>
<tr>
<td>7</td>
<td>Data Collection and Monitoring</td>
<td>Robust Data Collection System, Centralized Database, Regular Reporting</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Policy Implementation</td>
<td>Streamlined Bureaucratic, Coordination, Clear Communication</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Climate Change and Environmental Sustainability</td>
<td>Environmental Sustainability Curriculum, Eco-Friendly Practices, Promoting Environmental Issues</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Global Challenges</td>
<td>Contingency Plans, Technology Infrastructure, Flexible Policies, Resilience of Educational System</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Teacher Training and Capacity Building</td>
<td>Continuous Professional Development, Quality Assurance Mechanisms, Partnerships and Collaboration, Use of Technology, Policy Development</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>Technological Integration</td>
<td>Digital Infrastructure Development, Teacher Training and Capacity Building, Curriculum Reform, Collaboration with Technology Providers, Research and Development</td>
<td></td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>Community Engagement</td>
<td>Community Outreach Programs, Partnerships, Collaboration, Curriculum Development, Innovative Teaching Methods, Advocacy, and Policy Development</td>
<td></td>
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4. Discussion

4.1 Chat GPT

4.1.1 Access and Equity

Indonesia has a vast and diverse geography, which poses challenges in providing equal access to good education across all regions. By considering access and equity impact on (1) increased enrolment and participation of students from diverse socioeconomic backgrounds, (2) bridge the gap in educational opportunities between urban and rural areas.

4.1.2 Quality of Education

Ensuring consistent and high-quality education remains a challenge. Some institutions may need help to meet international standards, affecting the overall quality of education. By considering the impact of quality of education on (1) improved teaching quality and academic expertise, (2) educational standards are consistently met across institutions, and (3) fostering a culture of academic excellence.

4.1.3 Infrastructure and Resources

More infrastructure and resources in certain regions are needed to ensure the effective delivery of education by considering infrastructure and resources’ impact on (1) a more conducive learning environment, (2) additional resources for infrastructure development, and (3) sustainable improvements in educational facilities.

4.1.4 Relevance of Curriculum

There could be a disparity between the skills imparted in universities and the employment market requirements. By considering the relevance of curriculum impact on (a) Graduates possessing skills and knowledge in demand by the job market, (b) insights into emerging trends, enhancing the relevance of educational programs, and (c) preparing students for the dynamic needs of the workforce.

4.1.5 Research and Innovation

Promoting research and innovation is essential for academic progress and societal development. By considering research and innovation's impact on (1) knowledge creation and innovation, (2) practical and applied research, and (3) providing a platform for the development of cutting-edge ideas and solutions.

4.1.6 Internationalization

International collaboration is crucial for enhancing the quality of education by considering internationalization's impact on (1) the global reputation of Indonesian higher education institutions, (2) cross-cultural understanding and diverse perspectives, and (3) preparing students for a globalized world.
4.1.7 Data Collection and Monitoring

Inadequate data collection and monitoring systems can hinder the ability to track progress toward SDGs. By considering data collection and monitoring impact on (1) they have informed decision-making and policy formulation, (2) evidence-based decision-making, (3) a comprehensive view of educational outcomes and progress toward SDGs, and (4) transparency and accountability.

4.1.8 Policy Implementation

Effective implementation of education policies may face challenges due to bureaucratic hurdles, lack of coordination between relevant agencies, and a need for better governance structures. By considering policy implementation impact on (1) efficient policy implementation, (2) policies consistently contribution applied across educational institutions, and (3) dissemination of policies and updates.

4.1.9 Climate Change and Environmental Sustainability

Considering SDGs in the broader context, addressing environmental sustainability in higher education can be challenging. By considering climate change and environmental sustainability impact on (1) promoting awareness and responsible citizenship, (2) environmental conservation, and (3) culture of sustainability.

4.1.10 Global Challenges (e.g., COVID-19)

Global events, such as the COVID-19 pandemic, can disrupt education systems and exacerbate existing challenges, highlighting the need for resilience and adaptability. By considering global challenges' impact on (1) seamless adaptation to unforeseen disruptions like pandemics, (2) continuing education under changing circumstances, and (3) resilience adds to the education system.

4.2 Perplexity AI

4.2.1 Access and Equity

Securing equitable access to high-quality education throughout diverse regions and communities in Indonesia remains a significant challenge. By considering access and equity impact on (1) diversity and inclusivity [4]. (2) access to quality education [23]. (3) raise awareness about education [4]. (4) equal access for all students [23]. (5) enhances resource and expertise utilization [23].

4.2.2 Quality of Education

Enhancing the overall quality of education, including curriculum, teaching standards, and learning outcomes, is a pressing issue. By considering the quality of education impact on (1) producing high-quality graduates [25]. (2) continuous learning [24], (3) quality and fostering accountability [24]. (4) dynamic teaching and engaging environments [3], and (5) quality and competitiveness of Indonesian institutions [26].
4.2.3 Teacher Training and Capacity Building

Developing and retaining a high-quality teaching workforce, particularly in remote and underserved areas, is essential. By considering teacher training and capacity building impact on (1) a skilled and effective teaching workforce, (2) consistent and practical training, (3) educational research and innovation exchange, (4) engaging experiences, and (5) student learning outcomes [3].

4.2.4 Technological Integration

Integrating technology into education effectively and equitably is a challenge, especially in remote areas. By considering technological integration's impact on (1) access to materials and platforms, (2) using technology in the learning process [24], (3) technology-related skills, (4) enriching learning experiences, (5) innovative solutions and best practices [25]

4.2.5 Sustainable Financing

The revised roadmap for SDGs in Indonesia indicates an increased need for financing to achieve the goals. By considering sustainable financing impact on (1) secure sustainable financing for education [24], (2) financial resources [25], (3) innovative financing mechanisms [24], (4) take on financing challenges [25], (5) creating enabling environment [24].

4.2.6 Community Engagement

Community Engagement involves raising awareness about the importance of education and addressing specific challenges faced in each region. By considering community engagement's impact on (1) increasing SDGs awareness and engagement, (2) addressing community engagement challenges, (3) integrating relevant knowledge and principles, (4) addressing real-world challenges, and (5) enabling environment [24].

4.3 Scopus Database

4.3.1 Sustainability Course

Sustainability course equips students with the knowledge and skills necessary to tackle sustainability challenges, empower them to become agents of change, and contribute to the overall achievement of the SDGs 2030 [27]. Improvement in the sustainability learning process includes (1) Increasing awareness and understanding regarding environmental issues, (2) integrating SDGs into the curriculum, (3) adopting innovative pedagogical approaches, (4) promoting environmentally responsible behaviors, and (5) offering students practical sustainability experiences.

4.3.2 Integrated STEM Education

The students have a highly positive outlook on STEM education integrated with Education for Sustainable Development (ESD) and believe that it can contribute to attaining the objectives of the SDGs [28]. Challenges identified in implementing ESD-integrated STEM education include (1) Lack of knowledge and experience, (2) Uncertainty in STEM teaching
materials, (3) Obstacles applying the STEM approach in online learning, (4) Incomplete material presentation in ESD-integrated STEM.

4.3.3 Waste Management

By incorporating waste management into the curriculum, students can cultivate a more profound understanding of environmental concerns and evolve into responsible global citizens [29]. Some examples of green and sustainable practices that can be implemented in higher education institutions include (1) Waste Management, (2) Energy Conservation, (3) Water Conservation, (4) Sustainable Transportation, (5) Green Building Design, (5) Environmental Education, (6) Community Engagement (7) Food Sustainability (8) Research and Innovation (9) Green Procurement.

4.3.4 Green Campus

Achieving a Green Campus is important in higher education to accomplish the Sustainable Development Goals (SDGs). By creating a Green Campus, higher education institutions can promote a culture of environmental awareness and sustainability among students, faculty, and staff. By integrating sustainability into the curriculum and providing opportunities for experiential learning, universities can foster a holistic and comprehensive education that includes environmental awareness and responsibility [30].

4.3.5 Green Entrepreneurship

Green entrepreneurship plays a significant contribution in advancing sustainable development. By incorporating green values and education support, young adults can develop a positive perception of green entrepreneurship and understand the importance of environmental sustainability in their entrepreneurial activities [31]. Several actions to align the entrepreneurship learning system with sustainable development goals include (1) Introducing the goals of SDGs, (2) green value, (3) education support, and (4) fostering awareness of natural preservation and social equality.

4.3.6 Educational Programs for Higher Education

Higher education institutions have an essential role in achieving SDG targets. With a good understanding of SDG principles, higher education institutions can develop programs and activities supporting SDG goals [25]. Several educational programs that can be implemented by higher education (1) Education and training about SDGs (2) Integration of SDGs into the curriculum (3) Research and development related to the SDGs (4) Partnerships (5) Development of SDGs centers or poverty offices.

4.3.7 Social Media

Social media can substantially influence education quality, representing an essential aspect of Sustainable Development Goals (SDGs) in higher education [32]. Here are some ways in which social media can contribute to the achievement of these goals: (1) information and resources, (2) collaboration and communication, (3) interactive and dynamic learning experiences, (4) connecting with professionals, organizations, and institutions in their field of interest (5) gain a global perspective on various issues and topics.
4.3.8 E-Learning

E-learning plays a crucial role in higher education to achieve SDGs, which centers on guaranteeing inclusive and fair access to high-quality education while promoting lifelong learning opportunities for everyone [33]. E-learning can provide (1) access to education, (2) multimedia resources, (3) lifelong learning, (4) accessible and affordable learning (5) an inclusive educational environment.

5. Conclusion

Based on AI tools, Chat GPT and Perplexity, several challenges occur in Indonesian higher education in achieving SDGs 2030, with the most discussed being access and equity, quality of education, university programs, and infrastructure. That program, designed and implemented, impacts students in higher education to face future challenges. These impacts from programs can contribute to the advancement of education in Indonesia, aligning with the goals outlined in SDGs and fostering a more inclusive, equitable, and globally competitive higher education system.

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