



Universiteit
Leiden
The Netherlands

Navigating the implications of AI in Indonesian education: tutors, governance, and ethical perspectives

Wong-A-Foe, D.L.; Anutariya, C.; Bonsangue, M.M

Citation

Wong-A-Foe, D. L. (2023). Navigating the implications of AI in Indonesian education: tutors, governance, and ethical perspectives. *Communications In Computer And Information Science*, 349-360. doi:10.1007/978-981-99-7969-1_26

Version: Accepted Manuscript

License: [Creative Commons CC BY 4.0 license](https://creativecommons.org/licenses/by/4.0/)

Downloaded from: <https://hdl.handle.net/1887/3718643>

Note: To cite this publication please use the final published version (if applicable).

Navigating the Implications of AI in Indonesian Education: Tutors, Governance, and Ethical Perspectives

Daphne Wong-A-Foe^[0000–0003–4498–653X]

Cultural Anthropology and Development Sociology (CADS), Leiden University, The Netherlands

`d.l.wong-a-foe@fsw.leidenuniv.nl`

Abstract. The rapid advancement of Artificial Intelligence (AI) has opened up new frontiers of technological possibilities, yet the traditional education system in Indonesia has largely remained entrenched in conventional practices. Despite Indonesia’s recognition for its vibrant AI innovation scene and its diverse student population, there is a significant gap in exploring the multifaceted implications of AI in, for, and by education within the country. This paper aims to address this gap by delving into three key areas: AI tutors, governance, and (virtue-based) ethical considerations. Drawing insights from both global and Islamic literature, we first examine the discourse surrounding AI tutors within Indonesia’s education system. Next, we discuss the potential applications of AI in governance, including the role of the government and the emergence of AI-related education in Indonesia. Thirdly, we contemplate an ethical framework encompassing issues of inequality, public policy, and Islamic-based principles. Throughout, this paper emphasizes the critical importance of examining these three facets of AI’s impact in education. Ultimately, this research raises the intriguing question of how education and AI will mutually shape each other in the future, urging further exploration of this dynamic relationship.

Keywords: DS & AI Education · AI Tutors · AI Governance · AI Ethics · Indonesian Education · Islamic Context

1 Introduction

The recent advancements in Artificial Intelligence (AI) tools, such as ChatGPT (Chat Generative Pre-Trained Transformer), have illuminated the significant potential for AI to revolutionize educational practices on a global scale. However, this development has also evoked mixed reactions among educators, reflecting the ongoing discourse concerning the implications of AI in education. Consequently, some educational institutions have taken measures to restrict its use, concerned that students may excessively rely on ChatGPT for automated generation of academic assignments [1]. Nevertheless, as García-Peñalvo argued [2], these attempts to impose restrictions or prohibitions are unlikely to effectively

discourage students from using the AI-tool. Instead, there is an anticipation that ChatGPT will assume a vital role in the writing process, comparable to the transformative impact of computers and calculators on the fields of science and mathematics [3]. The unanticipated possibilities exemplify a paradigm shift in the way education is delivered, fostering a more tailored and efficient learning environment for students and educators alike.

Moving beyond the global perspective, it is crucial to consider the specific challenges and opportunities that AI presents in different cultural and educational contexts. Existing literature on AI applications in education primarily reflect a Western perspective [2, 4, 7], which may not fully account for the cultural and religious nuances specific to countries like Indonesia. As it is the world's fourth most populous country, Indonesia faces distinct challenges in providing quality education to its vast and diverse population [5]. Hence, this paper delves into the multifaceted implications of AI in Indonesian education, acknowledging the importance of examining the unique socio-cultural, economic, and educational milieu of the Southeast Asian nation. It aims to provide insights and recommendations to help Indonesian policymakers, educators, and other stakeholders better understand how AI can effectively address the region-specific education challenges.

Furthermore, Indonesia is also recognized as the world's most populous Muslim nation [6]. It boasts a significant network of more than 50,000 Islamic schools, which signifies the enduring influence of religious teachings on the lives and Islamic orientation of its citizens [5]. Consequently, when delving into the ethical implications of AI from an Islamic standpoint, it becomes imperative to critically examine the educational philosophy, curriculum, and pedagogy employed by Islamic schools in Indonesia. In this regard, this research paper builds upon the framework rooted in the *Maqāṣid* (objectives) theory, emphasizing the utilization of AI for meaningful feedback rather than focusing solely on efficiency gains. By doing so, this paper seeks to offer valuable insights into the convergence of AI ethics and Islamic perspectives, thereby fostering a deeper comprehension of how AI can be ethically integrated within the Indonesian Islamic education system.

To provide a comprehensive analysis of the implications of AI in Indonesian education, this paper will explore three key focus areas: AI tutors, -governance applications, and -ethical considerations. Firstly, the paper will examine the role of AI tutors, examining their role and impact on educational practices, drawing upon pertinent global and Islamic studies. Secondly, the study will delve into the potential applications of AI in governance, encompassing the government's involvement in curriculum development, integration of AI systems within religious institutions, optimization of administrative tasks, and educational policies. Lastly, the paper will discuss the ethical considerations surrounding the use of AI and education in Indonesia, including inequality, public policy, and Islamic-based ethics. By exploring these facets, this study aims to offer valuable insights and future directions to facilitate the successful integration of AI and education within the Indonesian milieu.

2 AI Tutors

2.1 A Brief Overview

In the realm of computer technology, the use of AI tutors in Western classrooms has gained momentum since the 1980s. A notable example is 'GPTUTOR,' a digital AI tutor introduced in 1984 to offer personalized instruction and feedback to students studying geometry [7]. GPTUTOR's design aimed to diagnose students' challenges and provide tailored learning experiences that matched their individual capabilities, which was highly advantageous during that period [8]. Research conducted by Schofield et al. [9] examining the impact of GPTUTOR on classroom behavior revealed that students exhibited increased effort and engagement in tasks, while teachers allocated more time to assist struggling students, interacted more collaboratively with students, and prioritized students' efforts when assessing their performance.

Nowadays, AI tutors have become prominent as educational aids, tutors, and facilitators of peer learning, manifesting in both embodied (physical) and disembodied (digital) forms across classrooms worldwide [10]. For instance, embodied social robots are now being utilized in preschools and elementary schools to assist educators, such as 'Mr. Robot,' teaching students about electric circuits in Palestine [11], 'Kebbi,' focusing on imparting knowledge about shapes and colors in England [12], and 'Sligo,' providing French language instruction in Ireland [13]. Conversely, disembodied AI tutors encompass digital platforms, such as the 'Duolingo' app that facilitates language practice for second language learners, and the 'iTalk2Learn' online platform that supports elementary students in mathematics learning.

This phenomenon extends not only to the Global North's focus on science subjects but also to the Islamic world, where chat-bots are employed for educational purposes in Islamic teachings. Notably, 'Muslim Pro' exemplifies this trend, functioning as a religious mobile application specifically designed for the practice of Islamic prayer. The app provides users with information on prayer times and the *Qiblah* (direction towards the Kaaba in Mecca) based on their specific location, offering a convenient tool for religious observance [14]. Additionally, Iran serves as an intriguing case study, showcasing the integration of Islamic AI tutors in embodied educational settings. For instance, bots like 'Alice' have been introduced in classrooms to educate children about the concept of *Hijab* (headscarf) [15]. Another bot named 'NOA' autonomously recites the *Salaat* (Islamic prayers) and performs the ritual acts while facing the *Qiblah*. These bots contribute to a more engaging and less unsettling approach to Islamic education for children in Iran, as discussed in the study by Alemi et al. [15].

However, despite the increasing usage of various types of AI tutors, there is still considerable hesitancy among teachers, students, and even parents to fully embrace them. According to a study by Hao [16], there is a prevailing belief that human tutors are more effective in assisting students with their learning compared to AI tutors. More evidently, the Covid-19 pandemic has further high-

lighted the strong yearning for interpersonal interaction among the majority of students [17], leading to important reflections on the effectiveness of robotic (religious) teaching practices.

2.2 Through a Religious Lens

From a religious perspective, the idea that the effectiveness of teachings can transcend the need for a human intermediary and include automated systems is encapsulated in the Latin concept of *ex opere operato* (from the work performed). This notion posits that the ritual or teaching itself possesses intrinsic value and efficacy, challenging the conventional belief that human involvement is indispensable for successful administration. In Islamic theology, a parallel concept is the *Niyyah* (intention), which recognizes the profound significance of one's intention, even outweighing actions considered *haram* (prohibited) [18]. By considering both the *ex opere operato* and the importance of *Niyyah*, a more comprehensive understanding of the role of AI technology and human agency in religious teaching practices can be attained.

In the realm of Islamic education, a distinct emphasis is placed on pedagogical approaches that differs from those found in secular educational settings [19]. Islamic teaching practices places strong emphasis on moral and ethical virtues such as honesty, integrity, compassion, and the significance of prayer. These fundamental values are imparted by religious educators known as *ustadz* or *kyai* [5]. Additionally, personalization stands as another pivotal facet of Islamic education, with instructors treating each student as a unique individual and adjusting their teaching approaches accordingly. In parallel to this, empirical research has demonstrated that various AI chat-bot voices cater to and are preferred by different individuals. This suggests that AI tutor voices can be tailored to accommodate the diverse characteristics and needs of each student [20]. This prompts us to question how Islamic education in Indonesia incorporates personalized teaching practices and how AI technologies can be harnessed to enhance this personalized approach.

2.3 Implications in Indonesian Education

To understand the Indonesian education system, it is necessary to realize that navigating the delicate balance between conservative beliefs and adjusting to societal demands can be a challenge in Indonesia. The country is officially secular, but both its *Pancasila* (national ideology) and the 1945 Indonesian Constitution uphold the religious belief in one supreme God [21]. For Muslims, this reaffirms the concept of *Tauhid*, emphasizing the indivisible oneness of God. As a result, religiosity is deeply ingrained in numerous facets of their daily lives, including education, as evidenced by the incorporation of religious instruction into the national curriculum across the country [5]. Nevertheless, when it comes to the potential conflict between Islamic teachings and scientific discoveries, the majority of Islamic schools in Indonesia adopt a stance that embraces the compatibility of Islamic beliefs and modern science. These schools do not perceive scientific

findings as contradictory to their religious teachings. Instead, they believe that Islamic principles and scientific knowledge can coexist harmoniously without conflicts arising between them. This approach adopted by Islamic schools in Indonesia safeguards the continuity and progress of Islamic education by avoiding obstacles that may emerge from discord between religious dogma and scientific advancements [22].

However, even though Indonesia seems to be thriving as an AI innovation ecosystem [23] with its diverse student demographic [24], little to none is known about the multifaceted implications of AI tutors and Indonesian education, especially when considering ethical and religious considerations. In an effort to shed light on this matter, a recent study conducted by Sumakul [25] investigated the use of AI apps in their English as a Foreign Language (EFL) classes. The study involved the trial implementation of two AI apps, namely 'Plot Generator' [<https://www.plot-generator.org.uk/>] for creative writing classes and 'Elsa' [<https://elsaspeak.com/en/>] for pronunciation classes. The findings of the study revealed that both Indonesian students and teachers expressed positive perceptions regarding the incorporation of AI technology in their EFL classroom. This pioneering research offers valuable insights into the application and impact of AI tutors within the Indonesian educational context. However, further qualitative and longitudinal exploration is necessary to fully comprehend the broader implications and potential challenges associated with the adoption of AI tutors in Indonesia's education system.

Subsequently, we will discuss Indonesia's history of technological nationalism and current efforts towards AI-dependent technologies for national development in order to demonstrate the country's willingness to embrace new technologies and its ability to adapt to changing technological landscapes.

3 Technology as an Ally

3.1 Historical Control and Classification

Historically, the Indonesian government has also sought to use technology as a means of classifying and controlling its citizens through education. For example, the government has implemented a national curriculum that aims to promote a specific understanding of Islam and Indonesian identity [5] through IT-based access to education [26]. The state has also used technology to monitor and control the dissemination of finances and information in schools, including through the regulation of textbooks and other learning materials [27].

Notably, the success of ICT implementation in Indonesian education was also determined by several governmental factors. One significant obstacle to the widespread use of computers among the Indonesian population was their limited proficiency in English, which resulted in a reluctance to embrace computer technology [28]. To address this issue and promote ICT literacy, the government issued Presidential Decree (No. 2/2001) which led to the development of computer applications in the Indonesian language. Further, the 2004 national

program 'Indonesia, Go Open Source!' (IGOS) and the 2009 policy letter of the State Ministry for State Apparatus (No: SE/01/M.PAN/3/2009), which concerned proper software utilization and open source software (OSS), played a significant role in accelerating and encouraging public internet usage, as well as improving ICT infrastructure within the education sector curriculum [26].

3.2 AI Governance in Indonesian Education

Similarly, in efforts to foster the successful integration of AI in Indonesian education, the *Kementerian Agama* (Ministry of Religious Affairs) recently launched a digitization program in 2021 as part of the 'Making Indonesia 4.0' state project. This program introduced AI systems, namely the Madrasah Self Evaluation (EDM) for administration and evaluation, and e-RKAM (Electronic-Based Madrasah Work Plan and Budget) for e-planning and e-budgeting, across madrasahs (Islamic elementary schools) in Indonesia [19]. In other words, this initiative addresses governance in educational institutions through the implementation of AI. According to Hamruni and Suwartini [19], this incorporation of AI in madrasahs aligns with Islamic morality, as it upholds principles of trustworthiness, non-maleficence, fairness, and beneficence. Consequently, it can be inferred that the use of AI governance in Islamic education is no different from its application in secular education within the Indonesian context.

Moreover, as Indonesia undergoes rapid technological transformation, the need for high-quality education and training in this field becomes increasingly important. To tackle this, Indonesia introduced its own National Strategy on Artificial Intelligence 2020-2045 (*Strategi Nasional Kecerdasan Artifisial 2020-2045*), placing great emphasis on Indonesia's AI innovation, research, and development in the education sector [29]. This 25-year strategy outlines the government's vision to shift from a resource-dependent economy to one that is innovation-driven, making Indonesia the second member of the Association of Southeast Asian Nations (ASEAN) after Singapore to do so [30]. At the local level, this national strategy has led to the initiation of projects such as the AI-dependent '100 Smart Cities' initiative[31]. These efforts have also attracted international attention, with China providing funding to AI firms and strengthening cybersecurity partnerships with Indonesia, while the United States primarily invests in private industries to support AI development in the country [29].

In the realm of education, AI startup Tokopedia has collaborated with Universitas Indonesia (UI) to establish the 'Tokopedia-UI AI Center of Excellence' in Jakarta [29], for example. Additionally, foreign companies like Huawei, Alibaba Cloud Indonesia, and Amazon Web Services have introduced cloud training programs targeting Indonesian students [29]. These privately funded programs cater to the demands of employers and have contributed to reducing the exclusivity of the local public university system. Furthermore, several Indonesian public universities have embraced the European-funded initiative Erasmus+ to provide local students with the opportunity to pursue the Data Science & Artificial Intelligence (DS&AI) master's program [<https://dsai-project.eu/site/>], namely

Institut Teknologi Bandung (ITB), *Universitas Syiah Kuala (USK)*, and *Universitas Sumatera Utara (USU)*. Additionally, *Universitas Islam Negeri Syarif Hidayatullah Jakarta (UIN-JKT)*, the first Islamic State University in Indonesia, is currently offering AI courses under the Indonesian translation *Kecerdasan Buatan* as part of its Informatics bachelor’s program. These initiatives and partnerships signify the growing importance of AI in shaping the future of education in Indonesia.

However, it is noteworthy that the mentioned projects seem to have a secular orientation, lacking explicit reference or connection to religion, despite Indonesia’s strong ties to religiosity. This raises questions about how Indonesian-Muslims navigate the challenges posed (if any) by emerging technologies and new educational programs.

4 Ethical Considerations

As AI technologies are being integrated into (religious) educational practices in Indonesia, it is essential to critically examine the ethical implications associated with their use within the Indonesian context. This section delves into three key dimensions: inequality, public policy, and Islamic ethics, as they pertain to the unique socio-cultural and religious dynamics of the Indonesian education system.

4.1 AI & Inequality

Firstly, the issue of inequality arises from concerns regarding the potential contribution of AI technologies to the deepening of existing disparities in educational access and outcomes within Indonesia. Emergent AI technologies often require advanced education and skills, leading to a growing education premium and increased inequality. Despite facing similar demands for technological change, not all countries experience the same level of inequality. Unlike before, where certain countries held a technological lead while others caught up [32], AI’s integration knows no geographical or other boundaries. This dynamic has significant implications for global competition and geopolitical struggles. In the context of Indonesia, with its diverse population encompassing various socio-economic backgrounds and geographic locations, ensuring inclusive and equitable access to AI-enabled educational opportunities becomes paramount. By critically examining the implications of AI in education through an equity lens, researchers and policymakers can contribute to the development of educational systems that empower all learners and foster a more equitable and just society, placing emphasis on the needs of marginalized and underserved learners in Indonesia.

4.2 AI & Public Policy

Moreover, the formulation of public policy is of utmost importance in addressing the ethical considerations associated with the integration of AI in education. One significant area that requires attention is academic integrity, as

highlighted by Sullivan et al. [33]. The rapid development of AI systems like ChatGPT has elicited concerns among academics and industry leaders, leading to calls for a temporary halt in the development of such powerful AI systems [<https://futureoflife.org/open-letter/pause-giant-ai-experiments/>]. While organizations like UNESCO have provided guidance on leveraging AI to enhance educational quality in line with Sustainable Development Goal 4 [34], existing frameworks often fail to comprehensively address the unique cultural and institutional context of Indonesia. For instance, the UNESCO guidelines propose the integration of AI literacy and AI ethics into existing programs and courses. However, given Indonesia's diversity and the presence of distinct socio-cultural and religious nuances, it is crucial to develop locally contextualized ethical frameworks that effectively address the challenges and opportunities arising from the AI era in education. Therefore, considering that the majority of Indonesians identify as Muslims, this study consequently delves into the examination and exploration of Islamic-based ethics as a viable framework for navigating the complex ethical dilemmas posed by AI in Indonesia.

4.3 AI & Islamic Ethics

Nowadays, researchers are increasingly exploring virtue-based ethics as a framework for addressing ethical dilemmas in the AI era [35]. Notably, even the Vatican has recently issued guidelines on AI ethics to serve as a guiding reference for individuals following the Catholic faith [36]. This development raises the question of whether the Islamic world can also unite and create a virtue-based handbook, fostering ethical guidelines specific to their values and principles in relation to AI, particularly within the domain of education.

Within the context of Islamic ethics, the principles of *Shari'ah* (Islamic law) seek to promote the common good and prevent actions that may harm individuals and society in all facets of human life [18]. Consequently, these Islamic principles extend to the use and creation of AI applications in education. Recently, Raquib et al. [37] proposed a valuable framework grounded in Islamic ethics known as the *Maqāṣid* (objectives) theory. This theory categorizes the advantages obtained from achieving educational objectives into the following: (1) essentials, (2) needs and necessities, and (3) enhancements. This classification emphasizes the importance of giving priority to student well-being (essentials) and educational progress (needs and necessities), rather than focusing solely on technological advancements (enhancements). For example, when assessing the use of AI in educational processes, such as grading or administrative tasks, the application of Islamic objectives ethics would involve evaluating whether the implementation of AI serves the essentials or needs and necessities of education. If the primary focus of using AI is to enhance efficiency without significantly improving student learning outcomes or overall educational experiences, it may be considered unnecessary and fall under the category of enhancements.

Hence, in the context of AI tutors, the Islamic ethics framework based on the *Maqāṣid* theory would prompt educators to avoid using AI tutors if they pose significant risks to students' academic progress or well-being. For example,

if an AI tutoring system lacks the capability to recognize and address students' emotional needs or struggles, resulting in an adverse impact on their overall learning experience, the use of such AI tutors would be considered inappropriate. In such instances, the involvement of human educators becomes crucial to ensure the holistic development and support of students throughout their educational journey. By carefully considering these distinctions and applying the *Maqāsid* theory, educators and policymakers can strike a balance between leveraging AI's potential and safeguarding the best interests of students within the Indonesian-Muslim context.

In conclusion, through an examination of these ethical considerations encompassing inequality, public policy, and Islamic ethics, it becomes evident that AI's integration in Indonesian education warrants careful evaluation and adherence to ethical principles. Such considerations are essential for ensuring equitable access, protecting academic integrity, and aligning technological advancements with the values and goals of education within the country.

5 Discussion & Future Directions

All in all, this paper has discussed the various applications of AI in the field of education, specifically focusing on AI tutors for science-based subjects and Islamic education. The research encompasses the utilization of AI tutors in language learning, mathematics, plot-generation, and Quran recitation tools, drawing upon examples from both global educational contexts and those specific to Islamic education. However, despite Indonesia's evident interest in AI technological advancements, as demonstrated by the aforementioned government-led projects, there remains a lack of understanding regarding the implications of AI applications in the Indonesian education system. Consequently, this paper sought to shed light on the practical implementation of AI in education in Indonesia, with particular attention to three fundamental aspects: firstly, ensuring the fair and equitable distribution of technological advancements and educational opportunities through an equity lens; secondly, establishing well-defined guidelines for AI usage in alignment with the recommendations set forth by UNESCO, to which Indonesia is a member-state; and lastly, developing an Islamic-based ethical framework that adequately addresses the unique needs and perspectives of the country's Muslim majority population.

However, the focus of this discussion should not solely be on the members of the current generation, who are already more adept in the use of AI technology than their elders. Instead, it should also encompass future generations who rely on AI technologies as their primary mode of communication, central platform for academic tasks, entertainment, and exploring contemporary issues. Nevertheless, it is essential to recognize that political and economic power will still predominantly reside with adults. Consequently, it becomes crucial for the upcoming generation to understand and adapt their interactions to effectively navigate society. However, the lack of skills or knowledge required to communicate with individuals who hold different values and attitudes further complicates

the traditional conflicts between youth and their elders. Moreover, these divisions extend beyond generational disparities and encompass any group with differing characteristics. Thus, this paper emphasizes the need for future generations to develop the necessary skills to bridge these gaps and navigate a society where technological advancements and differing perspectives are prevalent.

In terms of future directions for Indonesia, it is valuable to consider the advancements made in AI education in other countries. For example, China has made significant progress in AI education, with companies like Squirrel AI pioneering a learning center where students and teachers rely solely on the latest technologies for instruction, eliminating the need for physical blackboards and notebooks [16]. This approach aims to shift the focus away from test-centric education and prioritize physical, moral, and artistic aspects. China’s exploration of AI education has the potential to influence global educational practices and serves as a valuable case study for Indonesia.

Further, to ensure effective utilization of AI tools, proper training should be provided to educate educators and students on the functions of AI, including how to evaluate accuracy and information and how to track queries as discussed in the UNESCO guidelines. This paper suggests that educators should allow the use of ChatGPT and initiate its use, as students are likely to use it regardless [2]. Allowing students to use the tool gives them an equal chance to develop ideas and improve their writing [38]. To illustrate this, an example of reverse-engineering a ChatGPT-based exam could be given, showcasing how the tool can be used to stimulate critical thinking, creativity, and problem-solving.

In light of these considerations, further research and examination in the Indonesian context are necessary to comprehensively investigate the implications of AI in (religious) teaching practices within classrooms, accounting for diverse religious perspectives, theological considerations, and the intricate interplay between intention, actions, and spiritual rewards within different religious frameworks.

In conclusion, as we witness the potential of AI technologies like ChatGPT to effectively address the limitations of traditional exams, we find ourselves at a pivotal juncture in the evolution of education. To navigate this transformative path successfully, it is imperative that we actively engage in qualitative and longitudinal research within the context of AI and education in Indonesia. This paper serves as a preliminary step, offering valuable insights and emphasizing the urgent need for further investigations. Only through such rigorous investigation can we fully understand the multifaceted implications, benefits, and challenges that AI integration presents to our educational landscape. By embracing AI tools, offering comprehensive training, and dedicating ourselves to profound research in diverse educational settings, including religious education, we pave the way for an enlightened future of learning.

References

1. Ropek, Lucas. "New York City Schools Ban ChatGPT to Head Off a Cheating Epidemic." Gizmodo, <https://gizmodo.com/new-york-city-schools-chatgpt-ban->

- cheating-essay-openai-1849949384 Last accessed 4 Jul 2023
2. García-Peñalvo, Francisco José. "The Perception of Artificial Intelligence in Educational Contexts After the Launch of ChatGPT: Disruption or Panic?." (2023).
3. McMurtrie, B. (2022). "AI and the Future of Undergraduate Writing. The Chronicle of Higher Education," <https://www.chronicle.com/article/ai-and-the-future-of-undergraduate-writing> Last accessed 4 Jul 2023
4. Zembylas, Michalinos. "A Decolonial Approach to AI in Higher Education Teaching and Learning: Strategies for Undoing the Ethics of Digital Neocolonialism." *Learning, Media and Technology* 48.1 (2023): 25-37.
5. Alwasilah, A. Chaedar. "Islam, Culture, and Education: Essays on Contemporary Indonesia." Rosda, 2013.
6. World Population Review 2023, <https://worldpopulationreview.com/country-rankings/muslim-population-by-country> Last accessed 4 May 2023
7. Anderson, J. R., C. F. Boyle, and G. Yost. "The Geometry Tutor, proc. of 9th International Joint Conference on Artificial Intelligence." (1985).
8. Anderson, J. R. "Proposal to the Carnegie Corporation to Support Demonstration and Development of a Geometry tutor." Unpublished proposal, Carnegie-Mellon University, Pittsburgh, PA (1984).
9. Schofield, Janet Ward, Debra Evans-Rhodes, and Brad R. Huber. "Artificial Intelligence in the Classroom: The Impact of a Computer-based Tutor on Teachers and Students." *Social Science Computer Review* 8.1 (1990): 24-41.
10. Chen, Mo, Fanjue Liu, and Yu-Hao Lee. "My Tutor is an AI: The Effects of Involvement and Tutor Type on Perceived Quality, Perceived Credibility, and Use Intention." *Artificial Intelligence in HCI: 3rd International Conference, AI-HCI 2022, Held as Part of the 24th HCI International Conference, HCII 2022, Virtual Event, June 26–July 1, 2022, Proceedings*. Cham: Springer International Publishing (2022).
11. Hams, Mahmud (2021). "Robot Teacher Introduced in Gaza Classroom," <https://www.i24news.tv/en/news/middle-east/palestinian-territories/1639688788-robot-teacher-introduced-in-gaza-classroom> Last accessed 10 June 2023
12. Kohli, Diti (2021). "An Andover Preschool Hired an Unusual Teacher's Aide: a Robot," <https://www.bostonglobe.com/2021/12/06/business/an-andover-preschool-teacher-is-robot/> Last accessed 10 June 2023
13. McDonagh, Marese (2021). "Sligo Schoolchildren's New Teacher will be Nao – a Robot," <https://www.irishtimes.com/news/education/sligo-schoolchildrens-new-teacher-will-be-nao-a-robot-1.4659247> Last accessed 10 June 2023
14. Bellar, Wendi. "Rituals: Prayer App Rituals: How Islamic Participants Engage with Technological and Religious Affordances in Muslim Pro." *Digital Religion*. Routledge, 2021. 150-158.
15. Alemi, Minoo, et al. "Social Robotics, Education, and Religion in the Islamic World: An Iranian Perspective." *Science and Engineering Ethics* 26 (2020): 2709-2734.
16. Hao, Karen. "China has Started a Grand Experiment in AI Education. It could Reshape how the World Learns." *MIT Technology Review* 123.1 (2019).
17. Reuter, Peter R., Bridget L. Forster, and Bethany J. Kruger. "A Longitudinal Study of the Impact of COVID-19 Restrictions on Students' Health Behavior, Mental Health and Emotional Well-being." *PeerJ* 9 (2021): e12528.
18. Popova, Biliana. "Islamic Philosophy and Artificial Intelligence: Epistemological Arguments", *Zygon®* 55.4 (2020): 977-995.
19. Hamruni, and Suwartini, Sri. "Artificial Intelligence In Global Islamic Education." *IOSR Journal Of Humanities And Social Science (IOSR-JHSS)* (2022): 39–49.

20. Xu, Kun. "First Encounter with Robot Alpha: How Individual Differences Interact with Vocal and Kinetic Cues in Users' Social Responses." *New media & Society* 21.11-12 (2019): 2522-2547.
21. Morfit, Michael. "Pancasila: The Indonesian State Ideology according to the New Order Government." *Asian Survey* 21.8 (1981): 838-851.
22. Tan, Charlene. "Educative Tradition and Islamic Schools in Indonesia." (2014).
23. Das, K., et al. "The Digital Archipelago: How Online Commerce is Driving Indonesia's Economic Development. McKinsey & Company, August, 1-72." (2018).
24. Satya, Venti Eka. "Strategi Indonesia menghadapi Industri 4.0." *Info Singkat* 10.9 (2018): 19-24.
25. Sumakul, Dian Toar YG, Fuad Abdul Hamied, and Didi Sukyadi. "Artificial Intelligence in EFL Classrooms: Friend or Foe?" *LEARN Journal: Language Education and Acquisition Research Network* 15.1 (2022): 232-256.
26. Hermawan, Hardika Dwi, Nurhamsi Deswila, and Danis Nurul Yunita. "Implementation of ICT in Education in Indonesia during 2004-2017." 2018 International Symposium on Educational Technology (ISET). IEEE, 2018.
27. Rosser, Andrew. "Beyond Access: Making Indonesia's Education System Work." (2018).
28. Yuhetty, Harina. "ICT and Education in Indonesia." Retrieved September 19 (2002): 2012.
29. Goode, Kayla, and Heeu Millie Kim. "Indonesia's AI Promise in Perspective." Center for Security and Emerging Technology, August 28 (2021).
30. Sri Saraswati Wisjnu, Wardhani, Ismunandar Ismunandar, and Nugroho Anto S. "Strategi Nasional Kecerdasan Artifisial Indonesia 2020-2045." (2020).
31. Ministry of Communication and Informatics. (2017) Langkah Menuju "100 Smart City", https://kominfo.go.id/content/detail/11656/langkah-menuju-100-smart-city/0/sorotan_media
32. Clark, Charles MA, and Aleksandr V. Gevorkyan. "Artificial Intelligence and Human Flourishing." *American Journal of Economics and Sociology* 79.4 (2020): 1307-1344.
33. Sullivan, M., Kelly, A. and McLaughlan, P. (2023) "ChatGPT in Higher Education: Considerations for Academic Integrity and Student Learning," *Journal of Applied Learning and Teaching*, 6(1). Available at: <https://doi.org/10.37074/jalt.2023.6.1.17>.
34. Sabzalieva, Emma, and Arianna Valentini. "ChatGPT and Artificial Intelligence in Higher Education: Quick Start Guide." (2023).
35. Vallor S. "Technology and the Virtues a Philosophical Guide to a Future Worth Wanting." Oxford: Oxford University Press; 2018.
36. Flahau, José Roger et al. (2023). "Ethics in the Age of Disruptive Technologies: An Operational Roadmap," <https://www.scu.edu/institute-for-technology-ethics-and-culture/itec-handbook/> Last accessed 4 Jul 2023
37. Raquib, Amana, et al. "Islamic Virtue-based Ethics for Artificial Intelligence." *Discover Artificial Intelligence* 2.1 (2022): 11.
38. Halaweh, Mohanad. "ChatGPT in Education: Strategies for Responsible Implementation." (2023).