

Artificial Intelligence In Global Islamic Education

Hamruni

Professor of UIN Sunan Kalijaga Yogyakarta

Sri Suwartini

*Doctoral Program Students (S3)
Postgraduate UIN Sunan Kalijaga Yogyakarta*

Abstract

The development of contemporary education is enlivened with the issue of Artificial Intelligence (AI), a new achievement that has affected all fields, but its application in Islamic education has not yet been mapped. This article aims to explore the application of Artificial Intelligence in Islamic education in various countries, then map the influence of AI on Islamic education, and see future prospects regarding the potential and compatibility of AI for Islamic Education. Through the literature study method, especially on online sources, this study finds that AI has been applied in many Islamic educational institutions in various countries such as the United Arab Emirates, Indonesia, China, Japan, and Malaysia. The application of AI is mainly in education administration, language learning, tahfizul Qur'an, basic programming and design, research and community service. This study also found that AI is very prospective for personalization in Islamic learning, supporting students with special needs, updating communication patterns in education, helping school systems and management, preventing dropouts, improving evaluation skills, and increasing readiness to face any new innovations. Ethically, the application of AI is compatible with Islamic morality as long as it applies the principles of Trustworthy AI which include beneficence, non-maleficence, autonomy, justice, and explicability.

Keywords: artificial intelligence, islamic education, digitalization

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I. PRELIMINARY

Artificial Intelligence is the result of science and technology achieved in the modern century, to be precise since the computer era, and is growing rapidly along with advances in information technology that leads to digitization in all fields. This technology applies a computer algorithm process with several advantages. First, artificial intelligence has an extraordinary speed of thinking, especially with the increasing speed of computers and digital devices that are growing rapidly, the speed of thinking of artificial intelligence is also increasing. Second, it has high accuracy and precision because of the mechanistic and all-measurable process on the device. Third, minimize errors because they do not experience fatigue, sleepiness, or shift their focus as often experienced by humans (human error). These advantages make artificial intelligence quite promising to carry out various types of tasks for wide use, including for the world of education.

The use of artificial intelligence in education can already be seen in several countries. In Australia, the Intelligence Tutoring System (ITS)¹ has been developed which allows solving the problem of the quota ratio of the number of educators and students. In Japan, there have been robots with artificial intelligence that have been included in the national examination for university entrance in Japan and achieved a decent score to be accepted in 404 (out of 744) private universities in Japan.² In addition, artificial intelligence has many roles as information providers such as Google and the like. Artificial intelligence has even been applied to the work of facilitators and classroom management. Apps like Openlearning, Schoology, Edmodo, and the like have proven this. The latest development, artificial intelligence is integrated with the advanced internet platform, namely Metaverse.

Through a study of library sources and online sources, this study aims to explore the application of

¹ Wayne Holmes, Rose Luckin, dan UCL Knowledge Lab, *Intelligence Unleashed: An Argument for AI in Education* (London: Pearson : UCL Knowledge Lab, 2016), 25–26.

² Noriko H Arai dan Takuya Matsuzaki, "The Impact of A.I. on Education – Can a Robot Get into The University of Tokyo?," t.t., 9.

artificial intelligence in Islamic education globally, as well as the implications of artificial intelligence for Islamic education and its prospects in the future. Studies on the application of artificial intelligence in the Islamic world have indeed been researched. In general, artificial intelligence in the global Islamic world is applied for banking and business purposes. For example, it can be seen in the article entitled Artificial intelligence, smart contracts and Islamic finance written by Rahim et al.³ Then Khan's article entitled When Finance Meets Artificial Intelligence⁴, There is also Amer and Kazakov with the article Artificial Intelligence for Islamic Banking,⁵ and similar works from Zain⁶, Gazali⁷, and Rabbani⁸.

Meanwhile, studies on the application of artificial intelligence for education are still limited. Although relatively few compared to the application in the financial sector, studies on artificial intelligence in the world of education have been mapped and are worthy of being the object of literature research. Some of these studies include the work of Bali et al with the title Artificial Intelligence in Higher Education: Perspicacity Relation between Educators and Students,⁹ The study of Bali et al was conducted to find out and understand the relationship of intelligence between lecturers and students of Nurul Jadid University (UNUJA) in implementing artificial intelligence in College. Eraku and Baruadi article entitled Digital Literacy and Educators of Islamic Education.¹⁰ They highlight changes in the learning process in the digital era by describing the competence of Islamic Religious Education teachers in the digital era. Ali Akbar Ziaee in A Philosophical Approach To Artificial Intelligence And Islamic Values, explained that Artificial Intelligence has the potential to empower humans through improving learning and performance.¹¹

Eric Artwel et al in their article An Artificial Intelligence approach to Arabic and Islamic content on the internet review a series of Artificial Intelligence and Corpus Linguistics research at the University of Leeds on Arabic and the Koran, which has produced a series of software and corpus datasets for language research. Modern Standard Arabic and recently Quranic Arabic. Then another work is a book written by Kose and Dismus with the title Artificial Intelligence applications in distance education.¹² Applications of Artificial Intelligence in Distance Education seeks to examine the efforts made to bridge the gap between students and educators with computer application.

Santosa and Jazuli in their article entitled The Digital Madrasa as an Idea of IT-Based Islamic Education, discuss the opportunities for madrasas as Islamic educational institutions in facing modernization, as well as what learning methods are appropriate to use in learning. The term "digital madrasa" can be a bridge for a madrasa to be ready to face the era of globalization.¹³ Omar et al with the title An intelligent arabic

³ S. M. Rahim, Zam Zuriyati Mohamad, J. Abu Bakar, Farhana Hanim Mohsin, and Norhayati Md Isa. "Artificial intelligence, smart contract and islamic finance." *Asian Social Science* 14, no. 2 (2018): 145.

⁴ Shahnawaz Khan, and Mustafa Raza Rabbani. "Chatbot as Islamic Finance Expert (CaIFE) When Finance Meets Artificial Intelligence." In *Proceedings of the 2020 4th International Symposium on Computer Science and Intelligent Control*, pp. 1-5. 2020.

⁵ Amer Alzaidi, and Dimitar Kazakov. "Artificial Intelligence for Islamic Banking." *The Journal of Muamalat and Islamic Finance Research* (2008).

⁶ Nor Razinah Mohd Zain, Rusni Hassan, and Azman Ismail. "Enhancing Islamic Banking and Finance in Southeast Asia Through the Application of Artificial Intelligence: An Exploration of Banking's Best Practices." In *Impact of Financial Technology (FinTech) on Islamic Finance and Financial Stability*, pp.36-53. IGI Global, 2020.

⁷ Haneffa Muchlis Gazali, Junisa Jumadi, Noor Rasyidah Ramlan, Nurmaisarah Abd Rahmat, Siti Nor Hazilawati Mohd Uzair, and Amirah Norliyana Mohid. "Application of Artificial Intelligence (AI) in Islamic Investments." *Journal of Islamic Finance* 9, no. 2 (2020): 70-78.

⁸ Mustafa Raza Rabbani, Adel Sarea, Shahnawaz Khan, and Yomna Abdullah. "Ethical Concerns in Artificial Intelligence (AI): The Role of RegTech and Islamic Finance." In *The International Conference On Global Economic Revolutions*, pp. 381-390. Springer, Cham, 2021.

⁹ Muhammad Mushfi El Iq Bali, Maharani Putri Kumalasani, and Devi Yunilasari. "Artificial Intelligence in Higher Education: Perspicacity Relation between Educators and Students." *Journal of Innovation in Educational and Cultural Research* 3, no. 2 (2022): 146-152.

¹⁰ Sunarti Suly Eraku, Mohamad Karmin Baruadi, Samuel PD Anantadjaya, Siti Fadjarajani, Ucup Supriatna, and Ardian Arifin. "Digital Literacy and Educators of Islamic Education." *Edukasi Islami: Jurnal Pendidikan Islam* 10, no. 01 (2021): 569-576.

¹¹ Ali Akbar Ziaee, "A Philosophical Approach To Artificial Intelligence And Islamic Values," *IIUM Engineering Journal* 12, no. 6 (2011), <https://doi.org/10.31436/iiumej.v12i6.191>.

¹² Kose, Utku, ed. *Artificial Intelligence applications in distance education*. IGI Global, 2014.

¹³ Sedya Santosa dan Muhammad Fahmi Jazuli, "The Digital Madrasah as an Idea of IT-Based Islamic

conversational tutoring system for modern Islamic education.¹⁴ The article focuses on the development of Abdullah's novel Arabic Conversation Intelligent Guidance System (CITS). . Ekasari in his article Understanding Islamic Education Management in Digital Era: What Experts Say, reviews the opportunities for madrasas as Islamic educational institutions in the face of modernization, as well as appropriate e-learning learning methods to be used in learning.¹⁵ Some literature makes Islamic education in relation to intelligence artificial as the main object of study but some others only mention it in passing. Based on the literature review, studies are still needed that provide exploration of the application of artificial intelligence in Islamic education globally.

II. RESEARCH METHODS

The method used in this research is library research and literature review. This research is included in the type of qualitative research, trying to see the entity as it is according to the setting but then trying to interpret or make it better understood.¹⁶ The approach used in this research is Educational Technology. Educational technology is the study and ethical practice of facilitating and enhancing learning performance. The study and ethics of such practice can be through the creation, use, regulation of processes, and technological resources. The subjects of this research are Islamic educational institutions that apply AI technology in their educational activities. In this study, what is meant by global Islamic education is the institutions and practices of formal education in various countries in the world. Data were collected from studies of the latest information on the internet as well as from various accessible libraries and journal articles. After the data is collected, data analysis is carried out, namely the process of organizing the data into patterns, categories, and a basic description, so that a working hypothesis can be found and formulated.¹⁷ The stages start from the selection, categorization, and sorting of data, then data exploration, then data verification. and contextualization of data. The whole process will produce a descriptive-analytical presentation.

III. FINDINGS AND DISCUSSION

A. Artificial Intelligence characteristics and types

Artificial intelligence is one part of science that allows machines (computers) to do work, as and as well as humans do.¹⁸ Turban gives the understanding of Artificial Intelligence as the process of making, or preparing machines such as computers to have an intelligence based on human behavior. Artificial Intelligence basically aims to make computers carry out an order, which can be done by humans.¹⁹

Artificial Intelligence has a number of capabilities that have the potential to replace the role of humans, namely the ability to analyze, manage big data, respond quickly, create and repair documents quickly, and be able to carry out deeper personalization.²⁰ According to Wahyu Ramadhan, how artificial intelligence works can be understood by several key terms: (1) Machine Learning is the application of Artificial Intelligence to computer systems to provide the ability to 'learn' automatically through experience without needing to be programmed; (2) Artificial Neural Network (ANN) which is similar to human brain network; (3) Natural Language Processing (NLP), namely AI's ability to detect, understand; and (4) Computer vision, technology capable of processing visuals in the form of graphics, photos, tables, and tables.²¹

Education,” *Nazhruna: Jurnal Pendidikan Islam* 5, no. 2 (20 April 2022): 379–91, <https://doi.org/10.31538/nzh.v5i2.2121>.

¹⁴ Omar G. Alobaidi, Keeley A. Crockett, Jim D. O'Shea, and Tariq M. Jarad. "Abdullah: An intelligent arabic conversational tutoring system for modern islamic education." In *Proceedings of the World Congress on Engineering*, vol. 2. 2013.

¹⁵ Silvia Ekasari dkk., “Understanding Islamic Education Management in Digital Era: What Experts Say,” *Nidhomul Haq: Jurnal Manajemen Pendidikan Islam* 6, no. 1 (4 April 2021): 127–43, <https://doi.org/10.31538/ndh.v6i1.1336>.

¹⁶ Denzin N. and Lincoln Y. (eds.), *Handbook of Qualitative Research*, London: Sage Publication Inc., 2000, hlm. 3.

¹⁷ Lexy J. Moleong, *Metodologi Penelitian Kualitatif*, Bandung: PT. Remaja Rosdakarya, 2002, 190.

¹⁸ Kusumadewi, 2003

¹⁹ Turban, 1995, 422.

²⁰ Salsabela Liani dan Ruangguru Tech Team, “5 Rahasia Kemampuan Artificial Intelligence dalam Dunia Kerja,” diakses 29 April 2022, <https://www.ruangkerja.id/blog/5-rahasia-kemampuan-artificial-intelligence-dalam-dunia-kerja>.

²¹ Wahyu Ramadhan, “Ini Dia Rahasia Di Balik Kecerdasan Buatan Yang Serba Tahu,” *Kreativv*, 8

According to its development, Artificial Intelligence can be divided into 4 types based on its function. From the simplest, to the most advanced Artificial Intelligence. From what has been achieved by humans to Artificial Intelligence which is actually still in concept. The types of Artificial Intelligence according to the sequence of development are: (1) Reactive Machines (Type I), namely Machines designed based on the human ability to respond to stimuli but do not have memory, (2) Limited Memory (Type II) is still a reactive machine but equipped with limited capabilities. memory to store new data outside of existing programs. The ability to store data allows this AI to learn new things; (3) Theory of Mind (Type III) can be used to interact with humans better. Programs of this type are designed to capture the state of the environment and its influence on the human mind and emotions; (4) Self-awareness (Type IV) The pinnacle of the most advanced AI development, type IV, self-awareness. have the ability to think like humans in general. This AI can move at its own will without a program, to have feelings. This type is still in concept and has not actually become a reality.

It can be concluded that AI has several advantages, including: (1) Artificial intelligence is more permanent, while natural intelligence can change, this is due to human nature factors that are easy to forget; (2) artificial intelligence is easier to duplicate and propagate, (3) artificial intelligence is more consistent; (4) Artificial intelligence is cheaper than natural intelligence.

B. Application of Artificial Intelligence in Global Islamic Education

1. Islamic Dharwood Pau Memorial Primary School (IDPMPS) in Hong Kong

IDPMPS is an Islamic educational institution that was founded in 2007 in the city of Kowloon, Hong Kong, an area that has so far had a negative image due to problems with population density, gangsters, and narcotics. With such a community setting the school carries a mission to nurture students as lifelong learners and contribute to global citizenship through practicing the school's core values: "Educate and Love others".

The IDPMPS curriculum has implemented a high level of IT awareness. There are three programs that they categorize in the IT and Education cluster, namely the STEAM program, the BYOD (Bring Your Own Device) program, and the AI (Artificial Intelligence). IDPMPS students learn simple concepts and skills from artificial intelligence that can equip them with future skills. They can prepare for future careers related to artificial intelligence and meet the upcoming challenges of the future. The aim of this AI program is for students to understand the basic concepts of artificial intelligence; identify Artificial Intelligent elements (Big Data and Machine Learning) to generate results/predictions and understand that machine learning is a technique for training software models using data.

The AI program itself is a development, and at the same time direct support for the STEAM program which is a cross-disciplinary IT-based application where mathematics, arts, social sciences and some are integrated in class projects. For example in making coding, 3D models, 3D printing and so on. To ensure this IT program is sustainable, students are advised to bring their own devices, so that what is learned at school can be applied to practice at home. This is a support program called BYOD (Bring Your Own Device).

2. Digitalization of Madrasas in Indonesia

The application of AI to Islamic educational institutions in Indonesia is part of the madrasa digitization program launched by the Ministry of Religion. The goal is to improve the quality of learning and accelerate digital transformation efforts for education. Each madrasa that participated in the program received assistance of Rp. 150 million. The assistance is given to madrasahs that have implemented an AI-based system called the Madrasah Self Evaluation (EDM) program and the e-RKAM system (Electronic-Based Madrasah Work Plan and Budget) which were introduced in 2020 and will begin to be implemented in 2021. For reporting, The ministry has implemented the e-RKAM system as e-planning and e-budgeting for madrasahs. Thus, the accountability of reports regarding assistance to madrasahs can be guaranteed.²²

3. Alef Education United Arab Emirates

One example is Alef Education, a global educational technology company headquartered in the United Arab Emirates' capital, Abu Dhabi, one of the most innovative and cosmopolitan cities in the world. The Alef Platform idea first emerged in 2015 when it was conceptualized as a technology-based education mode to meet the needs of the local public school system in the United Arab Emirates. Along with its global expansion, Alef Education began to use Artificial Intelligence for several purposes. For example: (1) ready-made lessons, games, and assessments that can be used at school/madrasah, outside school/madrasah, or from home; (2) Automatically generated performance reports for each student; (3) Grade level and student reports identifying students' positions in their learning process; (4) Automatic assessment of daily exams and final exams, to save

Februari 2020, <https://kreativv.com/rahasia-kecerdasan-buatan/>.

²² Kirana Aisyah, "Indonesian Islamic Schools Embrace Digital Technology – OpenGov Asia," diakses 4 Mei 2022, <https://opengovasia.com/indonesian-islamic-schools-embrace-digital-technology/>.

your time; (5) class collaboration activities using the Teams feature for group work or assignments; (6) a star reward system to keep students motivated and engaged a framework for identifying which students are struggling and which are on the right track.²³

4. MBZUAI in Abu Dhabi

Mohamed bin Zayed University of Artificial Intelligence (MBZUAI), which opened in January 2021, is part of a wider diversification effort in Abu Dhabi, as it seeks to move away from an oil and gas-based economy to focus more on knowledge and skills. MBZUAI is a postgraduate research-based academic institution that offers specialized degree programs (MSc and PhD) for local and international students in the field of Artificial Intelligence. MBZUAI aims to support the advancement of scientific research, development, transfer, and use of Artificial Intelligence through programs that enable students to fulfill their intellectual potential in a sophisticated environment.

Students at MBZUAI are given some of the most essential (core components) and cutting-edge courses in Artificial Intelligence, namely: (1) Mathematical Foundations for Artificial Intelligence, (2) Big Data Processing, (3) Human and Computer Vision, and (4) Processing Natural Language and Speech. These essential aspects in AI are also studied specifically as a study program at MBUZAI at the master level, namely: Master of Science in Computer Vision, Master of Science in Machine Learning, and Master of Science in Natural Language Processing.²⁴

As a center for AI research and education, MBUZAI also aims to be a center for AI innovation by finding solutions to the world's most pressing challenges. Also, as a new institution, the university has ambitions to become the go-to place for governments and companies when it comes to AI expertise, solutions or advice. These include: Feasibility studies, Benchmarking and assessment, Business process improvement (enhancement), and expert mentoring for AI startups (guidance and mentoring).²⁵

5. YUAI and Other Islamic Schools in Japan

YUAI International Islamic School was launched in July 2016 in collaboration with the FGA Education Foundation and the Islamic Center of Japan. YUAI is an international school in Tokyo offering Integrated and Holistic Education emphasizing Islamic values and character building and intellectual excellence with the globally recognized IGCSE curriculum format from the University of Cambridge in the UK. YUAI serves education from kindergarten to secondary school level. For the highest level they teach: AQ & Islamic Studies, English, Maths, Science, Social Studies, Japanese Language, Arabic, Art & Craft, Health & Physical Education, Computer Studies.

Artificial Intelligence in Islamic schools in Japan is not specifically taught as a subject, but is usually mentioned in computer education subjects or Information and Communication Technology (ICT). Almost all Islamic schools in Japan provide computer education, not only at YUAI but also other schools such as International Islamic School Otsuka and Tokyo Iqra International School. At the Otsuka Islamic school, computer studies subjects were given which refers to the Cambridge curriculum. Meanwhile at Iqra Tokyo school, ICT lessons are given.

6. Syafana Islamic School Indonesia

Syafana Islamic School is an integrated superior school that acts based on national standards and has an international perspective. This school was founded in 2005 in Gading Serpong, Tangerang – Banten Indonesia. Graduates from this school are expected to become true believers, and exemplary people so that they become future leaders who have high academic achievements. Keeping this goal in mind, they will be able to compete and be accepted in International and National Institutions to continue their education with excellence. Artificial intelligence is applied by Syafana school for the purposes of E-Learning and e-Library.

7. I-Tasmik in Malaysia

I-Tasmik is a digital platform developed in Malaysia. This platform aims to help tahfiz students practice memorizing the Al-Quran more easily independently. It will also help Madrasah tahfiz to monitor their students when they return home and for remote students. I-Tasmik is a free business model that aims to provide a platform for tahfiz Madrasah, Ustaz and Ustazah students to help improve their memorization of the Quran and monitor their students' performance. This platform provides voice recognition system and monitoring system. Nine blocks of the Business Model Canvas (BMC) framework, Value Proposition Design (VPD) and

²³ <https://alef.co.id/>

²⁴ <https://www.masterstudies.com/universities/United-Arab-Emirates/Mohamed-bin-Zayed-University-of-Artificial-Intelligence-MBZUAI/>

²⁵ <https://mbzuai.ac.ae/professional-services>

environmental maps have been used as the methodology for this effort. Using the i-Tasmik system allows students' Tasmik notes to be monitored by Tasmik supervisors online. This i-Tasmik program recording system is the first of its kind at UiTM, which is patented, copyrighted and registered under the Research Innovation Business Unit in Malaysia.

C. The Effect of Artificial Intelligence Application on Islamic Education and Its Future Prospects

1. The Effect of Artificial Intelligence on Islamic Education

The application of artificial intelligence in Islamic education as described in the previous section still shows limitations both in terms of quantity and quality. However, some of these findings have shown the influence of artificial intelligence in Islamic education, namely: (1) AI is used in education administration, for example by the Syafana School, and the EDM and e-RKAM programs by the Ministry of Religion; (2) AI is used in language learning, for example by Alef Education; (3) AI is used in memorizing the Qur'an, for example through the I-Tasmik platform from Malaysia; (4) AI for basic programming and design, for example implemented by IDPMPS Hong Kong, and several Islamic schools in Japan; (5) AI for community service for example by MBZUI in Abu Dhabi.

The level of Artificial Intelligence that has been used in Islamic education is still limited to AI Type I (reactive machines) and AI Type II (limited memory). Software, applications, programs, which are built are still dominated by algorithm functions for data processing that produce assessments and recommendations. These programs do not yet have advanced machine learning capabilities. Therefore, its functions still depend on the supply of data that enters the program/application. Thus, the application of AI is still dominated by administrative functions. Even for the use of AI in language development, there are not many applications of Natural Language Processing NLP).

For the field of research on AI, it seems that Islamic education is only being done at the university level. MBZUI as an example in this case, conducts research to community service in the field of AI for students at the master and doctoral level. However, the hope to be carried out at the undergraduate and diploma levels is also quite high considering the contemporary reality where Islamic campuses, including PTKE in Indonesia, are starting to engage in digital technology studies which are of course very close to the study of big data to artificial intelligence.

2. Prospek Artificial Intelligence bagi Pendidikan Islam

Artificial Intelligence has good future prospects for education, both in general and Islamic education. Here are some of those prospects.

a. AI for Islamic Learning Personalization

A religious teacher (ustadz or kyai) sometimes treats his students differently, according to the character of the santri's personality. Positioning students as unique individuals and not generalizing them is a form of personalization in traditional education. The same is still needed in modern education. But often the classical system in education makes personalization more difficult, especially if the ratio of the number of students to teachers is not ideal. The presence of AI actually allows personalization to be done with modern devices. This AI solution is still relatively rarely applied, especially in the context of Islamic education. Personalization aims to provide instruction that is continuously responsive to learner abilities, the program assesses students' skill levels on a daily basis and uses algorithms to target content delivery and assign students to different instructional modes. This includes teacher-led instruction, student collaborative work and educational software such as virtual adaptive tutoring. Every day, students access a computer or smartphone dashboard that displays their progress. Personalized AI also provides teachers with real-time information about each student's class and performance via dynamic dashboards, allowing teachers to pay special attention.

b. AI Supports students with special needs

As the discourse of inclusive education develops, every educational institution is required to be more accommodating to students with special needs, and Islamic education institutions are no exception. Globally inclusive education generally aims to ensure equal access to all levels of education for all, including persons with disabilities. AI systems have demonstrated their effectiveness in helping students with disabilities, both those with visual or hearing impairments and impairments in social skills (language and communication), to benefit equally from education. For example, wearables using AI can help blind students read books and recognize faces, and thus learn and socialize in their communities.

A special system has been designed to assist students with all types of disabilities. Powered by AI, technologies such as augmented and virtual reality (AR/VR) and robotics support the learning and engagement of students with health disorders and mental health issues. While some technologies help overcome some obstacles, such as text-to-speech applications or vice versa speech-to-text, others are based on research and show promising results. As another example, diagnostic tools to detect special needs such as dyslexia, dyscalculia, spelling difficulties or Attention Deficit Hyperactivity Disorder (ADHD) are now based on technology tools using AI

techniques.²⁶ These applications are just a few examples of how AI can help make education more inclusive.

c. AI for Renewing Communication Patterns in Education

Other AI applications that use its ability to detect patterns to provide individualized suggestions to students, teachers or parents have been developed for: (1) Online and blended learning: AI agent-powered chatbots provide students and teachers with analytics about their learning; (2) Class dynamics: various types of sensors and cameras analyze class dynamics and student engagement to provide real-time or post hoc feedback and suggestions to teachers; (3) Foreign language learning: AI features such as speech recognition and analysis, pronunciation correction, help equip teachers in foreign language teaching.

d. AI for school systems and management

Educational management jobs require tools that facilitate the administration and distribution of authority. From simply sending files to organizing each member to make decisions, this can be done by means of technology. Now with AI, where computing with the power of algorithms is more powerful, making diagnoses, calculating opportunities and risks, making predictions and providing recommendations for management purposes is easier to do.

e. AI to Prevent Dropouts

Educators and policy makers often have difficulty identifying the factors that cause a student to drop out of school. If these factors are finally identified, it is often too late. Therefore, early identification of dropout factors will be a preventive measure for dropout problems. AI systems promise to improve early warning systems, which are increasingly based on emerging longitudinal datasets in education. While identifying risks doesn't necessarily mean solving them, AI solutions help principals use existing data in new ways and design interventions to predict and prevent dropouts more efficiently. Efforts to predict dropouts through AI, for example, are carried out using Deep Learning. The accuracy of the deep learning model obtained ranges from 67.1% for first year students to 94.3% for third year students.²⁷ Thus, predicting dropouts through AI technology has proven to be effective and accurate.

f. AI meningkatkan kemampuan Evaluasi

Hasil belajar siswa dievaluasi dengan banyak cara, namun banyak pula model- model evaluasi yang kurang berkembang. Model evaluasi dan penilaian yang periodic, misalnya dalam satu semester sekali, tampaknya masih menjadi model penilaian standar di banyak Lembaga Pendidikan. Evaluasi yang diselenggarakan dalam bentuk periodic seringkali membutuhkan kepanitiaan sendiri dan biaya tambahan. Evaluasi juga seringkali tidak mampu menilai aspek yang kompleks dan hanya menakar satu ketrampilan tertentu, yang umumnya sangat tertuju kepada kemampuan kognitif. Oleh karena itu model evaluasi yang kompleks sekaligus berbiaya rendah serta dapat lebih kerap dilakukan, tampaknya menjadi kebutuhan untuk Pendidikan kontemporer. AI membuka jalan baru ke arah ini.

g. AI prepares skills that are constantly evolving (ready to innovate)

Education must respond to change. When AI has become a big wave in changing times, then like it or not, education must be able to respond to it. If Education is not able to take advantage of the potentials offered by AI, then Education will turn into an anti-progress institution. Of course this is counterproductive to the purpose of education itself. By using AI, Education prospects will also continue to adjust progress. At this point, AI appears to be at its best for humans when it comes to repetitive and predictive tasks, tasks that rely on computational power, classifying large amounts of data and input, and making decisions based on concrete rules.²⁸

3. "Trustworthy AI" concept of Artificial Intelligence that is suitable for Islamic Education

Artificial intelligence (AI) presents many opportunities to contribute to individual well-being and economic and societal progress, but also new ethical, legal, social and technological challenges. Trustworthy AI (TAI) is based on the idea that AI can contribute to building the foundations of societies, economies and sustainable development, and therefore individuals, organizations and societies will only be able to realize the full potential of AI, if trust can be built in development, deployment, and use.

Trust (trust, not belief) humans rely on other humans. However, since the development of modern science and

²⁶ Athanasios Drigas dan Rodi Eleni Ioannidou, "Special Education and ICTs," *International Journal of Emerging Technologies in Learning (iJET)* 8, no. 2 SE-Papers (25 April 2013): 41–47, <https://doi.org/10.3991/ijet.v8i2.2514>.

²⁷ Francesco Agrusti, Mauro Mezzini, dan Gianmarco Bonavolontà, "Deep learning approach for predicting university dropout: a case study at Roma Tre University," *Journal of e-Learning and Knowledge Society* 16, no. 1 (2020): 44–54, <https://doi.org/10.20368/1971-8829/1135192>.

²⁸ Charles Fadel, Wayne Holmes, dan Maya Bialik, "Artificial intelligence in education: Promises and implications for teaching and learning," *The Center for Curriculum Redesign, Boston, MA*, 2019.

technology, humans have begun to rely on technology. Now when AI appears, the next challenge is, can humans trust AI? Or how can humans be sure that AI is worthy of trust? The answer to that question does not have to be exclusive. Actually humans still have to believe in other humans and at the same time can put their trust in technology including AI. This may be because the type of human trust in technology is indeed different from trust in humans. To distinguish these two, it would be best to follow the trust mapping model in the following table:

Table 1. Overview of common beliefs related to people and technology²⁹

Trust people	Believe in technology	
	Trust in IT artifacts based on systems	Believe in automation technology and autonomous systems
Competence / Ability: A person has the ability to do for others what others need to do. A group of skills, competencies, and characteristics that enable a party to have influence in some particular domain.	Functionality: The belief that a particular technology has the capability, functionality, or features to do what it needs to do.	Performance: Competence or expertise demonstrated by the ability of automation to achieve operator goals.
Benevolence: A person cares about the welfare of others and is therefore motivated to act in the interests of others, not acting opportunistically towards others.	Helpfulness: The belief that a particular technology provides adequate and responsive assistance to users.	Purpose: The extent to which automation is used within the purview of the designer's intent.

Trust people	Believe in technology	
	Trust in IT artifacts based on systems	Believe in automation technology and autonomous systems
Integrity: The extent to which the trustee (Trustee) adheres to a set of principles that the trustee deems acceptable.	Reliability / Predictability: The belief that a particular technology will consistently operate well and that its behavior can be predicted.	Process: The extent to which the automation algorithm is appropriate to the situation and is able to achieve the operator's goals.

Trust in AI is formulated in the Trustworthy AI Concept (TAI) which has five basic principles; (1) beneficence, (2) non-maleficence, (3) autonomy, (4) fairness, and (5) explicability.

Table 2. Principles of Trustworthy Artificial Intelligence³⁰

TAI principle	Information
<i>Beneficence</i>	Beneficence refers to the development, dissemination and use of AI that benefits humanity in the sense of promoting human well-being and respecting human rights.
<i>Non-maleficence</i>	Non-maleficence advocates developing, implementing, and using AI in a way that avoids harm to humans.
<i>Autonomy</i>	Autonomy focuses on promoting human autonomy, agency, and oversight, and may therefore include limiting the autonomy of AI-based systems, where appropriate.
<i>Justice</i>	Justice includes leveraging AI to change past injustices, creating sharable and subsequent benefit sharing through AI, and thwarting AI's creation of new harms and injustices.

²⁹ Scott Thiebes, Sebastian Lins, dan Ali Sunyaev, "Trustworthy Artificial Intelligence," *Electronic Markets* 31, no. 2 (1 Juni 2021): 447–64, <https://doi.org/10.1007/s12525-020-00441-4>.

³⁰ Scott Thiebes, Sebastian Lins, dan Ali Sunyaev, "Trustworthy Artificial Intelligence," *Electronic Markets* 31, no. 2 (1 Juni 2021): 447–64, <https://doi.org/10.1007/s12525-020-00441-4>.

<i>Explicability</i>	Explicability includes the development, deployment and use of an explainable AI by producing (more) interpretable AI models while maintaining a high level of performance and accuracy. In an ethical sense, a further explanation consists in creating an accountable AI.
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In the context of Islamic Education, the principles of TAI, according to the author, can be understood as follows.

- **Beneficence:** that the development, deployment and use of AI should benefit humanity, prosper, and respect humanity. This is in line with the Islamic principle that science is for the benefit, not science for science. Because Islam has the principle of *khairu al-naas yunfauhum li al-naas*; the best of humans, including the best of technology produced by humans is that which benefits as many other humans as possible.
- **Non-maleficence** in Islam needs to be interpreted that the development, application, and use of AI must avoid harmful ways. AI must be run non-violently.
- **Autonomy** is the principle of firmness in maintaining human authority as the best of God's creatures (*fii ahsani taqwiim*). The position of humans must always be above AI, even though one day AI has been able to reach level IV or the level of self-awareness where AI may have its own autonomy. After all, AI is a human creation that must submit to humans, not the other way around. Because positioning AI higher than humans is not only dangerous for life but also for *aqidah*.
- **Justice** should be a priority in AI development. AI products must be useful and can be used fairly in a non-hegemonic sense. Individual ownership is certainly allowed, because the principle of *al'* is not that all must be the same (communism). Ownership is allowed but the arbitrariness and injustice resulting from ownership (capitalism) must be prevented.
- **Explicability** in the context of Islam must be interpreted as transparency of processes and results. This transparency will ensure the clarity of ethical values in every AI product. In other words, AI must be in line with Islamic norms and ethics (*adab and morals*). Therefore, all AI work must be accountable and auditable to make it easier to determine its ethical values.

Islamic education that believes in AI needs to adhere to the principles above, so that the application of AI in the world of education can certainly have a positive influence on humanity and does not deny the human position as *Abdullah* as well as *khalifatullah fil ardh*.

IV. CONCLUSIONS AND RECOMMENDATIONS

Artificial Intelligence (AI) has become a new reality for human civilization. Its application in various fields has been widespread and has made significant progress. However, its application in Islamic education cannot be called encouraging. This study, with all its methodological and time limitations, only found a few examples of its application in the world of Islamic education in various (global) countries. Among them are Islamic Dharwood Pau Memorial Primary School (IDPMPS) in Hong Kong, Alef Education United Arab Emirates, Mohamed bin Zayed University of Artificial Intelligence (MBZUAI) Abu Dhabi, YUAI International Islamic School, International Islamic School Otsuka and Tokyo Iqra International School in Japan. , Syafana Islamic School Indonesia, Madrasas in Indonesia with the Digitization Program by the Ministry of Religion, and the I-Tasmik platform in Malaysia.

Looking at the application of AI in several global Islamic education institutions, this research finds that AI has influenced Islamic Education institutions in the realm of Education administration, language learning, *tahfizul Qur'an*, basic programming and design, research and community service. However, the Artificial Intelligence level that has been used in Islamic education is still limited to AI Type I (reactive machines) and AI Type II (limited memory), so it still requires further development.

The outlook for AI development is generally quite optimistic. AI is very prospective for personalization in Islamic learning, supporting students with special needs, updating communication patterns in education, helping school systems and management, preventing dropouts, improving evaluation abilities, and increasing readiness to face any new innovations. However, AI, as an ethical guarantee, needs to be developed with noble principles. Trustworthy Artificial Intelligence (TAI) is a promising concept because its main principles, namely 1) beneficence, (2) non-maleficence, (3) autonomy, (4) justice, and (5) explicability are very compatible with Islamic values. . Islamic education can use AI by applying the principles of Trustworthy Artificial Intelligence.

As a literature review, this article is still limited to written data. Therefore, this study still needs to be developed with field research. However, as a starting point, this study is expected to be enough to encourage researchers to study more deeply about the practices of implementing AI in Islamic education. Of course, this study still has shortcomings, for that the authors hope for constructive criticism and suggestions.

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