Jurnal Iqra' Kajian Ilmu Pendidikan

E-ISSN: 2548-7892 & P-ISSN: 2527-4449

Volume 9, Number 2, December 2024

Islamic Education in the Era of Industrial Revolution 4.0 and the Utilization of Digital Technology in the Teaching and Learning Process

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ARTICLE INFO

Article history:

Received

June 06, 2024

Revised

November 04, 2024

Accepted

December 30, 2024

ABSTRACT

This study explored how Islamic education proved its existence in the era of the Industrial Revolution 4.0 and how Islamic education adapts by using digital technology in the teaching and learning process. This study adopts a qualitative approach by using a Systematic Literature Review (SLR) as a study method. The SLR approach was chosen because it has several advantages, one of which is the existence of systematic and standardized procedures. In this study, 120 articles were found to be filtered using the PRISMA Model and analyzed more deeply about the existence of Islamic education in the era of the Industrial Revolution 4.0 and adapted by using digital technology in the teaching and learning process. This study shows that the existence of Islamic education is very worthy of appreciation; it is not only interpreted as a transfer of knowledge and transfer of values but also gives birth to human-centred and technology-based creativity and innovation. The existence of Islamic education can also answer society's need to live a more meaningful life by utilizing technological tools to improve the quality of education, science, technology, and imtaq, as well as the quality of moral and intellectual human resources. Islamic education aligns with the use of digital technology in the learning process by helping students and teachers, as well as the learning process itself, personalized learning or self-study, freedom to choose all learning approaches, project-based learning, and applicable field practice.

Keywords: *Islamic Education, Industrial Revolution 4.0, Digital Technology Utilization*

Journal Homepage https://journal.iaimnumetrolampung.ac.id/index.php/ji/

INTRODUCTION

As a human being who has civilization, education certainly cannot be separated from life itself. As stated by Rodliyah (2022) that "Life is education, education is life." Education should be a continuous learning process for the sake of a predetermined educational goal. Nuraeni & Mujahidin (2021)au defines education broadly as a deliberate, systematic, and sustained effort to transmit, evoke, or acquire knowledge, values, attitudes, skills, or sensitivities, as well as any learning that results from the effort, direct or indirect, intentional or unintentional. In the Indonesian context, in line with (Ajmain, Mahfuz, Rahman, & Mohamad, 2019) that education is a continuous process of educating and shaping humans into a meaningful situation in the life of the world and afterlife. When viewed from the point of view of Islamic education,

education can be summarized as a process of training the mind, body and spirit of humans based on Islamic values guided by the Qur'an and as-Sunnah to produce humans who devote themselves to the creator of the universe. Daradjat et al., (2019) also explained that Islamic education is inseparable from the education of faith, charity and individual and community education.

In principle, Islamic education also ensures that humans are always guided by fundamental human strengths, namely reason, heart, spirit and body. Those are the elements that are God's gift to humans always to process so that humans have an awareness of the mandate and burden of responsibility as servants and caliphs on earth (Supriyatno, 2019). The above definition clearly shows that Islamic education is a holistic, integrated and balanced paradigm. It not only emphasizes intellectual and physical elements, but also spiritual elements that bring happiness and prosperity in this world and the hereafter (Mujani, Ibrahim, & Safiai, 2012). However, the question today is how are the steps taken in an effort to convey knowledge, skills, and internalize Islamic values based on the Quran and as Sunnah, especially in the current Industrial 4.0 era.

The industrial revolution is theoretically a radical change in the way humans produce goods. Based on historical records, at least three major changes have occurred, and currently humans are in the fourth phase of change which we know as the industrial era 4.0, this refers to an era where technology is combined so that physical, biological, and digital aspects become indistinguishable (Schwab, 2017; Suhono, et al., 2023). In addition, the widespread use of artificial intelligence (AI), the advancement of the digital technology era 4.0 has changed and impacted all aspects of human life, including education. Putrawangsa & Hasanah (2018) show the existence of digital technology today is the single most significant factor affecting changes in education, including Islamic education. In addition to the times of automation and digitalization, the challenges and barriers of Islamic education continue to develop and improve (Imamuddin et al, 2022). Among them is the paradigm shift in education, for example in terms of the learning approach, in the age of traditional Islamic education, the teacher has become a central figure in learning activities, it is the main source of knowledge in the classroom, and can even be said to be the only one.

The signifcance of digital Islam in muslim societies is rapidly growing as digital technologies become more prevalent. It is imperative to understand how Islam adapts and is represented in this new medium (Wahid, 2024; Badruzaman et al., 2023). Regardless of the changes that occur, in fact Islamic education today is facing many complex and complicated problems, where there is still a compartmentalization between general education and religious education, knowledge that tends to be general or "too general knowledge" and weak or still low spirit and culture of research in Islamic educational institutions (lack of inquiry) (Raya, 2018). In addition, human resources (HR) are lacking; many teachers are in the advanced age phase and the methodology of teaching PAI runs conventionally-traditionally (Wardi, 2013). So, in the future with this technology, it is important for the learning process of Islamic education in the transfer of knowledge and values needed to utilize existing technology (Lian, 2023; Zulnaidi, Mafarja, Rahim, & Salleh, 2024). Given that so many branches of Islamic knowledge can not only be obtained in classrooms, but also in the "virtual" spaces of digitalization of material and the use of corrected artificial intelligence by teachers. This illustrates very clearly that in the current era of automation and digitalization, the challenges and obstacles of Islamic education continue to grow and increase (Priatmoko, 2018; Mustanadi, 2021; Sugiarto & Suhono,

2023). Other hand, although scientific and technological advances have also led to moral depravity and spiritual longing, these are variables that need to be carefully considered

In fact, there are still many models of Islamic education with a verbal intellectual approach, ignoring the relevance of educational experience and human contact between teachers and students (Agus, 2019). The old paradigm should change, whereas in the modern Islamic education paradigm, the teacher is the one who guides students; the learning process becomes student-centered, no longer teacher-centered (Moraes et al., 2023). This should also be in line with the industrial revolution of the 4.0 era that has used cyber system technology, where learning takes place through technological integration both physically and not through learning.

This research tries to see very carefully that in the midst of the decline of Islamic education today, there are still many things that can be done to improve these conditions. One of them is the digitalization of Islamic education which is a necessity. Islamic Education is able to answer all the challenges of the times with the concept of disruptive mindset, self-driving and reshaping or create. Islamic education is also able to answer the needs of society in living a more meaningful life by utilizing technological tools to improve the quality of education, the quality of science, technology and *imtaq* and also the quality of moral and intellectual human resources. By adopting digital technology in the teaching and learning process, it is hoped that Islamic education can develop in the Industrial Revolution 4.0 era because technology helps students and teachers as well as the learning process itself, starting from the birth of space and time innovations, personalized learning or self-study, freedom to choose all learning approaches, project-based learning, and applicable field practice.

Therefore, this paper not only looks at the reality of Islamic education today, but also provides a concrete picture of what can be done by Islamic education stakeholders who must be able to adapt to the existence of digital technology today. So that the transfer of knowledge and Islamic values can be accepted by today's generation of students. Based on the explanation above, the changes and developments of the times are a necessity, humans should be able to adjust themselves as the original purpose of creation, namely as *khalifatullah fil ardh*. Likewise, Islamic education must pay attention to all changes in the times and technological developments in the Industrial 4.0 era. Therefore, this study focus on exploring how Islamic education proves its existence in the Industrial 4.0 era and explore how Islamic education can adapt and use digital technology in the learning process. Thus, the results of this research are expected to make a significant contribution to the development of Islamic education, especially in the context of the application of digital technology in the teaching and learning process as an effort to improve the quality and relevance of Islamic education in meeting the demands of the times in the era of industrial revolution 4.0. In addition, this research is also expected to be a reference for Islamic education practitioners in designing policies and strategies that are more effective in improving the quality of Islamic education through utilizing of digital technology in teaching and learning process.

METHOD

This research uses a qualitative approach type of Systematic Literature Review (SLR). SLR has several advantages over traditional reviews such as the abundance of unique procedures. SLR encourages researchers to seek studies outside their subject areas and networks through the introduction of extensive search methods, predefined

search flows, and standardized inclusion and exclusion criteria (Shaffril, Samsuddin, & Samah, 2021).

In this study, the author used the Open Knowledge Maps search tool to see the scope of research and Publish on Perish (PoP) to find writing that suits the purpose of writing. In this case, a library search using Publish or Perish yields findings on Google Schoolar, Scopus and ScienceDirect online journals. The series of search keywords used to search for Islamic education in the era of Industrial Revolution 4.0 and the utilization of digital technology in the teaching and learning process are "islamic education", "education in the era of Industrial Revolution 4.0", "utilization of digital technology in the islamic education", and "utilization of digital technology in the teaching and learning process."

The author limits the number of findings in Publish or Perish to a maximum of 100 findings on each keyword and vulnerable time from 2020-2024, so the author finds 265 posts with various keywords above. The process of filtering by authors with duplicate writing categories of 56 writings leaves 209 writings. Deeper filtering using keywords in each article with a total of 67 articles that do not contain relevant keywords according to the purpose of the article. The author also eliminated 56 articles whose titles had no resemblance to the purpose of the study. Found 86 articles worthy of being taken by the author. However, in terms of feasibility, the author needs to look deeper into the discussion of each article, including the utilization of digital technology in the teaching and learning process, leaving 62 articles that are not included in the scope of discussion and producing 24 articles in accordance with the qualifications to meet the author's goals.

In this study, the author emphasizes on content analysis which is used to explain and systematically analyze the content of journal article writing to make valid conclusions from the text according to the context of its application. Content analysis is concerned with critical and reflective studies of Islamic education in the era of Industrial Revolution 4.0 and the utilization of digital technology in the teaching and learning process. In this research, data analysis uses the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) model introduced by Liberati (Liberati et al., 2009). PRISMA displays the results of analyzes from systematic reviews produced through systematic and explicit questions to identify, select and critically assess relevant research results. At the feasibility criteria stage, specifications are made to determine what is included (Inclusion Criteria/IC) and what is not included in the criteria (Exclusion Criteria/EC). This question was created to see the suitability of the selected literature.

RESULT AND DISCUSSION

From the data that has been filtered using the PRISMA model (see Figure 1), articles were found aimed or targeted at various institutions as well as at the formal education level such as higher education which numbered 5 and non-formal institutions such as of K-12 students and Islamic boarding schools 4 articles. In addition to the two research targets that have been carried out, it was found that the focus of research that leads not only to one institution, but can also be applied to both institutions. This article has 12 articles (see Table 1). Furthermore, the author also classifies the focus or field of discussion of the article in which it contains the object of writing such as education policy which amounts to 4, discussion of teachers which amounts to 3, learning methods amd media that number 2, learning environments that number 1, institutions or institutions number 3, service standards 1, and curriculum

that amounts to 1, students number 2 and are not detected 3 (see Figure 2). As for this study, the author tries to see other perspectives besides the above categories contained in educational systems and instruments, namely paradigms or perspectives in seeing Islamic education itself. The author's findings only produce 10 articles that discuss the paradigm, namely in the focus of the teacher field with 3 in number, 1 institution, 1 in policy, 2 students, and 2 undetected focus areas. This shows that every research is only in the form of reporting and institutional achievements that are not included philosophical arguments in seeing quality improvements in Islamic education (see Figure 3).

Figure 1 Article Finding Selection Process using PRISMA

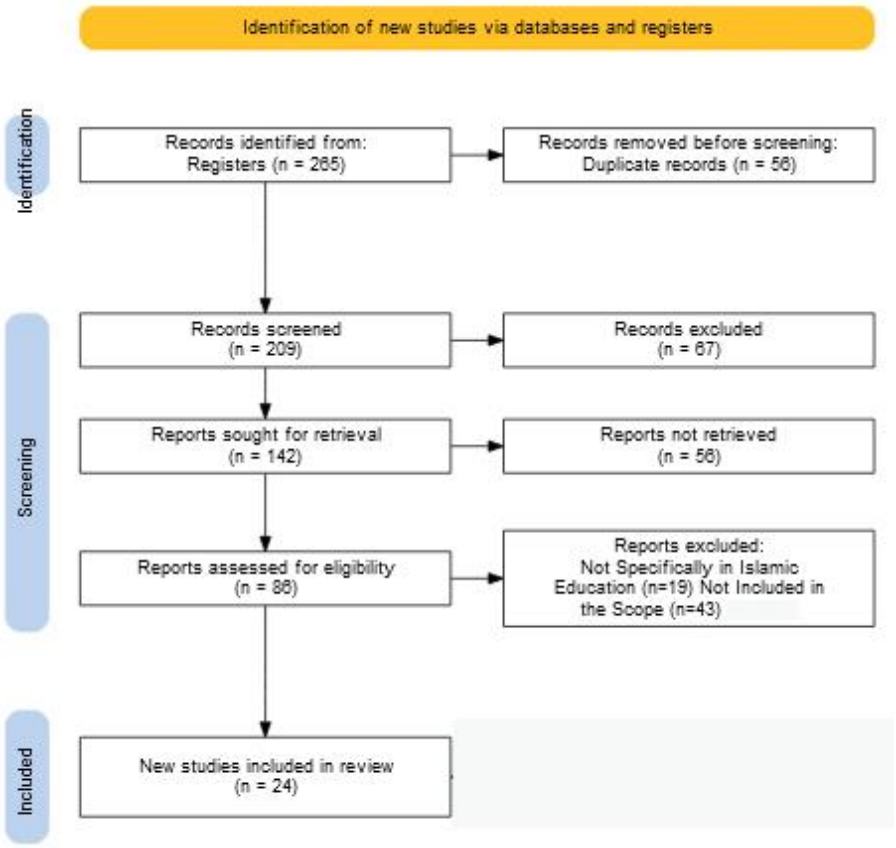

Table 1 Research Finding on Islamic Education in the Era of Industrial Revolution 4.0 and the Utilization of Digital Technology in the Teaching and Learning Process

No	Author	Institutions	Focus	Paradigm	Optimization
1	Amra Sabic-El-Rayess.	Common	Believe	Three shifts in the cultural history of Islamic education	Belief became privileged over the rationality mechanisms that had previously formed Islamic endeavors.
2	Adekunle Oke and Fatima	Formal	Innovations in Teaching and Learning	The readiness of the education	The opportunity for the education sector to harness

No	Author	Institutions	Focus	Paradigm	Optimization
	Araujo Pereira Fernandes.			sector fourth industrial revolution (4IR)	the innovations associated with 4IR through research and teaching to enhance learners' experience; however, this may require a significant improvement in education curricula, as well as investments.
3	Adisel, Robeet Thadi and Suryati.	Formal	Policy	The implementation of policies regarding the establishment of Islamic schools is carried out in the 4.0 era.	The transformation of Islamic education is used to fnd a way out of the problems that occur, thus strengthening Islamic educational institutions and the need for quality management quality improvements, effective leadership, and the need to reform educational policies.
4	Suyadi, Zalik Nuryana, Sutrisno and Baidi.	Formal	Policy	The academic reform agenda in State Islamic University Sunan Kalijaga Indonesia	There were four major agendas of academic reform consisting of study program internationalization, new program opening, the integration of postgraduate management into the faculty and the opening of

No	Author	Institutions	Focus	Paradigm	Optimization
					teacher certifcation program.
5	M. Imamuddin, Zaharuddin, M., Andryadi, Isnaniah, and Febria Sri Artika.	Formal	Institution	Islamic education in the 4.0 Industrial Revolution era	A concept for preserving Islamic education in the 4.0 Industrial Revolution era.
6	Zubairi, Nurdin, Rahmat Solihin.	Formal	Institution	Islamic education in the 4.0 Industrial Revolution era4	Discover how Islamic education is in the era of the industrial revolution 4.0.
7	Raodatul Jannah.	Common	Learning Enivironment	Efforts to continuously improve Islamic education.	Continuous improvement in Islamic education needs to pay attention to various aspects such as leadership, teachers, learning methods, learning environment, institutions, service standards, policies, pesantren management, and curriculum.
8	Suprima.	Common	Learning Enivironment	The challenges that exist in educating millennial Muslims in this era of development	Educate the millennial Muslim generation in the era of revolution 4.0 by creating a modern Islamic education environment.
9	Longwen Mei, Xiaojuan Feng, Fausto	Common	Digital technologies implementation	The competencies of the future workforce for	Data and information processing has emerged as the

No	Author	Institutions	Focus	Paradigm	Optimization
	Cavallaro.			digital technologies implementation in higher education	most important competencies of the future workforce for digital technologies implementation in higher education.
10	Kunqi Wang, Bangxi Li, Tian Tian, Norhayati Zakuan, Pratibha Rani	Formal	Institution	The drivers for digital transformation in higher education institutions in the era of industry 4.0 based on decision-making method	The digital transformation has been recognized as a priority for higher education institutions; this process is necessary for all the organizations claiming to be change leaders and competitive in their relevant domains.
11	Md. Jahangir Alam, Rakibul Hassan, Keiichi Ogawa	Formal	Digitalization of higher education	University students' attitudes toward digitalizing higher education in Bangladesh	Most of the students hold positive attitudes toward the digitalization of education. Students with digital accessibility generally hold positive attitudes. On the contrary, students who don't have access to digital facilities hold negative attitudes towards the digitalization of education, although they perceive the

No	Author	Institutions	Focus	Paradigm	Optimization
					digitalization of education as essential and timely.
12	Lailatul Chikmah, Maulidia Rahmawati, Destya Anugrah Putri	Formal	The role of Islamic education in the era of globalization and the industrial revolution 4.0	To fnd out about Islamic education, the challenges and the role of Islamic education in the era of globalization and the industrial revolution 4.0.	The role of Islamic education in the world of education which is carried out in intracurricular and extracurricular learning activities to create students with character capable of being the answer or solution to various challenges in the industrial era 4.0.
13	Maan Habib	Formal	Digital transforma-tion strategy for developing higher education	Investigate the potential of a digital transformation strategy to revitalize the higher education system in warravaged regions	Digital transformation presents a unique opportunity to address these challenges, support the continuity of education, and build a more resilient and inclusive educational environment for the future.
14	Hamdan, Rusdiana, Tarwilah, Suraijiah, Rusdiah, M. Ramli	Formal	Curriculum	The strategic optimization of Information and Communi-cation Technology (ICT) integration within the curriculum	While ICT adop-tion among stu-dents and faculty members is moderate, there is a significant need for tailored strategies to en-hance its integra-tion across vari-

No	Author	Institutions	Focus	Paradigm	Optimization
				education programs	ous subject areas. The key factors such as technical support, professional development, and institutional leadership as essential for facilitating effective ICT integration.
15	Ita Tryas Nur Rochbani	Non Formal	The 4.0 era's difficulties with learning islamic religious education	The challenges associated with learning Islamic religious education in the digital era or Era 4.0.	Islamic religious education is currently dealing with issues, demands, and needs that have never been encountered before. Thus, it is imperative to implement updates and innovations to the infrastructure and facilities, human resource capabilities, curriculum, governance, culture, work ethic, and other areas
16	Alex Sander Clemente de Souza and Luciana Debs	Non Formal	Innovative technologies, learning approaches	Concepts of Education 4.0, and the innovative technologies, key competencies, learning approaches, trend topics, and how it is being applied in engineering	Education 4.0 in higher education, specifcally engineering education: concept, competency based learning, specifc technologies applied to education, learning system,

No	Author	Institutions	Focus	Paradigm	Optimization
				education	and competency-based learning.
17	Azwani Masuwai, Hafzhah Zulkifli, Mohd Isa Hamzah	Non Formal	Teacher	The concept of self-assessment that must be practiced by Islamic education teachers for continuous professional development, focusing on the views of Islamic education teachers (IETs).	There are six main points of self-assessment: the meaning, purpose, aspects, timing, character, and problems associated with self-assessment among Islamic Education teachers (IETs)
18	Soleh Hasan Wahid	Non Formal	The intersection of Islam and digital technology	Key developments and trends in digital Islamic studies, including influential authors and their contributions, patterns of collaboration, and the evolution of themes	Digital Islam as a major area of digital religion, exploring the role of the 'digital Muslim' in the 'digital Ummah.' Digital Islam blends conventional and modern techniques, employs a crossdisciplinary theoretical approach, and signifcantly includes women.
19	Anne Lohr, Michael Sailer, Matthias Stadler, Frank Fischer	Formal	Teacher	Factors that are potentially associated with teaching and learning with digital technology	Teachers' technology-related teaching skills were crucial for different forms of students' active learning.
20	Gunawan B. Dulumina, Sagaf S. Pettalongi, Mohamad	Formal	Institution	The existence and role of Islamic educational institutions in	The existence and role of the Alkhairaat educational institution in the

No	Author	Institutions	Focus	Paradigm	Optimization
	Idhan			the Industrial Revolution 4.0 Era.	4.0 revolution era was assessed indicating that the measurement of the seven elements in McKinsey's 7S theory has been carried out well.
21	Nur Hanisfatin Rushami Zien, Nurul Azma Abu Bakar, Rohaizah Saad	Non Formal	Institution	Islamic quality management systems in educational institutions toward SDG-aligned education	By aligning with the principles of quality education advocated by the SDGs, there are significant opportunities to support educators and improve the quality of education
22	Renae Sze Ming Loh, Gerbert Kraaykamp, Margriet van Hek	Formal	Student	School resources in terms of ICT infrastructure, use of ICT in education, and availability of technical expertise are pertinent to students' digital skillfulness	Schools indeed play a meaningful role in nurturing digital skills, namely through students' use of ICT in educational tasks. Students from more advantageous socioeconomic backgrounds more often attend well ICT-resourced schools, pointing at the uneven distribution of school ICT resources in a way that reflects social reproduction processes.

No	Author	Institutions	Focus	Paradigm	Optimization
23	Muhammad Imran, Norah Almushar-raf, Milana Yunis Abbasova	Formal	Teacher	Teachers' post-Covid-19 experiences on digital learning transformation	Teachers agree that they put more effort into educating and developing learning aptitude in students after COVID-19. Due to the epidemic catching the majority of educational systems off guard, there has never really been an opportunity to enact improvements in the education sector
24	Paul F. Burke, Sandy Schuck, Kevin Burden, Matthew Kearney	Formal	Teacher	Mediating learning with mobile devices through pedagogical innovation	When teachers adopt innovative pedagogical tasks into their teaching with digital technologies, they perceive an improvement in student learning experiences.

Finally, the author also classifies how Islamic education proves its existence in the era of the Industrial Revolution 4.0 and how Islamic education adapts by using digital technology in the teaching and learning process. The opportunity for the education sector to harness the innovations associated with fourth industrial revolution (4IR) through research and teaching to enhance learners' experience; however, this may require a significant improvement in education curricula, as well as investments. The transformation of Islamic education is used to fnd a way out of the problems that occur, thus strengthening Islamic educatio-nal institutions and the need for quality manage-ment quality improvements, effective leadership, and the need to reform educational policies.

The role of Islamic education in the world of education which is carried out in intracurricular and extracurricular learning activities to create students with character capable of being the answer or solution to various challenges in the industrial era 4.0. Islamic religious education is currently dealing with issues, demands, and needs that have never been encountered before. Thus, it is imperative to implement updates and

innovations to the infrastructure and facilities, human resource capabilities, curriculum, governance, culture, work ethic, and other areas.

Digital transformation presents a unique opportunity to address these challenges, support the continuity of education, and build a more resilient and inclusive educational environment for the future. The digital transformation has been recognized as a priority for higher education institutions; this process is necessary for all the organizations claiming to be change leaders and competitive in their relevant domains. Most of the students hold positive attitudes toward the digitalization of education. Students with digital accessibility generally hold positive attitudes. On the contrary, students who don't have access to digital facilities hold negative attitudes towards the digitalization of education, although they perceive the digitalization of education as essential and timely.

DISCUSSION

The Existence of Islamic Education in the Utilization of Digital Technology in the Era of Industrial Revolution 4.0

The Industrial Revolution 4.0 has brought significant changes to education. Educator practitioners play an important role in this era by transforming knowledge, values and being a role model for students (Putri, Tanjungsar, & Hadi, 2023). Education in the 4.0 era is a new concept that combines the real world and the virtual world, focusing on project-based approaches and the development of important work skills (Moraes et al., 2023; Usmaedi, 2021). To face the challenges of the Industrial Revolution 4.0, students need to have knowledge, critical thinking skills, digital literacy, and mastery of ICT (Suni Amtonis, 2022).

Education in the industrial era 4.0 aims to prepare graduates for the future by focusing on skills that cannot be replaced by robots, such as artificial intelligence and information management (Minasi, 2022). However, the implementation of the Fourth Industrial Revolution in educational institutions is often inconsistent, with various barriers including global conflicts, conceptual complexity, and digital skills gaps (Lubinga, Maramura, & Masiya, 2023). To overcome these barriers, institutions must be able to conduct empirical research, design detailed skills plans, and implement change management strategies.

Likewise, when focusing on Islamic education, it is of course an educational process that has a concentration on knowledge about Islam and the educational process so that students behave following Islamic values or morals (Ningsih, 2019). This is certainly in line with the command in Surah Lukman 1-34 that the essence of education is to make people aware of their religious nature, grow and then manage and form insights related to morals that are reflected in behaviour that reflects Islamic values, which in the end is in order to serve Allah SWT.

The concept above is confirmed by the Prophet's hadith that "Whoever wants the world must be with knowledge and whoever wants the hereafter must be with knowledge, and whoever wants both (*the world and hereafter*) must be with knowledge." The knowledge that is meant in the hadith is of course all knowledge based on revelation, the hadith of the Prophet and the ijtihad of the Ulama (Syakur, 2017). To arrive at this stage, Islamic education must be able to present and adapt to today's global trends with the industrial revolution 4.0 with the necessity of several things, namely: first, Islamic education must be able to utilize technology in its *paroses (jihad)*. In the sense that the existence of technology in any form must be used as a fighting tool, technology is a means of creating innovation and creativity in thinking and

creating progress. Second, Islamic education must always be competitive, in the sense that with Islamic education it must be able to present quality Human Resources (HR), both related to science and technology, as well as HR who have true faith and piety. Third, Islamic education that has a sense of development towards a better direction and of course by utilizing existing technology, so that Islamic education institutions become a laboratory for the future of Islamic education.

The Industrial Revolution 4.0 has all the potential to improve the quality of life, including the quality of education. The quality of life starts from cheap, affordable and competitive prices, increasing efficiency and productivity, increasing the effectiveness of logistics and global supply chains, the presence of various technological sophistication, easy access to information and science, easy access to learning that is very fun, or commonly known as edutainment. For this reason, the role of digital society in the era of the industrial revolution 4.0 is a challenge for the development of information technology-based education that is able to answer the challenges of the needs of society in the era of the industrial revolution 4.0 (Indianto, 2019). The development and change of the world of education is of course a necessity, in the process there must be challenges, as well as the world of education in facing industry 4.0, where the challenge comes in the form of instilling values (Azra, 2017). Value education teaches the younger generation about the values and morals that should be owned. But in reality, with the rapid flow of technology, students are increasingly complacent and have an irresponsible attitude, moral degradation and increasing cases of crime among students. One of the substances of Islamic Religious Education is an effort to assist students in heading towards a stage of development in accordance with their readiness. Moral dilemmas are enough to drive moral development to help learners in addressing value content.

The rapid development of the industrial revolution 4.0 era has resulted in many learning media innovations, such as electronic communication media in the form of mobile phones, television, radio, and so on that have successfully penetrated geographical, social, and political boundaries intensely. The sophistication of technological tools is a characteristic of the industrial revolution 4.0 era. The industrial revolution is defined as a process of change in the production process that takes place rapidly. The change from phase to phase makes an articulate difference in terms of its usefulness.

The development of the 4.0 era is a momentum for teachers so that the learning process should be able to improve the quality of personal competence and students. The use of technology in the form of sophisticated tools today is balanced with the ability to carry out efficient methods that are well organized in education as an effort to transfer knowledge. In this case, teachers tend to use technological tools or products (media) that they consider can help in the learning process so that it needs to be a concern for learning technology developers (Syahri, 2018).

The world of education is currently busy preparing a generation that is able to survive the competition in the industrial era 4.0. In facing the era of the industrial revolution 4 several things that must be prepared include: a) preparation of a more innovative learning system. to produce competitive and skilled graduates, especially in the aspects of data literacy, technological literacy and human literacy; b) Reconstruction of educational institutional policies that are adaptive and responsive to the industrial revolution 4. 0 in developing trans disciplines and study programs that are needed; c) Preparation of responsive, adaptive and reliable human resources to face the industrial revolution 4.0; d) Rejuvenation of infrastructure and development of

education, research and innovation infrastructure also needs to be done to support the quality of education, research and innovation (Khusnan, 2016). Based on this explanation, Islamic education in the use of Digital Technology in the Era of the Industrial Revolution 4.0 continue to exist when it is able to adapt to all existing changes, among the things that must be followed in the Indonesian context in the view of (Indianto, 2019) are;

1. The suitability of the curriculum and education policy in Indonesia.

The suitability of the curriculum and education policy can be seen through the competencies possessed by education graduates. Looking at education in Indonesia today is still shrouded in various kinds of problems that do not support students to be able to survive in the industrial era is certainly a study that must find a solution. The offer of solutions as well as suggestions to several parties related to the world of Islamic education, including: a) Do not make the curriculum only as a written document that is not implemented properly. This often happens, when the curriculum has been arranged so well, but in practice it is not in accordance with the learning objectives in the curriculum. b) Realizing Islamic religious education that leads to Cognitive, Affective and Psychomotor abilities c) Evaluating policies and or curriculum of Islamic educational institutions in Indonesia based on the orientation of educational needs, not politicization.

2. Readiness of Human Resources in Utilizing Information and Communication of Technology (ICT)

At present, preparing all education systems aimed at maximizing the abilities of the millennial generation certainly cannot be separated from the latest technological equipment. Therefore, solutions in the field of education related to challenges in the era of the industrial revolution 4.0 always be related to the readiness of human resources and infrastructure as ICT users. The fact is that in Indonesia today, not all educators are capable of utilizing technology (Ilham & Sujana, 2021). This is certainly contrary to the expectations expressed as a solution in facing the industrial era 4.0. Judging from the problems of education in Indonesia, which has remote and isolated areas, the lack of educator skills in using ICT actually exacerbate the problem (Asnawani, 2010).

3. Readiness of human resources in optimizing students' abilities and characters.

Another solution to answer the challenges of Islamic religious education in the industrial era 4 is in terms of the ability and character building of students. This is certainly inseparable from the goals of education in the industrial era 4.0 to obtain education graduates who are competent in the current era, not only children are able to use ICT but also able to be competent in literacy, critical thinking, problem solving, communication, collaboration, and have good character quality.

The above explanation illustrates that education is closely related to globalization, which later gave birth to the industrial revolution 4.0. Education cannot ignore the process of globalization that create this global society. Towards the era of globalization, Indonesia must reform the education process, with the pressure of creating a more comprehensive and flexible education system, so that graduates can function effectively in a democratic global society (Haidir, Arizki, & Fariz, 2021). Islamic education must be designed in such a way that allows students to develop their potential naturally and creatively in an atmosphere of freedom, togetherness, and responsibility. In addition, Islamic education must also produce graduates who can understand their society with all the factors that can support success or obstacles that cause failure in social life.

To achieve all of this, Islamic education in Indonesia, in particular, must be able to present a curriculum that involves students in all educational processes, be it learning, research and various discussions. This is to train them to deal with various things that exist, both the development of culture, language and science itself. This give them the opportunity to develop their capacity to become global citizens which ultimately expand their capacity and reach (Fragouli, 2020).

The Existence of Islamic Education in the Era of the Industrial Revolution 4.0

The history of the entry of Islam into Indonesia cannot be separated from the role of da'wah and education, so the development of Islamic education within the framework of national education is associated with the establishment of educational institutions. Education towards the advancement of Islamic education led by Nahdatul Ulama and Muhammadiyah Based on the aspect of official legality, it shows that the basis for the development of Islamic education in Indonesia emphasizes two aspects, namely the fundamental ideals based on the Qur'an, sunnah, ijtihad and ijma' of the scholars, as well as the basis imposed by the government. Next is the operational basis which includes historical, philosophical and psychological elements (Umar, 2016).

In essence, the contents of the two institutions above have basically stated the existence of Islamic education in the history of the development of education in the country. In its development, based on many Islamic studies, (Yazid, 2021) claimed Islamic education itself has two meanings, the first is education about Islam, which is how to view Islam as subject matter in education. Second, education according to Islam, which is placing Islam as a perspective or point of view in Islamic Education (Djazaman, 2009). The problem that has been faced by observers of Islamic education is that Islamic Religious Education tends to be understood as education about Islam which is only fixated on the curriculum, materials and methods of how a teacher conveys to his students (Tulak, Wijaya, Rante, Nurmadiah, & Helaluddin, 2019). This concept is nothing more than a process of transferring religious values from teachers to students. However, the process does not give birth to progressive and creative thoughts (Syam, 2019). Thus, Islamic religious education has a tendency to lag behind education, commonly known as general education. This condition ultimately puts Islamic Religious Education as a second-class line of education.

This condition is certainly difficult to avoid, because in practice, not a few Islamic Religious Education processes are only a mere transfer of knowledge and transfer of values, the impression is far from progressive behavior and creativity of thought (Aristya et al., 2023), while the times require a dynamic understanding in every Islamic concept that has strong knowledge roots, both from aqidah or proper divine values (Mujahada, 2019). Meanwhile, the presence of the Industrial Revolution 4.0 also gave rise to the era of Social Revolution 5.0 or Social 5.0. The era of social revolution 5.0 is the concept of a technology-based human-centered society (Dakir & Fauzi, 2019). The existence of society 5.0 must solve all social problems and adapt to technological innovations born in the era of the industrial revolution4.0. Therefore, education in the era of the Industrial Revolution 4.0 must train people with 21st century life skills, namely quick reaction skills, critical thinking, communication and cooperation. The concept is an attempt to combine humans and technology (Umro, 2020). Meanwhile, the existence of Islamic religious education are be able to answer all the challenges of this era (Pihar, 2022), currently all aspects of life have been supported by the presence of digital technology, the internet is then seen as a physicality that offers various opportunities (Santoso, 2023). The industrial revolution 4.0 ultimately gave birth to

artificial intelligence where intelligence was born in the era of society 5.0 which prioritizes the human aspect (Musyafak & Subhi, 2023). This is what eventually transform millions of lives of Internet data into a new order that balances economic and social issues to help people live more meaningful live (Putrawangsa & Hasanah, 2018).

Based on the above statement, it is necessary to make changes in the paradigm of Islamic Education by adapting to the era of society 5.0 for the sake of future life. Minister of Education and Culture Muhadjir Effendy stated the need to improve Human Resources and learning technology, so that education can adapt to the times (Saputro, 2020). In the end, the problems in the existence of Islamic Religious Education gave birth to deep criticism, including: First, the slow response of Islamic education to the development of technology and science; the emergence of scientific decimals, Third, conflicts arise among education policymakers (Priatmoko, 2018). Therefore, to catch up with the social era 5.0, a way out is needed so that Islamic education remains accepted in the midst of this era (Haris, 2019).

Seeing these conditions, education expert Rhenald Kasali suggests several alternative solutions so that Islamic education can adapt to the social era 5.0, namely disruptive thinking, self-driving and remodeling or creating (Kasali, 2018). The disruptive mindset is a mindset that does setting before acting. Rhenald Kasali revealed that disruption is a theory to capture and predict the future, so that everything old become ancient. Likewise in Islamic Religious Education, Educators need to form a mindset so that it does not seem that Islamic religious education is always left behind (Haris, 2019). Indeed, the religious teachings that Muslims believe that the Qur'an is a guide to human life until the end of time. In other words, all the rules outlined in the Qur'an must be translated correctly and can answer the existing life problems convincingly (Adnan, 2022). Of course, this is the homework of all who care about Islamic Religious Education.

Islamic education in the Industrial 4.0 era must adapt to technology and digitalization with fast access to information to meet the multidimensional and real time needs of society, everything that takes a long time will soon be abandoned by the community. This is what Renald Kasali calls the corporate mindset (Hair, 2018). This mindset must exist in observers of Islamic education, a mindset that is not bound by time, always provides proactive services and is no longer confined to classrooms that only rely on knowledge transfer. In addition, there is a mindset that no longer depends on the budget, and continues to innovate even when faced with financial constraints. Therefore, this cooperate mindset must be able to utilize the functions of social media and adopt all the benefits of technology and information, so that it always presents solutive thoughts and is not allergic to change and always acts strategically and has a clear roadmap.

Furthermore, a self-driving person is a reliable driver who can control all changes and be able to adapt to all situations with creativity, effectiveness, innovation and efficiency at work. The ability to be a good driver is what is needed in Islamic Education, namely Human Resources with the mentality of a good driver who is agile (Nuh, 2023), and quick to read the situation and has integrity (Purnomo, 2020). Next is reshape or create which means the ability to accept and process it into something new. Therefore, Islamic education innovation in the era of industrial revolution 4.0 and social era 5.0 can be maintained so that it always develops sustainably from time to time (Priatmoko, 2018). The above view is also emphasized in the study "Revitalization of Islamic Education Technology (Syakur, 2017). Islamic education are be able to face

the times with three things, first being able to utilize technology; second science, technology and imtaq must be used to improve moral and intellectual human resources; third, Islamic education must have a sense of development to survive in the midst of the industrial revolution 4.0 (Syarnubi, Syarifuddin, & Sukirman, 2023).

Education is constantly evolving and changing over time, and this is certainly true of Islamic education. Today, conversations between students and teachers are commonplace, whereas in the past they were rare (Riyadi, 2018). The interaction between students and teachers is considered a success in the educational process of modern theory (Astawa, 2016). So that later it give birth to generations who are able to answer the challenges of the times. As revealed by (Yazid, 2021) that Islamic Education basically aims to increase faith, understanding, appreciation and appreciation of Islam, so that Muslims who believe and fear Allah SWT and have noble character in personal, social, nation and state life must be able to utilize the facilities of the times in the era of the Industrial Revolution 4.0 and the era of the Social Revolution 5.0, (Alifiyah, 2023). So that the sustainability of Islamic education is ultimately able to meet the needs of society by living a more productive and meaningful life by utilizing technological tools to improve the quality of education, the quality of science, technology, imtak and also the quality of moral and intellectual human resources.

Islamic Education Adapts and Able to Utilize Digital Technology in the Learning Process

Everyone's life must undergo changes, which can only be known by those who have studied the structure and energy of a society at a certain time and compared with the structure and life of a society, the life of that society (Wasil & Anam, 2021). Changes that occur of course in all aspects of life, including in the world of education globally and so is the world of Islamic education that moves and changes, starting from human needs, vision and mission or architect of its development (Islam & Jahan, 2018). Changes in the world of education include all activities that occur at all ages and in all circumstances of life. Education occurs in all types, forms, and levels of the environment, which then stimulates the development of individual potential as a whole so that it can grow into an intelligent, intelligent, and mature adult human being. In the next phase of educational activities, these three goals constitute the cultural structure of human life (Alinafiah, Ridwan, & Ahmadi, 2020).

In the development of the cultural structure of human life, there has been a shift and is in the era of the industrial revolution 4.0. Facing the era of the industrial revolution 4.0, we need education to train creative, innovative and competitive generations (Tulak et al., 2019). This condition can certainly be achieved by optimizing the use of technology as a means of education which is expected to provide results that can follow or change from time to time for the better. Education 4.0 is the answer to the needs of Industry 4.0, where humans and technology are intertwined to create new opportunities in creative and innovative ways.

Returning to Islamic religious education aims to increase faith, understanding, appreciation and experience of Islam, so that it becomes Muslims who believe and fear Allah SWT and have noble character in personal, social, nation and state life . Islamic education has five objectives, as stated by Athiyah al-Abrasyi. First, to build noble morals (Rinnanik, 2018). Second, as a provision in life in the world and the hereafter. Third, to arouse the spirit of learning and curiosity. Fourth, professional students. Fifth, work readiness and maintenance of useful aspects (Sulastri & Rasyidah, 2020). Based on the vision above, to achieve these goals, Islamic religious education must

certainly meet the needs of education in the 4.0 era related to advances in digital technology and artificial intelligence.

The use of technology in education has at least three beneficial effects for Islamic education. Technology can help students achieve more in Islamic educatiossn (Narh-Kert, Osei, & Oteng, 2022). it can help teachers be more successful and it can influence what and how Islamic education should be studied and taught and with today's digital technology, learners find it easier to search for newer references and knowledge. As (Fisk, 2017) view reveals that the new way of looking at learning encourages students to acquire not only the necessary skills and knowledge, but also identify the sources for acquiring these skills and knowledge. According to (Aziz, 2018; Fisk, 2017), there are nine trends or trends related to education 4.0, all of which also support Islamic education in the adaptation and utilization of digital technology in the learning process, the trends are as follows: First, different times and places, this is a condition where learners are able to reverse the classroom and can take advantage of all opportunities in any condition and anywhere; second, independent or personalized learners, where students learn with various facilities that suit their abilities (Satori, Komariah, & Suryana, 2019). Students be challenged with more difficult tasks and questions once they reach a certain level, students who have difficulty with a subject have the opportunity to practice until certain conditions are met. This present a positive learning experience and reduce the number of students who lose confidence in their learning abilities (Sari & Wilujeng, 2020). In addition, teachers are be able to see which students need help in which areas; third, freedom of choice, where the same subject is taught for the same purpose, but the path to that purpose may be different for each student. Students are be able to modify their learning with the technology they need. Blended learning, flipped classroom and BYOD (Bring Your Own Device) have become important terms in this shift; fourth, project-based, students must be able to adapt to project-based learning, where students must learn to apply their short-term skills to different situations. This requires organizational, collaboration, and time management skills for their future academic careers; fifth, practical experience, as technology can create greater efficiency in certain areas, so the program make room for skills that only require human knowledge and direct interaction (Irawan, Sutadji, & Widiyanti, 2017). So practical experience is deepened through lessons and exercises and schools allow students to acquire specific skills that are representative of their jobs; sixth, data interpretation, the development of computer technology are eventually take precedence over analytical tasks performed manually due to the presence of current technology, which makes it possible to manipulate, describe and predict the 'future'. This is where humans come in, where human interpretation of existing data become a more important part, where the application of theoretical knowledge to numbers and their use.Human reasoning to deduce logic and trends from data are become a new aspect as the next learning baseline; seventh, Diversified assessment, where today's assessment must change, where students' actual knowledge can be assessed in the learning process and the application of that knowledge can be tested as students work on their projects in real life; eighth, student involvement, where students can determine their own subjects or curriculum, because students' opinions are taken into account when designing and updating the curriculum, so their Expertise comments help curriculum designers create modern, up-to-date, and high-value programs; ninth, mentoring, where every learning process is supported to increase students' independence in learning, so teachers only act as facilitators who guide students during the learning process.

In the Indonesian context, we recognize the term Massive Open Online Course (MOOC) called Open and Integrated Online Learning (PDTT/PDITT). This concept is successful at the Open University, even in various universities throughout Indonesia have used learning models such as Focus Fisipol UGM, Indonesia X supported by ITB, ITS and UI, UCEO Ciputra University and others. At the primary and secondary levels, the Ministry of Education and Culture of the Republic of Indonesia developed ICT based learning facilities through the Rumah Belajar portal that can be easily accessed by teachers and students. In this concept, it is seen that the ability of digital literacy which includes information literacy, media literacy and IT literacy are greatly help every learning activity, this concept needs to be replicated and expanded to meet the needs of Islamic religious education programs (Lase, 2019).

The development of Islamic education must focus or be oriented towards the vision and mission, flexibility, relevance of education in schools (formal) and education outside schools (non-formal). This means that the flexibility of the system and cooperation between Islamic forms of educational institutions give birth to new alternative models today and in the future future. In an effort to find an "alternative model of Islamic education" that suits the needs of Indonesian society, at least three approaches are proposed as alternative models of Islamic education, namely: Systematic approach, which means that changes must be made to the entire system in existing formal Islamic education institutions, in the sense that there are comprehensive changes. The complementary approach, which includes the addition of a number of educational modules, aims to further expand the understanding and appreciation of Islamic teachings (Haqqi & Wijayati, 2019). This step is done in the popular term "patchwork".

A complementary approach is to slightly modify the study program to adapt it in an integrated manner. This means that in the current situation, changes in Islamic education programs must be oriented towards skills, namely knowledge, skills, skills (certain competencies), socio-cultural capacity and spiritual spiritual capacity (Sa'idi, Anvaripour, Jaderi, & Nabhani, 2014). In addition to the three factors above, in the era of the industrial revolution 4.0, the world of education plays an important role in improving the quality of human resources, where students are expected to have 21st century life skills. Creativity, Critical Thinking, Communication and Collaboration. This is part of an effort to synergize humans (humancentered) and technology (technology-based) sically (Umro, 2020), the problem of Islamic education in the modern era must be in line with the times, which is currently the era of the industrial revolution 4.0, and schools or madrasah and universities must be able to adapt to these developments by integrating Islamic religious education with intellectual abilities in technology (Zubairi, 2022). The same view is also conveyed by Haidir et al (2021) that adaptation to technology is not only carried out by students but also by all Islamic Religious Education practitioners, so that they can master digital literacy which today is available so much and easily (Ismail et al., 2020).

CONCLUSION

The existence of Islamic education in the history of national education development is very long. There are many problems in the process, but its development deserves to be appreciated. Islamic Religious Education is not only interpreted as a transfer of knowledge and transfer of values, but must be able to give birth to creativity and innovation that is human-centered and technology-based. In addition, Islamic Religious Education should be able to answer all the challenges of the

times as Rhenald Kasali said with the concept of disruptive mindset, self driving and reshape or create. So that all religious doctrine that Muslims believe that the Qur'an is a guide to human life until the end of time should be able to be translated correctly and convincingly to answer existing life problems. All these concepts must be able to be translated and are applicable and again limited to bureaucratic. So that in the end, the existence of Islamic education is able to answer the needs of society in living a more meaningful life by utilizing technological tools to improve the quality of education, the quality of science, technology and imtaq and also the quality of moral and intellectual Human Resources.

The good existence of Islamic Education must go hand in hand with the use of digital technology in the learning process. The use of technology in education has at least three beneficial effects on Islamic education. Technology can help students achieve more in Islamic education, can help teachers be more successful, and can influence what and how Islamic education should be studied and taught. So, with the adaptation of existing technology, educationists and students are be able to take advantage of many things, ranging from space and time innovations, personalized learning or self-study, freedom to choose all learning approaches, can do project-based learning, giving birth to applicative field practice. So that the development of existing Islamic education is oriented towards the vision and mission, and is flexible, so as to give birth to new alternative models that are able to answer future challenges.

ACKNOWLEDGEMENT

The conceptual article entitled "Islamic Education in the Era of Industrial Revolution 4.0 and the Utilization of Digital Technology in the Teaching and Learning Process" is a writing in the author's long thoughts on the condition of Islamic education today. So much homework that must be completed by observers of Islamic education in Indonesia. Hopefully this article provide its own discussion discourse for its readers. Therefore, the author expresses his gratitude to colleagues who always provide spaces for discussion until the publication of this writing and thinking. Likewise, a big thank you to Jurnal Iqra' for giving permission to publish this article. Hopefully, this article can enrich the literacy of Islamic education in Indonesia.

REFERENCES

Adisel, Thadi, R., & Suryati. (2022). The Implementation of Education Policy in the Development of Islamic Religious Education in the Industrial Revolution Era 4.0. *MADANIA: Jurnal Kajian Keislaman*, *26*(2), 177–184. http://dx.doi.org/10.29300/madania.v26i2.3773

Adnan, M. (2022). Islamic Education and Character Building in The 4.0 Industrial Revolution. *Nazhruna: Jurnal Pendidikan Islam*, *5*(1), 11–21. https://doi.org/10.31538/nzh.v5i1.1771.

Afwan Yazid, A. (2021). Existence of Islamic education in the era of society revolution 5.0. *AMCA Journal of Religion and Society*, *1*(1), 13–15. https://doi.org/10.51773/ajrs.v1i1.34

Agus, Z. (2019). Konsep pendidikan Islam bagi remaja menurut Zakiah Daradjat. *Raudhah Proud To Be Professionals: Jurnal Tarbiyah Islamiyah*, *4*(1), 11–24. https://doi.org/10.48094/raudhah.v4i1.38

Ajmain, M. T., Mahfuz, A. N. A., Rahman, S. N. H., & Mohamad, A. M. (2019). Challenges of Islamic Education Teachers in Teaching. *… Studies and Human …*, *2*(1), 38–47. http://bitarajournal.com/index.php/bitarajournal/article/view/45.

Akhmad Syahri. (2018). Spirit Islam dalam teknologi pendidikan di era. *Attarbiyah*, *28*, 62–80. https://doi.org/10.18326/attarbiyah.v28.62-80

Alam, M. J., Hassan, R., & Ogawa, K. (2023). Digitalization of Higher Education to Achieve Sustainability: Investigating Students' Attitudes toward Digitalization in Bangladesh. *International Journal of Educational Research Open*, *5*(100273), 1–13. https://doi.org/10.1016/j.ijedro.2023.100273

Alifiyah, F. L. N. (2023). Ekstensi local genius berbasis diseminasi pembelajaran dalam mengatasi krisis pendidikan karakter di era digital. *Jurnal Integrasi Dan Harmoni Inovatif Ilmu-Ilmu Sosial (JIHI3S)*, *3*(1), 1–7. https://doi.org/10.17977/um063v3i1p1-7

Alinafiah, M., Ridwan, M. B., & Ahmadi, S. (2020). The Role of The Interdiscipline Approach in Islamic Study on The Religiusity of The Millenial Generation in The Digitalization Age. *Budapest International Research and Critics Institute (BIRCI-Journal)*, *5*(3), 20333–20340. https://doi.org/10.33258/birci.v5i3.6050

Aristya, Septian, Fauzan, U., & Malihah, N. (2023). Transformasi Pendidikan Agama Islam di Era Society 5.0 : Pengunaan AI oleh Mahasiswa di PTKIN Kalimantan Timur. *Ta Dib Jurnal Pendidikan Islam*, *12*(2), 641–650. https://doi.org/10.29313/tjpi.v12i2.12141

Asnawani. (2010). Pendidikan Islam dan Teknologi Komunikasi. *Jurnal Falasifa*, *1*(2), 93–110. https://jurnalfalasifa.wordpress.com/wp-content/uploads/2012/11/7-asnawan-pendidikan-islam-dan-teknologi-komunikasi.pdf.

Aziz, H. (2018). Education 4.0 Made Simple: Ideas For Teaching. *International Journal of Education and Literacy Studies*, *6*(3), 92–98. https://doi.org/10.7575/aiac.ijels.v.6n.3p.92

Azra, A. (2017). Pendidikan Islam Di Era Globalisasi: Peluang Dan Tantangan. *EDUKASI: Jurnal Penelitian Pendidikan Agama Dan Keagamaan*, *6*(4), 1–15. https://doi.org/10.32729/edukasi.v6i4.269

Badruzaman, A., Hosaini, H., & Halim, A. (2023). Bureaucracy, Situation, Discrimination, and Elite in Islamic Education Perspective of Digital Era. *Bulletin of Science Education*, *3*(3), 179-191. https://doi.org/10.51278/bse.v3i3.363

Burke, P. F., Schuck, S., Burden, K., & Kearney, M. (2025). Mediating Learning with Mobile Devices Through Pedagogical Innovation: Teachers' Perceptions of K-12 Students' Learning Experiences. *Computers & Education*, *227*(105226), 1–17. https://doi.org/https://doi.org/10.1016/j.compedu.2024.105226

Chikmah, L., Rahmawati, M., & Putri, D. A. (2023). The Role of Islamic Education in Facing the Industrial Age 4.0. *Khuluqiyya: Jurnal Kajian Hukum Dan Studi Islam*, *5*(1), 39–46. https://doi.org/10.56593/khuluqiyya.v5i1.92

Dakir, D., & Fauzi, A. (2019). Epistemologi pendidikan islam rahmatan lil'alamin di era revolusi industry 4.0; sebuah kajian paradigmatik. *Edureligi: Jurnal Pendidikan Agama Islam*, *3*(2), 92–100. https://doi.org/10.54396/saliha.v2i2.33

Daradjat, Z., Sadali, A., Feisal, Y. A., Abdulhaq, I., Muchsin, M., & Faridl, M. (2019). *Dasar-Dasar Agama Islam*. Jakarta : Pusat Penerbitan Universitas Terbuka.

Dimas Indianto. (2019). Pendidikan Agama Islam dalam Revolusi Industri 4.0. *Prosiding Seminar Nasional Prodi PAI UMP*, *8*(2), 106–107. https://digitallibrary.ump.ac.id/254

Djazaman, M. (2009). Konsep Pendidikan Islam. *Jurnal Ilmu Pendidikan Islam*, *1*(2). https://ejournal.kopertais4.or.id/pantura/index.php/jipi

Dulumina, G. B., Pettalongi, S. S., & Idhan, M. (2024). The Existence and the Role of Islamic Education Institutions in the Era of Industry 4.0 Revolution: A Case

Study of Central Alkhairaat Education Institution in Palu City, Indonesia. *International Journal of Social Science and Human Research*, *7*(2), 1236–1242. https://doi.org/10.47191/ijsshr/v7-i02-44

Fisk, W. J. (2017). The Ventilation Problem in Schools: Literature Review. *Indoor Air*, *27*(6), 1039–1051. https://doi.org/10.1111/ina.12403

Fragouli, E. (2020). A Critical Discussion on Issues of Higher Education: Curriculum Internationalization, Challenges, and Opportunities. *International Journal of Education and Learning, 2(2),* 67-75. https://doi.org/10.31763/ijele.v2i2.110

Habib, M. (2023). Digital Transformation Strategy for Developing Higher Education in Conflict-Affected Societies. *Social Sciences & Humanities Open*, *8*(100327), 1–10. https://doi.org/10.1016/j.ssaho.2023.100627

Haidir, H., Arizki, M., & Fariz, M. (2021). An Innovation of Islamic Religious Education in The Era of The Industrial Revolution 4.0 in Elementary School. *Nazhruna: Jurnal Pendidikan Islam*, *4*(3), 720–734. https://doi.org/10.31538/nzh.v4i3.1688

Hair, Moh Afiful dan Moh Subhan. (2018). Pendidikan Agama Islam dalam Keluarga dan Masyarakat. *Ahsana Media: Jurnal Pendidikan Dan Penelitian Ke Islaman*, *4*(2), 91–100. https://doi.org/10.31102/ahsana..4.2.2018.28-34

Hamdan, Rusdiana, Tarwilah, Suraijiah, Rusdiah, & Ramli, M. (2024). Industrial Era Islamic Education Revolution 4.0: Strategy for Optimizing ICT Integration in Curriculum Education Study Programs. *Jurnal Iqra': Kajian Ilmu Pendidikan*, *9*(2), 242–258. https://doi.org/10.25217/ji.v9i2.4525

Hatiah, H., & Muslimah, M. (2024). Peran Orang Tua dalam Pembentukan Karakter Anak di Era Digital. *Jurnal Al-Qiyam*, *5*(1), 16–23. https://doi.org/10.33648/ALQIYAM.V5I1.357

Haqqi, H., & Wijayati, H. (2019). *Revolusi Industri 4.0 di Tengah Society 5.0: Sebuah Integrasi Ruang, Terobosan Teknologi, dan Transformasi Kehidupan Di Era Disruptif*. Yogyakarta: Anak Hebat Indonesia.

Haris, M. (2019). Manajemen Lembaga Pendidikan Islam dalam Menghadapi Revolusi Industri 4.0. *Mudir*, *1*(1), 33–41. https://doi.org/10.55352/mudir.v1i1.26

Hidayah, Y., & Feriyansyah, F. (2023). Netiquette dalam Perspektif Pendidikan Kewarganegaraan sebagai Perwujudan Warga Digital yang Baik. *Jurnal Al-Qiyam*, *4*(1), 74–85. https://doi.org/10.33648/ALQIYAM.V4I1.290

Ilham, M. & Sujana, A. P. (2021). Pembuatan Aplikasi Berbasis Augmented Reality Pembelajaran Pengkabelan LAN Untuk Pelajar SMK Teknik Komputer Jaringan. *eProceedings of Applied Science*, *7*(6), 3464-3479. https://openlibrarypublications.telkomuniversity.ac.id/index.php/appliedscience/article/view/16830/16547.

Imam Tabroni, Ikah Farihatunnisa, Novi Siti Fatimah, Muammira Idris, & Rini Purnama Sari. (2022). Education Media in the Perspective of Islamic Education. *Jurnal Riset Rumpun Agama Dan Filsafat*, *1*(1), 1–5. https://doi.org/10.55606/jurrafi.v1i1.1

Imamuddin, M., Zaharuddin, M., Andryadi, Isnaniah, & Artika, F. S. (2022). The Era of Industrial Revolution 4.0 and the Existence of Islamic Education at Indonesia. *TADRIS: Jurnal Pendidikan Islam*, *17*(1), 198–210. https://doi.org/10.19105/tjpi.v17i1.5178

Imran, M., Almusharraf, N., & Abbasova, M. Y. (2025). Digital Learning Transformation: A Study of Teachers' Post-Covid-19 Experiences. *Social Sciences & Humanities Open*, *11*(101228), 1–9. https://doi.org/10.1016/j.ssaho.2024.101228

Irawan, V. T., Sutadji, E., & Widiyanti. (2017). Blended learning based on schoology:

Effort of improvement learning outcome and practicum chance in vocational high school. *Cogent Education*, *4*(1), 1282031. https://doi.org/10.1080/2331186X.2017.1282031

Islam, S., & Jahan, N. (2018). Digitalization and Education System: A Survey. *International Journal of Computer Science and Information Security*, *16*(1), 70–73. www.ebook.gov.bd.

Ismail, S., Zahrudin, M., Ruswandi, U., & Erihadiana, E. (2020). The Competence of Millennial Islamic Education Teachers in Facing The Challenges of Industrial Revolution. *Nazhruna: Jurnal Pendidikan Islam*, *3*, 389–405. https://doi.org/10.31538/nzh.v3i3.823

Jannah, R. (2022). Problems of Islamic Education in the Era of Industrial Revolution 4.0. *Journal of Social Science*, *3*(5), 1179–1189. https://doi.org/https://doi.org/10.46799/jss.v3i5.434

Kasali, R. (2018). *The great shifting*. Gramedia Pustaka Utama.

Khusnan, A. (2016). Teknologi Pembelajaran Pai (Pendidikan Agama Islam) Dalam Paradigma Konstruktivistik. *Fikroh: Jurnal Pemikiran Dan Pendidikan Islam*, *4*(2). https://doi.org/10.37812/fikroh.v4i2.18

Lase, D. (2019). Pendidikan di Era Revolusi Industri 4.0. *Jurnal Sundermann*, *1*, 28–43. https://doi.org/10.36588/sundermann.v1i1.18

Liberati, A., Altman, D., Tetzlaff, J. M., Mulrow, C., Gøtzsche, P. C., Ioannidis, J., … Moher, D. (2009). The PRISMA Statement for Reporting Systematic Reviews and Meta-Analyses of Studies That Evaluate Health Care Interventions: Explanation and Elaboration. *Journal of Clinical Epidemiology*, *62*(10), 1–34. https://doi.org/10.1136/bmj.b2700

Loh, R. S. M., Kraaykamp, G., & Hek, M. van. (2025). Plugging in at School: Do Schools Nurture Digital Skills and Narrow Digital Skills Inequality? *Computers & Education*, *226*(105195), 1–13. https://doi.org/10.1016/j.compedu.2024.105195

Lohr, A., Sailer, M., Stadler, M., & Fischer, F. (2024). Digital Learning in Schools: Which Skills Do Teachers Need, and Who Should Bring Their Own Devices? *Teaching and Teacher Education*, *152*(104788), 1–12. https://doi.org/10.1016/j.tate.2024.104788

Lubinga, S., Maramura, T., & Masiya, T. (2023). The Fourth Industrial Revolution Adoption: Challenges in South African Higher Education Institutions. *Journal of Culture and Values in Education*, *6*(2), 1–17. https://doi.org/10.46303/jcve.2023.5

Masuwai, A., Zulkifli, H., & Hamzah, M. I. (2024). Self-assessment for Continuous Professional Development: The Perspective of Islamic Education. *Heliyon*, *10*(e38268), 1–17. https://doi.org/10.1016/j.heliyon.2024.e38268

Mei, L., Feng, X., & Cavallaro, F. (2023). Evaluate and Identify the Competencies of the Future Workforce for Digital Technologies Implementation in Higher Education. *Journal of Innovation & Knowledge*, *8*(100445), 1–15. https://doi.org/10.1016/j.jik.2023.100445

Minasi, R. (2022). *Industry Revolution 4.0 and Its Impact on Education*. https://doi.org/10.4018/978-1-7998-9220-5.ch132

Moraes, E. B., Kipper, L. M., Hackenhaar Kellermann, A. C., Austria, L., Leivas, P., Moraes, J. A. R., & Witczak, M. (2023). Integration of Industry 4.0 technologies with Education 4.0: advantages for improvements in learning. *Interactive Technology and Smart Education*, *20*(2), 271–287. https://doi.org/10.1108/ITSE-11-2021-0201

Mujahada, K. S. (2019). Memperkuat Eksistensi Pendidikan Islam dalam Menghadapi

Era Revolusi Industri 4.0. *SALIHA: Jurnal Pendidikan & Agama Islam*, *2*(2), 38–48. https://doi.org/10.54396/saliha.v2i2.28

Mujani, W. K., Ibrahim, I. A., & Safiai, M. H. (2012). Observatories in Islamic history. *Advances in Natural and Applied Sciences*, *6*(8), 1370–1373. https://www.aensiweb.com/old/anas/2012/1370-1373.pdf.

Mustanadi, M. (2021). *Pendidikan Islam Non Formal dan Penguatan Perilaku Keagamaan Masyarakat Transisi*. https://etheses.uinmataram.ac.id/2009

Musyafak, M., & Subhi, M. R. (2023). Strategi Pembelajaran Pendidikan Agama Islam dalam Menghadapi Tantangan di Era Revolusi Industri 5.0. *Asian Journal of Islamic Studies and Da'wah*, *1*(2), 373–398. https://doi.org/10.58578/ajisd.v1i2.2109

Narh-Kert, M., Osei, M., & Oteng, B. (2022). Readiness of Education 4.0 in Ghana. *Open Journal of Social Sciences*, *10*, 502–517. https://doi.org/10.4236/jss.2022.101037

Ningsih, T. (2019). Pendidikan Multikultural Mengembangkan Karakter Berbasis Modal Sosial. In D. I. S. (Ed.), *Pustaka Senja* (1st ed.). Yogyakarta: Pustaka Senja.

Nuh, M. (2023). Reformulasi Kepemimpinan Pendidikan Islam Di Era Revolusi Industri 4.0. *Jurnal Manajemen Pendidikan Al Hadi*, *3*(1), 1. https://doi.org/10.31602/jmpd.v3i1.10150

Nuraeni, & Mujahidin, E. (2021). Landasan dan Prinsip-Prinsip Perencanaan Pendidikan Islam. *Idarah Tarbawiyah: Journal of Management in Islamic Education*, *2*(2), 104–121. https://doi.org/10.32832/itjmie.v2i2.4596

Oke, A., & Fernandes, F. A. P. (2020). Innovations in Teaching and Learning: Exploring the Perceptions of the Education Sector on the 4th Industrial Revolution (4IR). *Journal of Open Innovation Technology Market and Complexity*, *6*(31), 1–22. https://doi.org/10.3390/joitmc6020031

Pihar, A. (2022). Modernization of Islamic Religious Education in the Era of Society 5.0. *Journey-Liasion Academia and Society*, *1*(1), 1–12. https://j-las.lemkomindo.org/index.php/BCoPJ-LAS.

Priatmoko, S. (2018). Memperkuat Eksistensi Pendidikan Islam Di Era 4.0. *TA'LIM : Jurnal Studi Pendidikan Islam*, *1*(2), 221–239. https://doi.org/10.52166/talim.v1i2.948

Purnomo, S. (2020). Reformulasi kepemimpinan pendidikan islam di era revolusi industri 4.0. *INSANIA : Jurnal Pemikiran Alternatif Kependidikan*, *25*(1), 54–64. https://doi.org/10.24090/insania.v25i1.3751

Putrawangsa, S., & Hasanah, U. (2018). Integrasi Teknologi Digital Dalam Pembelajaran Di Era Industri 4.0. *Jurnal Tatsqif*, *16*(1), 42–54. https://doi.org/10.20414/jtq.v16i1.203

Putri, K. E., Tanjungsar, T., & Hadi, S. (2023). Analysis of education policies for elementary school children in the industrial revolution 4.0 era. *Jurnal Pendidikan Dasar Nusantara*, *8*(2), 237–249. https://doi.org/10.29407/jpdn.v8i2.19279

Raya, M. K. F. (2018). Sejarah Orientasi Pendidikan Islam Di Indonesia (Dari Masa Kolonial Hingga Orde Baru). *Jurnal Pendidikan Islam*, *08*(2), 228–242. https://ejournal.uiidalwa.ac.id/index.php/jpi/article/view/202.

Rinnanik, R. (2018). Tinjauan Filosofis Pendidikan Islam. *Tarbawiyah: Jurnal Ilmiah Pendidikan*, *1*(01), 250–271. https://e-journal.metrouniv.ac.id/tarbawiyah/article/view/1021/879

Riyadi, M. (2018). Eksistensi Pendidikan Agama Islam Di Tengah Kemajuan Ilmu Pengetahuan. *Risalah, Jurnal Pendidikan Dan Studi Islam*, *4*(2, Sept), 149–167. https://doi.org/10.31943/jurnal_risalah.v4i2.88

Rochbani, I. T. N. (2024). The 4.0 Era's Difficulties with Learning Islamic Religious Education. *ZIJEd: Zabags International Journal of Education*, *2*(1), 13–20. https://doi.org/10.61233/zijed.v2i1.15

Rodliyah, S. (2022). Policy Analysis of Islamic Education Management Program Curriculum Development in Preparing Quality Graduates in the Era of Industrial Revolution 4.0. *Fenomena: Journal of the Social Science*, *21*(1), 131–148. https://doi.org/10.35719/fenomena.v21i1.108

Sa'idi, E., Anvaripour, B., Jaderi, F., & Nabhani, N. (2014). Fuzzy risk modeling of process operations in the oil and gas refineries. *Journal of Loss Prevention in the Process Industries*, *30*, 63–73. https://doi.org/10.1016/j.jlp.2014.04.002

Sabic-El-Rayess, A. (2020). Epistemological Shifts in Knowledge and Education in Islam: A New Perspective on the Emergence of Radicalization Amongst Muslims. *International Journal of Educational Development*, *73*(102148), 1–10. https://doi.org/10.1016/j.ijedudev.2019.102148

Sari, W. K., & Wilujeng, I. (2020). Education change in the industry 4.0: Candidate science teacher perspective. *Journal of Physics: Conference Series*, *1440*(1), 12090. https://doi.org/10.1088/1742-6596/1440/1/012090

Satori, D., Komariah, A., & Suryana, A. (2019). Character education in the era of industrial revolution 4.0 and its relevance to the high school learning transformation process. *Utopia y Praxis Latinoamericana*, *24*(5), 327–340. https://produccioncientificaluz.org/index.php/utopia/article/view/29966

Schwab, K. (2017). *The Fourth Industrial Revolution*. Portfolio. https://books.google.co.id/books?id=9hgXvgAACAAJ.

Shaffril, H. A. M., Samsuddin, S. F., & Samah, A. A. (2021). The ABC of Systematic Literature Review: the Basic Methodological Guidance for Beginners. *Quality & Quantity*, *55*(11), 1–28. https://doi.org/10.1007/s11135-020-01059-6

Souza, A. S. C. de, & Debs, L. (2024). Concepts, Innovative Technologies, Learning Approaches and Trend Topics in Education 4.0: A Scoping Literature Review. *Social Sciences & Humanities Open*, *9*(100902), 1–16. https://doi.org/10.1016/j.ssaho.2024.100902

Sugiarto, S., & Suhono, S. (2023). Studi Kasus Penggunaan ChatGPT pada Mahasiswa di PTKI Lampung. *Jurnal Al-Qiyam*, *4*(2), 110–119. https://doi.org/10.33648/ALQIYAM.V4I2.318

Suhono. (2023). An Assistance of Islamic University EFL Students through Artificial Intelligence (AI) Machine Translation and Writing Tools. *International Journal of Community Engagement Payungi*, *3*(2), 74–90. https://doi.org/10.58879/IJCEP.V3I2.36

Sulastri, & Rasyidah, A. (2020). Penafsiran Amanah Dalam Kitab Tafsir Al-Munir Oleh M . Wahbah Az-Zuhaili (Study of the Quran Surah al-Ahzab : 72 , Surah an-Nisa ': 58 and Surah al-Anfal : 27). *Al-Bayan : Jurnal Ilmu Al-Qur'an Dan Hadist*, *3*(2), 212–234. https://doi.org/10.35132/albayan.v3i2.223

Suni Amtonis, J. (2022). E-Lkpd Dan Literasi Lingkungan Pada Pendidikan Era Revolusi Industri 4.0. *Jurnal Koulutus*, *5*(1), 71–80. https://doi.org/10.51158/koulutus.v5i1.786

Suprima. (2022). Challenges to Educate the Millennial Muslim Generation in the Era of the Industrial Revolution 4.0 to Create A Modern Islamic Education Environment. *Ta'dib: Jurnal Pendidikan Islam*, *11*(2), 319–332. https://doi.org/10.29313/tjpi.v11i2.10289

Supriyatno, T. (2019). Amalan Akhlak Kepala Sekolahdasar Islam Di Malang Melalui

Muraqabah, Muhasabah Dan Mujahadah. *Progresiva : Jurnal Pemikiran Dan Pendidikan Islam*, *8*(1), 15. https://doi.org/10.22219/progresiva.v8i1.8927

Suyadi, Nuryana, Z., Sutrisno, & Baidi. (2022). Academic Reform and Sustainability of Islamic Higher Education in Indonesia. *International Journal of Educational Development*, *89*(102534), 1–11. https://doi.org/10.1016/j.ijedudev.2021.102534

Syakur, A. (2017). Revitalisasi Teknologi Pendidikan Islam. *TADRIS: Jurnal Pendidikan Islam*, *11*(2), 170–187. https://doi.org/10.19105/tjpi.v11i2.1166

Syam, A. R. (2019). Guru dan Pengembangan Kurikulum Pendidikan Agama Islam di Era Revolusi Industri 4.0. *TADRIS: Jurnal Pendidikan Islam*, *14*(1), 1. https://doi.org/10.19105/tjpi.v14i1.2147

Syarnubi, S., Syarifuddin, A., & Sukirman, S. (2023). Curriculum Design for the Islamic Religious Education Study Program in the Era of the Industrial Revolution 4.0. *Al-Ishlah: Jurnal Pendidikan*, *15*(4), 6333–6341. https://doi.org/10.35445/alishlah.v15i4.3421

Temon Astawa, I. N. (2016). Teori - Teori Dalam Dunia Pendidikan Modern. *Jurnal Penjaminan Mutu*, *1*(1), 67. https://doi.org/10.25078/jpm.v1i1.40

Tulak, H., Wijaya, H., Rante, S. N., Nurmadiah, N., & Helaluddin, H. (2019). The Intercultural Competence in Education Era 4.0: A Learning Strategy for Students of Elementary School in Indonesia. *Proceedings of the 1st International Conference of Science and Technology in Elementary Education, ICSTEE 2019, 14 September, Makassar, South Sulawesi, Indonesia*. https://doi.org/10.4108/eai.14-9-2019.2289961

Umar, U. (2016). Eksistensi Pendidikan Islam Di Indonesia (Perspekstif Sejarah Pendidikan Nasional). *Lentera Pendidikan : Jurnal Ilmu Tarbiyah Dan Keguruan*, *19*(1), 16–29. https://doi.org/10.24252/lp.2016v19n1a2

Umro, J. (2020). Tantangan Guru Pendidikan Agama Islam Dalam Menghadapi Era Society 5.0. *Jurnal Al-Makrifat*, *5*(1), 79–95. https://ejournal.kopertais4.or.id/tapalkuda/index.php/makrifat/article/view/3675/2698

Usmaedi. (2021). Education Curriculum for Society 5.0 in The Next Decade. *Jurnal Pendidikan Dasar Setiabudhi*, *4*(2), 63–79. https://stkipsetiabudhi.e-journal.id/jpd.

Wahid, S. H. (2024). Exploring the Intersection of Islam and Digital Technology: A Bibliometric Analysis. *Social Sciences & Humanities Open*, *10*(101085), 1–28. https://doi.org/10.1016/j.ssaho.2024.101085

Wang, K., Li, B., Tian, T., Zakuan, N., & Rani, P. (2023). Evaluate the Drivers for Digital Transformation in Higher Education Institutions in the Era of Industry 4.0 Based on Decision-Making Method. *Journal of Innovation & Knowledge*, *8*(100364), 1–12. https://doi.org/10.1016/j.jik.2023.100364

Wardi, M. (2013). Problematika Pendidikan Islam Dan Solusi Alternatifnya (Perspektif Ontologis, Epistemologis dan Aksiologis). *Tadris*, *8*(1), 54–70. https://doi.org/10.19105/tjpi.v8i1.383

Wasil, M., & Anam, N. (2021). Model Integrasi Pembelajaran Karakter-Sufistik dalam Budaya Sekolah di SMP Nuris Jember. *PROCEEDING: The Annual International Conference on Islamic Education*, *5*(1), 65–75. https://jurnal.stitnualhikmah.ac.id/index.php/proceedings/article/view/858.

Webb, R. K., & Bohan, C. H. (2015). *Beyond Jane Addams: The Progressive Pedagogies of Ella Flagg Young, Lucy Sprague Mitchell, Lucy Maynard Salmon, and Anna Julia Cooper*. Georgia: Georgia State University.

Zien, N. H. R., Bakar, N. A. A., & Saad, R. (2024). Unveiling Insights: A Dataset

Analysis of Islamic Quality Management Systems in Educational Institutions Toward SDG-aligned Education. *Data in Brief*, *54*(110343), 1–8. https://doi.org/10.1016/j.dib.2024.110343

Zubairi. (2022). Sistem Pendidikan Agama Islam di Era Revolusi 4.0. *International Conference and Visiting Scholars*, 1–20. https://prosiding.insuriponorogo.ac.id/index.php/aicoms/article/view/125.

Zubairi, Nurdin, & Solihin, R. (2022). Islamic Education in the Industrial Revolution 4.0. *Scaffolding: Jurnal Pendidikan Islam Dan Multikulturalisme*, *4*(3), 359–371. https://doi.org/10.37680/scaffolding.v4i3.2118

Zulnaidi, H., Mafarja, N., Rahim, S. S. A., & Salleh, U. K. M. (2024). Ethical mediation: The influence of mathematics teachers cooperation on readiness for the industrial revolution era in Indonesia and Malaysia. *Acta Psychologica*, *243*, 104151. https://doi.org/10.1016/j.actpsy.2024.104151