The Challenges of Elementary Education in Society 5.0 Era

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ABSTRACT

This study aims to describe the teachers' perceptions and readiness to face classroom instruction in the eras of Industrial Revolution 4.0 and Society 5.0. As an essential part of education, teachers are responsible for teaching (imparting knowledge to students) and educating them (shaping their character traits). These roles demand the design of a learning process that stimulates students to acquire 21st-century skills. The challenges posed by the disruptive era of Industrial Revolution 4.0 and Society 5.0 (supersmart society era) present significant hurdles for today's teachers. To address these challenges, teachers demonstrate adaptability and embrace ongoing development. This study employed a qualitative descriptive method to gather data; the data were collected through observation, interviews, document review, and secondary data sources. The study's primary respondents were 15 teachers from schools/madrassas (Islamic schools) in 5 regencies; Kudus, Pati, Rembang, Grobogan, and Blora. The results reveal that technological devices, learning methods, and human resources are the most significant barriers for teachers facing the society 5.0 era. To overcome these challenges, teachers must develop professional competencies in utilizing digital technology during classroom instruction.

Keywords:

Society 5.0 Era, Teacher Competency, Digital Transformation, Teachers' Challenges.

ABSTRAK

Penelitian ini bertujuan untuk mendeskripsikan persepsi dan kesiapan guru dalam menghadapi pembelajaran di era industri 4.0 dan masyarakat 5.0. Sebagai komponen penting dalam pendidikan, guru bertanggung jawab untuk mengajar (menyampaikan ilmu kepada siswa) dan mendidik mereka (membentuk karakter mereka). Peran tersebut menuntut guru untuk menciptakan proses pembelajaran yang merangsang siswa untuk memperoleh hasil belajar dari tuntutan keterampilan abad 21. Dengan kata

lain, guru saat ini sangat tertantang oleh perubahan era industri 4.0 (era disruption) yang diikuti dengan era masyarakat 5.0 (supersmart society). Untuk menghadapi tantangan tersebut, guru harus mampu beradaptasi dengan perkembangan yang ada. Penelitian ini menggunakan metode deskriptif kualitatif dimana data diperoleh dari observasi, wawancara, telaah dokumen, dan data sekunder lainnya. Informan utama penelitian ini adalah 15 guru sekolah/madrasah di 5 kabupaten; Kudus, Pati, Rembang, Grobogan, dan Blora. Temuan menunjukkan bahwa perangkat teknologi, metode pembelajaran, dan sumber daya manusia menjadi kendala utama bagi guru dalam menghadapi era masyarakat 5.0. Kesulitan tersebut di atas dapat diakhiri jika guru memiliki kualifikasi khusus terkait dengan kompetensi pembelajaran dengan pemanfaatan teknologi digital di era masyarakat 5.0.

Kata kunci:

Era Society 5.0, Kompetensi Guru, Transformasi Digital, Tantangan Guru.

1.   Introduction

Massive information and communication technology advancements have revolutionized both social and industrial structures. Human civilization has undergone continuous and transformative changes throughout history. These changes have culminated in an uncontrollable environment marked by volatility, uncertainty, complexity, and ambiguity, commonly called the VUCA era (Alimudin, 2019). These changes occur due to the sophistication of information technology (IT) and digital-based scientific products.

Regarding changes in human civilization, the 'term industrial revolution' refers to significant changes in how humans produce goods. (Alsakrisna & Asto B, 2014). These changes have far-reaching effects on various aspects of human life. They extend beyond the confines of the production or industrial sectors. Now humans are faced with significant transformations as the 21st century transitions into the 22nd, driven by advancements in digital technology – the era of Industrial Revolution 4.0 and Society 5.0. In this era, a variety of technologies, particularly in manufacturing sectors, are gradually integrated with Big Data (BD) and Internet of Things (IoT) models, as well as Artificial Intelligence (AI) or robotics. The revolution has unleashed massive and systematic effects on all sectors of life, including economics, politics, the military, culture, education, and even religious practices (religiosity). The profound impacts that arise within the industrial sectors have caused the collapse of several conventional professions while simultaneously introducing new job opportunities that were inconceivable. Automated machines have systematically replaced jobs that once relied on human physical abilities. Moreover, the presence of the Internet in this era serves not only as a means of sharing information and analyzing data but also as a tool for experiencing life itself. To confront these challenges of this era, individuals must possess hard and soft skills compatible with the requirements and needs for survival.

In the era of Industry 4.0 and Society 5.0, education plays an essential role in preparing and improving the quality of human resources. Within this context, educational institutions must rise to the challenge of equipping students with the necessary life skills to thrive and excel in the dynamic landscape of the 21st century. These competencies encompass the 4Cs: creativity, critical thinking, communication, and collaboration. By nurturing these necessary 21st-century life skills, students are empowered to succeed in the competitive arenas of the modern world. Moreover, the learning process must go beyond the development of the 4Cs alone. It must also encompass six basic literacy skills: numeracy, scientific literacy, information literacy, financial literacy, cultural literacy, and civic literacy. Furthermore, students need to hold digital literacy, which includes understanding how machines work and harnessing the potential of digital applications such as coding, artificial intelligence, machine learning, engineering principles, and biotechnology. Proficiency in humanities, communication, and design is indispensable (Kementerian Pendidikan dan Kebudayaan, 2018).

In facing the society 5.0 era, education and its various elements and stakeholders, such as government, community organizations, and society, must share and synchronize their perceptions. At the micro level, a profound paradigm shift in classroom instruction practice becomes imperative. Teachers must undergo a transformative process, transitioning from being more providers of knowledge content to becoming inspiring role models who foster the development of students' creativity. Teachers are facilitators, tutors, motivators, and mostly lifelong learners who encourage students to embrace their innate "Freedom to Learn" (Laila & Hendriyanto, 2021a). It is crucial for all parties involved to acknowledge and fully understand the significant differences between education in the 20th and 21st centuries; education largely revolved around information derived from books and is inclined to have a regional and national focus. However, in the 21st century, education encompasses learners of all ages, with every child considered a member of a global learning community. Knowledge acquisition occurs through various sources, including books, the Internet, technological advancements, information platforms, and innovative curriculum development. This condition requires teachers to be proficient in digital literacy and creative thinking. As mentioned by Zulfikar Alimuddin (2019), to meet the learning needs of the 21st century, teachers must be literate in making use of the Internet of Things (IoT), Virtual/Augmented Reality (VR/AR), and Artificial Intelligence (AI) to discover and identify the learning need (Alimudin, 2019).

Regardless of the remarkable advancements in technology and the numerous benefits they bring, according to Kumi Laila and Hendriyanto (2022), there is an essential role of teachers that cannot be undermined or replaced by technology alone, such as direct communication, emotional bonds between teachers and students, character building, and teacher modeling (Laila & Hendriyanto, 2021b).

According to Hasanah (2019), the success of any education policy or the effectiveness of the education system heavily hinges on teachers, as they are the ones who directly teach students in the classroom (Hasanah, 2018). As crucial educators engaged in direct interaction with students, teachers must possess a comprehensive understanding of their roles and responsibilities and the necessary skills to fulfill them. Consequently, they must be able to address these various challenges and needs

of students, ensuring that the educational process fosters the development of competent individuals who embrace human dignity and humanity. Failure to do so means that technological advancements could undermine the essence of human glory as -*Khalifatullah fil ard*- the custodians of the universe. Technology, when misused, can lead to humans glorifying themselves rather than focusing on what truly matters. Therefore, humans should not worship technology.

The title/theme of this study is Society 5.0 (*supersmart society*). Nevertheless, due to significant similarities and its extension of the concept of the Industrial Revolution 4.0, both the theoretical framework and data gathered and examined between the two images were analyzed through the lens of digitalization in the learning process. This refers to the study's objective of exploring teachers' perceptions and readiness to cope with the changes and challenges of an era that demands mastery and implementation of information and digital technology.

2. Methods

This study involved field research conducted through a qualitative approach. As a result, the data generated by this study is descriptive, taking the form of written or spoken words, along with observations of the behavior of data sources in the field (Creswell, 2009). According to Creswell (2009), the qualitative method is a research procedure that generates descriptive data from participants through spoken or written responses and observable behavior.

The main objective of this study is to thoroughly examine teachers' perceptions and readiness to adapt to digital transformation in classroom instruction of Elementary Education during the Society 5.0 Era. Therefore, this study predominantly adopted an empirical approach, where the data collection aligned with the research objectives and enabled logical conclusions to be drawn. The data were collected through interviews, observations, and documentation studies.

The data were derived from two sources: primary and secondary data sources. Primary data sources were gathered through in-depth interviews with selected teachers from 15 Elementary Schools/*Madrassas* who engaged directly in educational activities (teaching-learning process). On the other hand, secondary data sources were classified into two categories: human and non-human. Human data sources served as the key respondents (key informants), while non-human data sources consisted of relevant documents related to the research focus. The selection of respondents in this study followed a purposive random sampling method, ensuring their eligibility and accuracy in addressing the research problems (Creswell, 2015).

The participants in this study consisted of teachers from 15 schools/*madrassas* located in five regencies, notably Kudus, Pati, Blora, Grobogan, and Rembang. They were purposively selected as research subjects. According to Sugiono (2015), Purposive sampling is a sampling technique with particular considerations to make the research data more representative (Sugiyono, 2015). A comprehensive review of secondary data was also conducted to support and strengthen the main findings. This review investigated the concept of Industrial Revolution 4.0 and the emergence of

Society 5.0 by examining several library materials, national education policy documents, research publications, and expert opinions. Triangulation was employed to ensure the validity of the data.

The data acquired through the three techniques were subsequently subjected to an inductive evaluation using a cycle model proposed by Miles and Huberman. This model encompasses data reduction, presentation, conclusion drawing, or verification (Sugiyono, 2015).

3.   Results and Discussion

3.1   *Society 4.0 and Society 5.0*

Society 5.0 is a concept that envisions a human-centered and technology-based society. In this era, society is expected to have the capacity to address social challenges and improve the quality of human life by employing various innovations from the Industrial Revolution 4.0. Society 5.0 was introduced in Japan and officially adopted by the Japanese government (cabinet) on January 21, 2019. Furthermore, it has become a significant industrial development strategy and an essential element of Japan's future investment strategy (Sasikirana & Herlambang, 2020).

The basic principle of the Society 5.0 concept is the utilization of digital technology-based scientific knowledge to meet and support human needs. It represents an advancement or additional benefits of the Industrial Revolution 4.0 concept, as both ideas share a common framework built upon internet-based digital technology. The primary distinction lies in their focal points, while the Industrial Revolution 4.0 aims to improve human life by implementing artificial intelligence (AI). On the other hand, Supersmart society emphasizes integrating modern technology while retaining humans as its central element. Consequently, this concept fosters technological advancements, which are, in turn, capable of minimizing societal gaps.

Society 5.0 represents a paradigm where virtual and physical space seamlessly integrate (real space) to bring forth transformative outcomes. In the preceding society 4.0, individuals accessed cloud services (databases) in cyberspace via the Internet to search. Retrieve, and analyze stored information or data. However, in society 5.0, an abundance of data generated by sensors in the physical world is collected and stored in cyberspace. This wealth of data, often referred to as big data, is then analyzed by artificial intelligence (AI) systems. The insights derived from this analysis are subsequently transmitted to humans in various forms within the physical realm.

Simply put, Society 4.0 refers to information gathering and analysis through networks, while Society 5.0 aspires to achieve optimal outcomes by connecting humans and systems in cyberspace with the assistance of AI. These outcomes are then translated into tangible benefits within the physical space (real world), adding significant value to industries and societies. This process encompasses various aspects of human life in the industrial sector, such as manufacturing processes, decision-making and prediction, marketing strategies, and so on (*Smart Manufacturing: 3 Teknologi Paling Penting Untuk Industri Manufaktur Era Society 5.0*, n.d.)

Japan's adoption of the Society 5.0 concept has resulted in remarkable advancements in people's well-being. The nation has experienced improved living standards and witnessed economic growth. Furthermore, the demand for energy and food has also escalated, accompanied by an extended life expectancy. Once faced with numerous societal challenges arising from economic globalization, including intense international competition and rising social disparities, Japan has found solutions in the face of digital transformation. Innovations like AI, IoT, robotics, machine learning, and data processing have played a pivotal role in facilitating human life. The Society 5.0 concept has contributed to increased production, reduced unemployment rates, sustainable industrialization, wealth redistribution, and reduced social inequality.

3.1.1 Teachers' Competence as Professional Educators

Teachers are professional educators whose primary responsibility is to educate, teach, guide, direct, train, assess, and evaluate students in formal education settings, including early childhood, elementary, and secondary education (Nurkholis, 2020). In essence, teachers are responsible for fostering the holistic development of their students, encompassing affective (sensitivity), cognitive (creativity), and psychomotor (kinesthetic) potentials (Pratama, 2019). In this globalization era, teachers face the challenge of effectively navigating and filtering abundant abstract and concrete information amidst rapid changes and the influx of data (Ismail et al., 2020). Embracing change is an essential requirement, and teachers must cultivate an adaptive mindset while acquiring the necessary competencies to address current needs and challenges. Although the concept of competence is not new, its significance has been recognized since the 1960s and early 1970s (Mitrani *et al.* 1992), primarily within the industrial context, closely tied to productivity. An organization's productivity heavily relies on individuals' motivation and competence in performing their tasks.

According to Szokol (2016), a teacher's personality can be evaluated across three main domains: a profoundly educational and professional foundation, axiological (value orientation), and praxeological (practical skills) (Szokol, 2016). The epistemological profiling of a teacher's personality involves a comprehensive educational and professional foundation. Axiological profiling focuses on the teacher's value orientation, encompassing the development of personality traits and competencies that promote self-exploration and emotional, intellectual, and moral improvement while adhering to ethical values. Praxeological profiling determines practical skills, encompassing the teacher's behavior, actions, and skills 'both inside and outside the classroom, as teachers are expected to serve as role models for their students (Szokol, 2016).

Armstrong (1994) defines competence as 'the behavioral dimensions of a role— an individual's required behavior in carrying out a task satisfactorily.' This notion is further supported by Armstrong and Murlis (2007), suggesting that competence comprises 'behavioral characteristics that differentiate high performers in a given role, such as achievement' (Armstrong & Murlis, 2007). Woodruffe (1992) describes competence as a set of behavioral patterns that individuals must possess to perform tasks and function competently in a position (Woodruffe, 1992). In a slightly different formulation, Mitrani et al. (1992) and Spencer and Spencer (1993) describe competence as 'an

individual's underlying characteristics that are causally related to the criteria of effective and superior performance in a particular task or situation' (Mitrani et al., 1992; Spencer Jr & Spencer, 1993). The phrase 'underlying characteristics' implies that competence is deeply rooted in an individual's inherent personality and manifests as predictable behavior in various situations and tasks. On the other hand, the phrase 'causally related' implies that competence influences behavior and performance.

Zwell (2000:25) categorizes competence into five groups; (1) task achievement, (2) relationship, (3) personal attributes, (4) managerial, dan (5) leadership (Zwell, 2000). Furthermore, Zwell mentions that an individual's skills or competencies are influenced by six factors, namely (1) belief and values, (2) skills, (3) experience, (4) personality, (5) motivation, and (6) emotional factors (self-confidence).

Teachers in Indonesia are expected to have four essential competencies, as normative-regulatory standards require. These competencies include professional, pedagogical, social, and personal competencies. According to Pardede (2019), applying these four competencies should consider national ideology, development goals, universal education concepts, global perspectives, and other relevant elements (Pardede, 2019). According to Yuningsih (2019), competence is the capacity to complete tasks or activities based on relevant capabilities and necessary work attitudes (Yuningsih & Ardianti, 2019). The concept of 'competence' encompasses various perspectives. One perspective defines competence as a set of intellectually responsible behavior that individuals must acquire to effectively fulfill their tasks in a specific field (Noor, 2019). Similarly, Wibowo (Ataunur & Ariyanto, 2015) suggests that competence is the capacity to perform duties or tasks based on skills, knowledge, and work attitudes required for task execution. Competence, In essence, represents the mastery of knowledge, skills, values, and attitudes that contribute to performance and is reflected in how individuals think and act following their professional roles (Runtu et al., 2015).

In general, competence can be seen from two perspectives. Firstly, in terms of organizational perspective, competence is defined as an organization's knowledge, expertise, and capacity that allow it to surpass competitors. The concept is oriented on the holistic and unified competence of the organization. Secondly, regarding the individual perspective, competence is characterized by traits observed in individuals with effective task performance (Kartika, 2014).

Spencer and Spencer (1993) categorize competence into five components: motives, traits, self-concept, knowledge, and skills. Reasons refer to an individual's consistent thought process before taking action. Traits represent the characteristics influencing an individual's behavior or response to specific stimuli. Self-concept pertains to an individual's attitudes and values, which are measured through tests to determine their values and motivations in task execution. Knowledge refers to an individual's understanding of a particular field. Skills are defined as the ability to physically or mentally carry out specific tasks (Spencer Jr & Spencer, 1993).

On a micro-scale, within the context of classroom instruction, teachers should be capable of teaching and designing assessment tools that comprehensively evaluate students' knowledge, skills, and character. These aspects must be explored, developed, and assessed throughout the learning process. Teachers should be able to create assessment reports that capture each student's unique qualities and achievements. These assessment reports serve as valuable feedback for parents and students, facilitating continuous improvement of students' academic performance (Wati & Kamila, 2019).

Referring to the description above, in the Industrial Revolution 4.0 and Society 5.0 era, teachers require competencies encompassing knowledge, skills, values, and attitudes reflected in their thinking and execution of tasks. Moreover, the most significant consideration for every teacher is their commitment to nationalism following the nation's ideology, development goals, universal education concept, and global life relevant to the challenges and developments of the era.

3.1.2 Teachers' Challenges in the Industrial Revolution 4.0 Era

To realize the vision and mission of national education –to educate the life of the nation– the Ministry of Education and Culture of the Republic of Indonesia has formulated a profile of educational outputs: intelligent and competitive Indonesians, as envisioned in the 2025 education vision. To achieve this vision, the 2013 curriculum is implemented, aiming to produce productive, creative, and innovative graduates with socio-emotional competence. This is achieved through the reinforcement of integrated attitudes, skills, and knowledge, including character-building (PPK), literacy skills, and 21st-century learning competencies (4Cs and HOTS). Therefore, teachers must proactively improve their professional competencies to tackle the challenges of the Industrial Revolution 4.0 and Society 5.0 eras (Nurkholis, 2020).

The Industrial Revolution 4.0, a paradigm-shifting era, has profoundly changed the global order. This era is characterized by the globalization of life processes and rapid advancements in science and technology, particularly in information and communication. As key educational actors, teachers encounter numerous challenges in this global era. These include the fast-paced and fundamental advancement of science and technology, moral crises threatening the nation, social upheavals, and national identity crises (Oviyanti, 2013).

As professionals, teachers must continuously develop their instructional and educational skills to navigate the evolving landscape of science and Technology. They face the more significant challenge of educating students to become excellent and high-quality human resources following the vision and objectives of national education. Furthermore, teachers should not be technologically illiterate, implying that they must acquire the skills to effectively leverage technology and facilitate learning (Sari, 2017). The major challenge for teachers in today's world is proactively addressing the consequences of rapid technological advancements and globalization. Technological developments do not only affect the scientific domain but also the individual's socio-culture domain. These changes significantly influence societal values, particularly among people with Eastern cultures and customs,

such as Indonesians. Observations indicate that technological advancements significantly impact the cultural values deeply ingrained in urban and rural Indonesian societies (Ismail et al., 2020).

Admittedly, our current educational system and practices have fallen short of many expectations, and it is acceptable to much criticism, particularly regarding human resource development. One prevailing issue is that contemporary formal education institutions often prioritize predefined curriculum achievement targets, leaving little room for critical thinking or reflection during the learning process. Furthermore, the lack of professionalism among teachers in implementing school-based learning has contributed to 'misconduct.' Professional teacher consistently prioritizes the successful transfer of knowledge, values, and skills, with their attitudes characterized by intellectual enthusiasm and proficiency in their profession. Thus, the role of a teacher should be seen as an integral part of advancing education and classroom instruction (Mudiono, 2017).

In recognizing the challenges faced by teachers in the Industrial Revolution 4.0 and Society 5.0 eras, it becomes clear that their responsibilities have become even more demanding compared to previous periods. Teachers must possess a deep understanding of the scientific materials taught while being technologically literate, creative, and innovative. As role models for millennial students, teachers play a crucial role in helping them comprehend the limitations of technology and prevent its misuse. The challenges persist because the millennial generation cannot be compelled to conform to traditional norms. In the modern era, teachers must remain open to new ideas and adapt their teaching methods following the times. Technology's existence should not be questioned if it adheres to established norms (Barni, 2019).

Based on this explanation, teachers in the Industrial Revolution 4.0 and Society 5.0 eras have a wide-ranging role and great responsibility in maintaining the paradigm shift necessary to foster excellence and competence in their students. It needs to be more to refer to teachers as professionals based solely on normative and regulatory status (National Education System Laws in 2003). Teaching requires expertise that only some people can carry out. Teachers are responsible for planning and implementing the learning process, assessing learning outcomes, providing guidance and training, and engaging in research and community services.

3.2   Teachers' Competences in Facing Challenges of the Industrial Revolution 4.0 Era

The rapid pace of technological advancements during the Industrial Revolution has profoundly impacted global society's patterns and lifestyles. The 21st century represents a period in which all human endeavors must strive for high quality. To develop high-quality individuals, experts must professionally manage educational institutions (Meisanti et al., 2020). Teacher plays a crucial role in the educational process as professionals who are well-prepared to perceive and shape the students' personality and develop their skills in educational activities (Ditrtova-Krhutova [2009] in Szokol [2016:27]) (Szokol, 2016). To efficiently address these challenges, teachers must possess expertise in their field, demonstrate exemplary pedagogical practices, possess a breadth of knowledge, and be culturally wise (Turek [2008] in Szokol [2016:27]) (Szokol, 2016). According to Kostrub (2008) in

Szokol (2016:27) (Szokol, 2016), a good teacher is thoroughly familiar with the curriculum, employs well-considered teaching approaches and methodologies, as well as recognizes the educational objectives that students and their learning processes should focus on. To meet the demands of human resources (intelligent and competitive) in the Industrial Revolution 4.0 and Society 5.0 eras, the Ministry of Education and Culture has formulated five competencies that students should acquire (Kementerian Pendidikan dan Kebudayaan RI, 2018)

3.2.1 Educational Competence

The use of the Internet as a learning resource has become a trend and a requirement in modern education and classroom instruction. Online learning, also known as internet-based learning models, has gained significant traction in various educational and training activities. Moreover, the integration of digital-based learning media, such as electronic learning materials, as interactive supplements has further propelled the development of creative and innovative learning approaches. One of them is electronic learning media, which can supplement more interactive learning media (Alsakrisna & Asto B, 2014). Teachers must recognize and adapt their traditional learning methods to digital approaches that are more applicable in meeting student needs. The patterns of converting conventional to digital-based techniques may vary depending on how teachers and educational institutions respond and adapt to these changes (Prayogi & Estetika, 2019).

Globalization and the digital era have triggered a significant paradigm shift in education. The modification comprises several key transformations: firstly, a change from a teacher-centered approach, where teachers primarily serve as sources of knowledge, to a student-centered approach, where teachers act as facilitators, guiding students' learning using various alternative resources (Lince, 2016). Secondly, traditional classroom-based learning, characterized by conventional approaches and styles, is evolving towards more flexible models such as distance learning. Thirdly, there is now a greater emphasis on the quality of education at an international level. Lastly, the boundaries between school-based and non-school-based education are becoming more flexible, aligning with the growing popularity of lifelong learning (Lince, 2016).

3.2.2 Competence in Technological Commercialization

Despite the sophistication and vastness of technology, a teacher's role in the classroom must be replaced by more sophisticated tools or machines. Teaching possesses unique skills that set it apart from other professions, particularly in duties and responsibilities closely related to the required qualifications and competencies (Syafii, 2016).

According to the National Educational Technology Standards (NETS) outlined in the Instructional Technology and Media for Learning, effective teachers can design, implement, and create a conducive learning environment that enhances students' abilities. Teachers should have the following standard skills: (1) fostering creativity and inspiration in students' learning journeys, (2) designing and developing digital media for interactive learning assessment, (3) employing digital media in academic and professional settings, (4) showing enthusiasm to nationalism and a strong

sense of responsibility in the digital era, and (5) improving professionalism and leadership skills continuously (Daryanto & Karim, 2017).

Teachers must have these abilities to seamlessly integrate new technologies into education and enhance the capacity of Indonesian human resources to contribute to various breakthroughs in the most recent innovations. The optimal use of internet information, improved accessibility, and optimized 'cyber-security' protection are required to compete in the Industrial Revolution 4.0. However, according to the Institute for Management Development (IMD) World Competitive Yearbook 2022, Indonesia's competitiveness ranking (in 2022) has dropped to 44th place from 37th in 2021, making its lowest position in the past five years, or since 2018. Indonesia's competitiveness was ranked 43rd in 2018, rising to 32nd in 2019. Indonesia's competitiveness fell to 40th in 2020 before rising to 37th in 2021 (Ulya, 2022). Compared to Malaysia, Singapore, and Thailand, Indonesia lags with Thailand at 32nd, Malaysia at 23rd, and Singapore at 3rd. According to Susanti (2019), education and learning methods are cited as contributing factors to Indonesia's CGI lower competitiveness in ASEAN countries, with deficiencies in higher education, science, and technology readiness and innovation and business sophistication (Susanti, 2019).

Every teacher should have the competence to tackle the challenges of the Industrial Revolution effectively 4.0 is the ability to instill a digital-based entrepreneurial mindset and foster student innovation. Teachers should also actively engage students in digital entrepreneurship to prepare them for the future. With the Internet's vast opportunities, students can quickly sell their innovative products regarding food, clothing, toys, or other items. Given the intensifying competition in the business landscape, teachers must consistently encourage and nurture students' innovative thinking (Meisanti et al., 2020).

3.2.3 Competence *in* Globalization

Teachers must be able to deal with diverse cultures, hybrid competencies, and problem-solving expertise. They must guide and develop students' life skills within a global context, including social, cultural, political, and economic dimensions. Teachers are responsible for equipping students with the necessary skills and knowledge to thrive in the current revolution 4.0 era (Nurkholis, 2020). As previously outlined, the data highlighting Indonesia's competitiveness challenges should serve as a catalyst for teachers to improve competence in this era of global competition.

3.2.4 Competence *in Future Strategies*

As agents of change, teachers must possess the foresight to predict future trends and formulate effective strategies. Anticipating and analyzing the challenges and requirements of the Industrial Revolution 4.0 and Society 5.0 eras is essential (Imania & Munawar, 2019). Failure to anticipate challenges and adapt accordingly may result in losing competitive momentum at regional, national, and global levels.

3.2.5 Counsellor Competence

Besides being educators, instructors, and trainers, teachers play a vital and strategic role as counselors. The parts become indispensable in assisting students with various learning difficulties, particularly those arising from the transformation of learning in the Industrial Revolution 4.0 era. The integration of digital technology in education poses future challenges in classroom instruction. Students may encounter issues ranging from difficulties in understanding subject materials to psychological challenges from the pressures of an increasingly complex and demanding environment. In such cases, the presence of teachers as counselors or psychologists is invaluable. As a scientific principle in psychology, teachers can provide guidance and solutions to address various learning problems students encounter.

According to Fitriyah (2019), several efforts can be made to develop teacher competencies to meet the demands of the Industrial Revolution 4.0 and Society 5.0 eras (Fitriyah, 2019). The efforts include:

(1) Optimizing professional organizations, such as *Kelompok Kerja Guru* (KKG or Teacher Working Group) and *Musyawarah Guru Mata Pelajaran* (MGMP/Subject Teacher Group Discussion). This initiative seeks to foster collaboration and promote teacher self-development. It involves conducting academic and training activities while applying the principles of prior learning. To facilitate this collaboration, the government, including the Education Office and other relevant authorities, can provide support by organizing training of trainers (ToT) for programs to disseminate innovative practices within local communities effectively.

(2) Improving teachers' professionalism in the long-term period through the PKB program (*Pengembangan Keprofesian Berkelanjutan* or Sustainable Professional Development). The PKB program aims to bridge the gap between teachers' current knowledge, skills, social competencies, and personality and the future demands of their profession. Teachers can carry out the PKB program consistently and continuously by actively participating in seminars, training, and workshops focusing on developing methods following the demands of the Industrial Revolution 4.0 and 5.0 Society eras. The dissemination of scientific research, publication of textbooks, and creation of innovative technology-based learning tools also significantly improve teacher competence. To promote the PKB program effectively, the government must ensure equitable distribution of functional training facilities, enabling teachers in remote areas to access these opportunities. Additionally, providing research grants and laboratory funding will foster the creation of learning innovations.

(3) Increasing the number of teacher discussion forums to improve personal and social competencies among its members. These forums provide a platform for teachers to actively engage in problem identification, solution finding, planning, implementing learning activities, and evaluating learning processes and outcomes. Such collaborative activities contribute to the professional competence of teachers.

(4) E-literacy support plays a vital role in facilitating initiatives to improve teacher competence. With e-literacy, teachers can access a wide range of information, analyze and process it effectively, and generate new knowledge. By leveraging e-literacy, teachers can enhance their understanding and insight to effectively navigate the challenges of the Industrial Revolution 4.0 and Society 5.0 eras (Fitriyah, 2019).

3.3   Challenges Implementing Digital Technology in Classroom Instruction

A valuable lesson from the Covid-19 pandemic is that we have further recognized our quality and readiness to use digital technology in education. Both social and physical distance as Covid-19 prevention mechanisms require direct interaction that cannot be carried out in person. This also applies to the field of education, where online learning is becoming one of the options. Offline learning, previously used, had to be replaced by online or distance learning. This shift caused several issues in the field of education.

Online learning has been mentioned as an obligation in line with digital and information technology advancement. It is claimed to be a practical and cost-effective learning process that can be done anywhere and does not require costly physical infrastructure, among other things. In this regard, teachers share the same perception of the importance and need for digital technology-based learning. However, online learning and the use of digital technology are more complex than they seem. For instance, distant places make teachers unable to interact directly with students and control the learning process. This makes learning ineffective since teaching materials are problematic in their delivery and comprehension.

After two years of implementing online learning, the school/*madrassa* organization has discovered several interesting points. Teachers must work hard each day to ensure students learn effectively despite various obstacles and limitations. There are many lessons to learn behind the multiple barriers found in online learning. Online learning prompts teachers to master learning technology, develop more diverse learning methods and models, and develop familiarity with today's learning media. Another vital lesson from adopting online learning is that digital facilities are distributed unfairly in several regions. Another identified gap is that only some students and teachers have the required digital resources or skills for online learning. Other data showed that 67% of teachers reported difficulty operating devices and using online learning platforms.

From the observations and interviews conducted with respondents at a number of purposefully selected schools/*madrassas*, there have been numerous challenges encountered by teachers, students, and parents in implementing the online teaching and learning process. In terms of their causal factors, these various obstacles can be divided into three categories: technological tools, learning methods, and human resources. The followings are some barriers contributing to low-quality online learning at the schools/*madrassas* that served as the research locus.

3.3.1 The Expensive Cost of Internet Access and Information Technology

Most students and teachers cannot participate in digital learning due to high costs and insufficient (smooth) internet connectivity. Funding has been a significant barrier for schools/*madrassas* and teachers in adopting online learning. Despite the government's efforts to provide free internet services, it has been unable to meet the demand due to various technical issues. Since the mobile data package system has yet to cover the leading platforms used by students and teachers, mobile data internet cannot be used effectively. Despite the government's efforts to improve internet connectivity, many students, such as computers or smartphones, need more facilities for online learning.

Limited devices for online learning have long been a problem in schools and *madrassas*. Students, in some cases, have to wait their turn with other family members to attend classes. This has undoubtedly made the learning process ineffective. Even though teachers only sometimes conduct online meetings in real-time, it is still considered disruptive to students' ability to complete assignments flexibly. Due to a lack of funds to purchase proper tools, the lower middle class has generally been subjected to these online learning barriers.

Another obstacle is a slow internet network which may only be available in certain areas. It affects the quality of online learning in certain areas or villages. They could previously teach and learn without the Internet, but the pandemic has forced them to find ways to connect to the Internet. Things worsen when students must attend classes in real time via video conferencing. To work effectively, such a learning model requires an internet network and the availability of adequate mobile data.

Regarding internet network availability, Indonesia ranks last among OECD (Organization of Economic Co-operation and Development) countries. Indonesia faces a difficult task in achieving equitable development. OECD is an inter-governmental organization whose mission is to establish a strong, clean, and fair global economy). In the implementation, OECD helps policymakers overcome several issues and current global issues and strive to identify policy solutions to acquire optimum advantages from globalization while responding to several challenges and solving economic, social, and good governance problems (Kemenkeu.go.id, 2020).

3.3.2 Adaptation Issues in Online Learning

Implementing online learning has been a challenge and a burden for students and teachers, particularly those who do not have supporting facilities. Meanwhile, parents require more assistance on how to manage 'learning from home.' Due to a lack of interaction between teachers and students, the teaching burden has shifted from teachers to students and their parents. The same happens to school teachers, who need more support and infrastructure, such as computers, laptops, and LCD projectors. Other obstacles are a lack of internet access, electricity, crowded buildings or classrooms, insufficient libraries, and a need for supporting books.

Another barrier is the existence of a generation gap related to teacher-student interaction. Most active teachers working these days were born before 2000 and are still struggling with digital literacy. At the same time, the students are primarily from the 21st-century generation, with various levels of digital literacy. Simply put, many students today are more digitally literate than their teachers. As yet, teachers from the New Order era were no longer those with versatility and high authority before students or society, according to Earl V. Pullias and James D Young's book entitled 'A Teacher is Many Things.' Teachers in the modern era, on the other hand, are those who can adapt and respond to changes. Digitally illiterate teachers will lose credibility before their students, allowing them to underestimate them. The solution is that even if teachers are from the 1990s or 1970s, their scientific capacity should be upgraded as time passes.

These impediments accumulate with teachers' inability to adapt to the changes, challenges, and learning demands required in the Industrial Revolution 4.0 and Society 5.0 era. This should not occur since the challenges and competition are no longer at the national level but at the global level.

3.3.3 Teachers' Inability to Conduct Direct Monitoring Toward Learning Process

Direct interaction is one of the keys to the learning process because there are actions and reactions between teachers and students. Although it is simple as it may seem, this interaction contributes to the effectiveness of the teaching and learning process. Teachers can provide students with solutions orally and instantly. At the same time, students can focus on the teacher's gestures, expressions, and explanations. In certain levels of education, online learning may remain applicable due to frequent independent learning. However, lack of interaction is an unavoidable barrier to online learning for kindergarten through high school students.

It must also be recognized that the shift in learning activities makes monitoring learning and students' learning outcomes difficult for teachers. This leads students' learning achievement to decline. Teachers are unable to monitor student learning progress due to limited digital skills. In some cases, students do not put forth their best effort when completing assignments, and they even cheat by using the Internet or asking family members for assistance. In fact, in some schools, students only gain knowledge from printed materials and regularly do exercises given by the teachers, resulting in one-way learning activities.

Due to the lack of direct interaction between students and teachers, teachers need help implementing learning activities and making evaluations and assessments on learning outcomes. In some cases, teachers resort to an 'emergency' and 'safe' solution by awarding high scores to nearly all students. In addition, all teachers being interviewed asserted that it was difficult to provide objective assessments. Online assignments and exams were done, and the results were deemed 'acceptable.' However, the validity of these results could have been better since the teachers were unsure whether the students themselves did the tasks or exercises.

3.3.4 Low Student Motivation to Actively Participate in Online Learning

Even though the idea of using digital technology in the field of education, particularly in classroom instruction, had existed for a long time when the national policy on online learning was adopted, all stakeholders (schools, teachers, students, and parents) were in a rush, and there was no indication of readiness. Learning means a face-to-face activity involving direct interaction between teachers and students. It means that our mindset has established, and has even developed a culture, that learning can only be manifested through face-to-face meetings between teachers and students in spaces or places specifically designed for learning. There is even a belief that students and teachers need to interact in person (face-to-face) so the learning process will benefit the students. Some even go so far as to say that learning without a teacher is equivalent to learning from the devil.

Online learning is a new thing that must now be fully implemented. This insight and belief leave the parties, particularly students, unprepared. In some cases, students must learn independently and without being directly monitored by the teacher. The lack of a teacher as a guide and motivator in the learning process gives students a sense of 'freedom.' As a result of this situation, students' motivation to adapt to online learning models is low. In general, the online teaching and learning process leads the learning process to be non-interactive. Many students need clarification about a particular subject but find it challenging to approach the teacher. It occasionally occurs because teachers only convey materials in one direction and do not allow students to ask questions.

In some cases, due to various limitations (students, teachers, schools), teachers frequently do not conduct video conferences and instead provide students with written materials and explanatory videos. This situation makes it difficult for students to understand and ask teachers questions about specific materials. As a result, students find the teaching and learning process ineffective and uninteresting.

Based on the UNICEF report entitled 'Situational Analysis on Digital Learning Landscape in Indonesia,' students' motivation to study independently during online learning still needs to improve. They are less severe about education because there is no physical school space and no teachers monitoring the learning process. Students have preferred playing with or watching entertainment content on digital devices rather than using them for learning. Students also need help to actively participate in learning activities due to various factors, including unsupported home conditions, limited internet access and online learning resources, and the burden of parents assisting with homework.

3.3.5 Lack of Curriculum Design Supports in Digital-Based Education

The curriculum for the learning process is prescriptive, meaning that what is formulated in the curriculum becomes a reference in practice. There needs to be standardization or accountability for using technology in education. The curriculum and learning process has yet to be compelled to use ICT thoroughly. The application of ICT should be mentioned in evaluating the student learning process. Schools should provide teachers with digital-based education to establish digitalization in

education. Schools/*madrassas* can implement computer-based teaching and learning activities by providing teachers with education or training to ensure that teaching and learning activities run smoothly. This can start with using ICT for various educational and learning activities.

3.3.6 Distraction during Learning from Home

It is undeniable that learning from home leads to the extent of distraction. All activities at school are undoubtedly related to the teaching and learning process, allowing each component to focus on the other. As classroom instruction is moved to home-based learning, things change. Distractions can arise from the surrounding environment, television, or loud noises. Thus, the significant distinction between learning at school or on campus and learning from home is the level of distraction encountered by students. When students study in a classroom, the environment is designed to support the learning process and ensure it runs smoothly. It is different from learning from home, instead. Students need an identical home environment to support their learning. Many students need access to a study room with a quiet, comfortable, enough light setting. Furthermore, home-based learning activities frequently result in many distractions for students. These diverse distractions range from noise to various distractions that cause students to lose focus on learning.

Another factor that makes studying from home difficult is the disparity in socio-economic status and educational level of parents/family members. Besides the need for adequate tools, mobile data packages are a socio-economic barrier to smooth online learning. Students should have access to the Internet while learning from home. However, only some families can afford the relatively expensive mobile data packages. Furthermore, portable data package prices differ from one area to another.

4.   Conclusion

The globalization era has brought about rapid advancements and sophisticated information technology, fundamentally reshaping every aspect of our lives. Inevitably. These societal changes have a profound impact on the educational process. Claiming that education exists 'from and for change is not an exaggeration.' Educational institutions, as an organization dedicated to developing human resources, must proactively address the demands and needs of society for a more comfortable future. Education graduates must be prepared to meet the challenges and conditions of the 21st century. Therefore, teachers must comprehensively understand what they need to master and how they should adapt their teaching practices to meet the evolving societal needs from an academic perspective. However, the educational issue is multi-dimensional. Educational activities constitute various learning and teaching processes involving stakeholders and components often presenting conflicting views. This intricate nature often leads to the persistence of unresolved educational issues. This complexity is understandable as many individuals rely on education as a livelihood, resulting in various parties claiming authority in managing and discussing academic matters.

While teachers, as education practitioners, may possess a good perception of the changes and challenges posed by the Industrial Revolution 4.0 and Society 5.0 eras, several barriers hinder their

practical implementation in practice. These challenges are not solely attributed to the shortcomings of individual teachers but rather reflect systemic issues within the educational system. It implies that many components (sub-systems), including non-educational factors, exert influence and determine the outcomes of the education system as a whole. These barriers can be broadly categorized into three main areas: technological tools, learning methods, and human resources. The followings are several barriers that contribute to low-quality outcomes: (1) high costs associated with internet access and information technology, (2) adaptation issues on online learning, (3) Teacher's inability to conduct direct monitoring during the learning process, (4) low student motivation to actively engage in online learning, (5) lack of curriculum design supports for digitalization-based education, and (6) distractions during home-based learning environments.

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