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The Role of Primary Teacher in the Midst of the Opportunities and Challenges Faced in the Fourth Industrial Revolution

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Abstract
The Fourth Industrial Revolution (4IR) has generated significant transformations in education, creating both opportunities and challenges for primary school teachers. While prior studies emphasize the teacher's role as a learning facilitator in this digital era, empirical realities show that many teachers still struggle to understand the broader educational context of 4IR and to reposition their professional roles accordingly. This study aims to explore the opportunities and challenges experienced by primary school teachers during the 4IR, particularly in relation to the use of the Internet, and to identify how teachers' roles are evolving in response to these changes. The findings indicate that the 4IR offers substantial opportunities, including expanded access to knowledge, diverse digital learning resources, and more innovative instructional methods. Technology integration also enables learning to become more interactive, flexible, engaging, and meaningful for students. However, teachers face persistent challenges such as limited infrastructure and technological facilities, variations in students' characteristics and digital readiness, and difficulties in adapting to rapidly developing technologies. These obstacles often hinder the effective implementation of digital learning practices. The study further reveals that the role of primary school teachers in the 4IR extends beyond being mere facilitators. Teachers are expected to act as mentors who guide students' learning processes, classroom managers who create conducive digital learning environments, motivators who encourage active participation, and evaluators who assess both learning outcomes and digital competencies. Future researchers are encouraged to conduct more in-depth investigations focusing on specific competencies, institutional support systems, and sustainable professional development models to better prepare teachers for continuous educational transformation in the digital age.

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Introduction

Humans are now living in the era of the industrial revolution 4.0, which is characterized by the widespread use of the internet, cheaper and smaller but more sophisticated sensors, and the development of artificial intelligence (Schwab, 2016). The fourth industrial revolution occurred because it was pioneered by one of the technologies that humans are familiar with today, specifically the internet (Savitri, 2019). This is in line with Schwab's (2016), which states that the fourth industrial revolution is a transformation in human life caused by the integration of technology, such as the internet. The internet has the ability to connect many individuals to the cyber network, increasing efficiency in business and organization while also helping regenerate the natural environment through better asset management (Savitri, 2019). The impact of the internet can be seen very clearly at this point: everyone who is connected to the internet will then be connected to each other through social media.

The impact of the industrial revolution 4.0 on the field of education, particularly with the development of the internet, is that teachers in the era of the industrial revolution 4.0 have the opportunity to obtain various sources, such as images, videos, and other learning materials that can support the learning process; even now, there are various websites that assist teachers' academic and non-academic administration (Widiasworo, 2019). The internet facilitates all learning by providing an opportunity for teachers and students to access sources or learning materials such as e-books, videos, and images. Not only that, but the integration of the internet into the world of education allows for e-learning, remote learning, the creation of a digital library system, access to online journals, e-mail, and data storage via cloud computing (Setiawan, 2018).

Putri et al. (2018) also stated that the internet has educational benefits, specifically as a learning resource, making it easier for students and teachers to get resources that help the learning process. Teachers must use a variety of learning approaches to keep students motivated in learning (Kusmaryono & Setiawati, 2013, p.140). In line with this, Widiasworo (2019) stated that teachers can use the internet to access a variety of learning tools or materials, as well as share their knowledge or views. As a result, teachers have a greater possibility in the period of the Industrial Revolution 4.0, particularly with the Internet, to manage academic and non-academic administrative data, as well as to access learning tools or materials.

While the Fourth Industrial Revolution brought many opportunities and benefits to the human life, however, there are also many challenges that should be addressed immediately. Shahroom and Hussin (2018, p. 318) identified some of the changes that have occurred in the era of the industrial revolution 4.0 causing challenges at this time, including: 1) changes in work trends, where jobs that exist today may no longer exist in the future; 2) changes in technology, where various new digital technologies have emerged; and 3) changes in students' attitudes and behaviors.

On top of that, the disparity of internet access among the region of the country particularly in Indonesia should be taken more seriously. A survey conducted by the Asosiasi Penyelenggara Jasa Internet Indonesia (Association of Internet Service Providers in Indonesia) reported that internet penetration in Indonesia reached 78.2% of the total population in 2023 (Aminudin et al., 2025), with Java Island accounting for the largest proportion of gadget users

at 71% (Anggraini et al., 2025), meanwhile data from the Central Statistics Agency of Central Java indicate that internet usage in Semarang remains relatively low, at only 5.01% (Central Statistics Agency of Central Java, 2021; Wahid & Rini, 2024). This data shows that the integration of internet in Semarang society was low compared to the percentage of internet usage nationwide. Furthermore, low internet usage limits people's access to informational resources. In education, a lack of internet access can negatively impact students' academic performance, as those with internet access tend to achieve better results (Amponsah et al., 2022).

Dwiningrum (2018) stated that another issue in the field of education is that the existence of a generation gap between the student and teacher generations, as well as the development of rapidly shifting technological developments that change the way students learn. This makes the teachers struggle to cope with the students who are digital natives (Afrianto, 2018). Digital natives, also known as Generation Z and Alpha, have grown up with and use digital technology (Kivunja, 2014). According to Widiasworo 2019, this issue could happen because there are still many teachers who are digital immigrants who come from the baby boomer generation and generation X still trying to adapt and look for the best approach and resources that can be used to teach the students hence, the teachers struggle to catch up with the students, while the students struggle to engage in the learning.

Especially, for primary students who are now living in the midst of technological advancements, such as gadgets and the internet, primary teachers should make extra efforts to find the best approach and method that suits their learning styles. While digital technology can offer advantages in developing students' cognitive skills, such as problem-solving and creativity, through interactive applications, the excessive and uncontrolled use of digital technology will most likely lead to decreased concentration and emotional regulation, alongside a reduction in communication skills (Salman et al., 2024). Therefore, the role of the teacher in this era is crucial, particularly in collaborating with parents to guide young learners in effectively leveraging the internet and other digital technologies.

According to Minsih & D (2018) and Khairunnisa (2017), the role the teachers in the learning activity are 1) as an educator who is able to be a role model and have good values and morality, 2) as a motivator who can encourage students' enthusiasm to participate in learning, provide explanations to students about what they will gain from the learning they learn, and provide them rewards or honors, 3) as a facilitator who can facilitate the learning resources and media that can support the students to achieve the learning objectives. 4) as a demonstrator who is able to give example or lead the demonstration during the learning process whether by using learning media or not. 5) as an instructor who direct a lesson of learning as well as deal with or overcome any obstacles or challenges that arise during the learning process.

In this era of the fourth industrial revolution, the role of teachers is no longer central to learning or teacher-centered, but rather student-centered, with teachers serving as facilitators for the provision of students' learning needs in their efforts to carry out learning by preparing learning resources and media that are intended not only for students nearby but also for those who are physically distance (Surani, 2019). However, Sadriani, Ahmad, and Arifin (2023) stated that teachers in the digital era have several qualities, including the fact that they serve not just as facilitators but also as motivators and inspirations for their students. Furthermore, during

the learning process, teachers must be able to also cultivate excellent values and consistently develop the character of their students (Sapitri, Sahwal, Satifah, & Takziyah, 2023). As a result, the researcher's focus in this study is on 1) understanding the role of primary teachers in the fourth industrial revolution era, as well as 2) identifying the opportunities and challenges that primary teachers face because of the fourth industrial revolution.

Method

In this research the researcher used the qualitative method which is suitable to address the research problem in which needed more exploration on the phenomenon that happened (Creswell, 2012). The research problems to be answered in this research are 1) to understand the role of primary teachers in the fourth industrial revolution era, as well as 2) to identify the opportunities and challenges that primary teachers face because of the fourth industrial revolution. The researcher took the data from the research instruments such as observation reports and reflections after observing some teachers teaching. The researcher observed 3 different teachers in grade and subject. One teacher from grade 2, another teacher from grade 4, and the other one was teaching grade 6. Another instrument used by the researcher to collect data was teaching reflection, along with the mentor's feedback. The teaching reflection was a teacher's reflection after the teaching and learning, while the mentor's feedback was an evaluation made by a chosen experienced teacher who gave effective and reliable data regarding the students' performance during the researcher's teaching and implementation of the teaching approach and methodology, particularly in the use of technology-related tools such as the internet and digital platforms. In addition, the researcher collected the data through an online questionnaire that was filled out by 13 teachers who were teaching at a private school in Semarang, Central Java. From the observation report and reflection, teaching reflection, mentor's feedback, and online questionnaire, the researcher could find the opportunities and challenges that the teachers face in the fourth industrial revolution, particularly in one of the private schools in Semarang, along with its suitable role in this era. On top of that, the researcher used data triagulation as data analysis techniques, where the researcher used mutiple sources of information to examine findings and ensure the accuracy and credibility of the data (Creswell, 2012). Furthermore, the researcher used theories triangulation, which supports the use of several theoretical schemes that provide for an analysis of an occurrence (Noble & Heale, 2019) and comparisons to the literature to determine how the findings support or contradict past studies or viewpoints (Creswell, 2012).

Results and Discussion

Results

The findings of this study show that teachers in primary schools in the fourth industrial revolution era can get three major benefits from technology integration in education. One of the most significant aspects is that, with the rapid development of digital technology in the fourth industrial revolution era, such as the internet, teachers now have an abundance of learning resources that are highly beneficial to the learning process, regardless of the topic and approach that is desired. In addition, teachers are receiving additional assistance with administrative tasks such as lesson planning, grading, evaluation, and classroom decoration.

Furthermore, because there are so numerous educational materials available on the internet, teachers could create teaching and learning to be more interesting and interactive, which leads to students being more engaged in the lesson and following it enthusiastically. For example, when teachers incorporate audiovisual features (video) into learning through YouTube, students can visualize the teachers' explanations and are more engaged in asking questions or sharing ideas.

While the fourth industrial revolution era provides opportunities for primary teachers, data collected through a questionnaire and field observations indicate that primary teachers face challenges that must be addressed promptly, such as inadequate facilities or infrastructure, specifically a lack of internet access for teachers, as well as limitations in device compatibility, in this case, computers or laptops. Furthermore, considering the rapid development of technology lately, the data reveal that there is a digital literacy gap between the teachers and students. The teachers are struggling to adapt, as the majority of teachers are digital immigrants from generations X and Y. This also makes the teachers have difficulties dealing with the students who are now from generations Z and Alpha, who have different characteristics and learning styles.

Moreover, the study documents that the primary teachers at the private primary school in Semarang, where the study is conducted, demonstrate the variety of teacher roles, such as serving as facilitator, motivator, mentor, classroom manager, evaluator, advisor, demonstrator, and educator. These data indicate that the teachers' roles nowadays are beyond teaching and facilitating the students to achieve the learning goals, but there are various roles that the teachers have.

Discussion

Based on the three main resources of data collected by the researcher, there are three main opportunities that the primary school teachers would have with the integration of technology, particularly internet in the learning activity. First of all, with the technology integration in Education, the primary teachers are able to find lots of learning resources and materials that are widely spread on the internet. Surani (2019) stated that various technological developments, especially the internet, make it easier for teachers to handle students' academic and non-academic administrative data, and this technology, even more importantly, supports teachers in the teaching and learning process.

Table 1. Opportunities that Teachers Have

Questionnaire	Teaching and Observation Reflections	Mentor Evaluation
The Internet is an instrument to get learning resources or materials.	Students are exhibited high levels of affective engagement such as active to share their thoughts, answer questions and ask inquiries while the teacher used photos and videos from the internet.	Learning went enthusiastically, interestingly, and smoothly

Secondly, the students' engagement during the lesson could increase significantly, such as the students are being more attentive and active to share their thoughts and ask questions while the teacher was using the photos and videos from the internet. This is in line with Recard

et al. (2019), who stated that the digital learning platform, such as YouTube, can boost students' motivation or desire to learn. This can be seen clearly when the teacher used the videos or pictures taken from the internet; the students were triggered to actively participate in the lesson. As the primary school students have limitations in their attention span (Asprilia et al., 2020), the integration of digital platforms that could provide interactive videos and pictures will be very helpful to keep the students engaged in learning.

Furthermore, the data from mentor evaluation or feedback clearly stated that the lesson ran enthusiastically, interestingly, and smoothly. This was definitely true with the interesting media and resources that the teacher could provide; it will help them to create enthusiastic, interesting, and smooth lessons. Furthermore, as the resources of the lesson could be more easily obtained through the internet, it also increases the learning desire of the learner, hence the learning objective will be more achievable (Putri et al., 2018, p. 7).

On the other hand, in the period of the Fourth Industrial Revolution, particularly in terms of the internet, there are numerous challenges, particularly in the field of education. According to questionnaire data collected from teachers at a primary school in Semarang, the challenges encountered by teachers in the era of the fourth industrial revolution are 1) inadequate facilities or infrastructure, 2) difficulties in adapting to technology at this time, and 3) students' different personalities and learning styles. This is nearly identical to the findings of Razak et al. (2018), who found that the challenges teachers face in applying technology in the era of the Fourth Industrial Revolution are 1) outdated infrastructure, 2) a lack of skills, training, and experience in technology, particularly the internet, and 3) the use of traditional methods.

Table 2. Challenges Faced by Teachers Based on the Questionnaire

	Based on Questionnaire
1	Inadequate facilities or infrastructure
2	Difficulties in technological adaptation
3	Students have different personalities or learning styles.

Facilities and infrastructure are two factors that can help towards optimal learning as they relate to the equipment used to assist the teaching and learning process, such as teaching aids and learning media (Nasrudin & Maryadi, 2018). This is possible because facilities or infrastructure are educational components that must work in line with other components such as goals, teachers, students, curriculum, and the environment (Kurniawan, 2017). Additionally, based on the data from the researcher's direct observations at school, the problems with facilities and infrastructure discovered are a lack of internet connection and a shortage of internet-capable equipment, such as computers or personal computers. Some classes in a primary school in Semarang remain without computers, and internet access has not been extended across the entire school. As a result, teachers and students may face difficulties in using the internet for educational purposes.

The difficulty of adjusting to technology is closely related to the difference in teaching methods of digital immigrant teachers who, at a fairly advanced age, are new to the internet and must then deal with the learning styles of students who are digital natives who have known the

internet since birth, or, simply said, there is a digital literacy gap between the teachers and the students (Wahyudi, 2019). According to the questionnaire results, seven of the thirteen teachers in a primary school in Semarang were from generation X (born between 1961 and 1980) and six from generation Y (born between 1981 and 1994). Meanwhile, primary school teachers are currently dealing with digital natives from Generation Z (born between 1995 and 2010) and the Alpha Generation (born between 2010 and above), who were born during a period of rapid technological development, particularly the internet (Widiasworo, 2019).

In the era of the industrial revolution 4.0, teachers will face students who are already very familiar with the use of technology, especially the internet, as well as students who can learn better with a technology-based learning environment (Ghavifekr & Rosdy, 2015). Teachers who struggle with technology or on the internet will likewise struggle to understand how students learn in the era of the fourth industrial revolution, which demands the internet. Meanwhile, "the fluent use of advanced technologies allows teachers to model themselves as lifelong learners, therefore motivating students' learning" (Peng, 2023).

Jukes, McCain, and Crockett (2010, p. 35), outline some of the disparities between how digital native children learn and how most teachers (digital immigrants) respond to or educate them, as follows.

Table 3. Differences in Student Learning Techniques and Teacher Teaching Methods

Students	Teachers
Prefer to receive information quickly from various media.	Prefer to be slow and limited by the release of information from a limited source.
Prefer to work on images, sounds, colors, and videos first rather than text.	Prefer to provide text in advance rather than images, sounds, colors, and videos.
Prefer to learn things that are relevant, useful, active, and fun.	Teaching memorizing through test preparation.
Prefer to access the media randomly to obtain information.	Provide information in a linear, logical, and sequential form.

Source: (Jukes et al., 2010)

According to Hariharasudan and Kot (2018), one of the reasons for this disparity is a lack of training, expertise, and digital culture. Razak, Alakrash, and Sahboun (2018) discovered that teachers were unprepared to use technology in the era of the fourth industrial revolution due to a lack of skills, knowledge, and training in the use of digital technology, as well as the need for various new learning facilities such as computer technology, internet connection devices, and good internet servers.

Jukes et al. (2010) recommend several solutions to help teachers, particularly those with a background as digital immigrants, adjust to their students' learning styles, including: 1) Teachers must be willing to adapt by making time to learn the latest technology, particularly the internet, and commit to using it in their daily lives, and 2) teachers must learn about various types of new basic skills that are appropriate for the 21st century. 3) Teachers must also allow kids to seek for material on the internet. 4) Teachers must help pupils develop their

collaboration skills, particularly while completing assignments. 5) Teachers must convey information visually. 6) Teachers must reconsider how they evaluate or assess pupils' work or accomplishments.

Teachers are the initiators of education; how can students have a great spark if the teacher is unable to correctly spark the fire of learning within them (Sumardianta & AW, 2018). As a result, teachers are now expected to acquire and get familiar with the use of technology, including hardware and software, as well as the internet, in order to effectively carry out each work and obligation, as well as their role in the learning process (Widiasworo, 2019).

According to K. A. Anggraeni and Yusnita (2017), the main role of teachers in the 21st century is to facilitate student-centered learning and to encourage students to think critically, be creative, and independent. This is also supported by Fisk (2017), who said that the trend in the era of the fourth industrial revolution is for students to become more independent, leading teachers to take on the role of facilitators, guiding students throughout the learning process (Hussin, 2018).

Table 4. Primary Teachers Role

Observation Result	Teaching and Observation Reflection	Mentor's Feedback
Teachers serve as facilitators, motivators, mentor, classroom manager, and evaluators.	Teachers serve multiple roles, including facilitators, educators, classroom manager, mentor, and demonstrators.	Teachers serve as motivators, facilitators, mentor, evaluators, classroom manager, and advisors.

Based on data from the observation results of the research conducted one of the primary schools in Semarang. In the learning process, teachers not only play the role as facilitators but also play a variety of functions during the learning process, including class managers, motivators, supervisors, and facilitators. Data from teaching and observation reflection indicate that primary teachers play a variety of roles in the learning process, including facilitators, educators, classroom managers, guides, demonstrators, and others.

In addition, the data from mentor's feedback or evalution also shows that as prospective primary teachers, student teachers are required to fulfill aspects such as: 1) attracting students' attention, 2) conveying learning objectives to students (cognitive, affective, and motor), 3) motivating students, 4) ensuring the level of student understanding 5) Providing diverse and effective techniques, 6) providing direction to students, 7) utilizing learning media, 8) managing courses (student time and discipline), 9) giving advise, 10) understanding the content given, and 11) integrating spiritual values.

Based on all of the information demonstrated previously, it is possible to conclude that teachers perform a variety of roles during the learning process, in besides acting as facilitators. If it is said that teachers in the era of the fourth industrial revolution play the role of facilitators, teachers are only tasked with providing various types of facilities in the form of environments, motivations, problems, and activities to allow students to develop and produce their own understanding of the concepts or theories taught, and they will only provide guidance if

necessary. Furthermore, if teachers merely serve as facilitators, they will be focused on just students' knowledge and skills. This contradicts the definition of education, which is "a conscious and planned effort to create an atmosphere of the teaching and learning process so that students actively develop their potential to have religious spiritual strength, self-control, personality, intelligence, noble morals, and the needs needed by themselves, society, nation, and state" (Kurniaman & Noviana, 2017).

Therefore, the role of teachers in the fourth industrial revolution is beyond just as facilitator but it plays variety of role which could be as facilitator, mentor, classroom manager, motivator, and evaluator. As a facilitator, the teacher must be able to facilitate all factors necessary for achieving the learning objectives, including psychological aspects (Sapitri et al., 2023). As a mentor, a teacher can guide students on their journeys of intellectual, mental, emotional, moral, and even spiritual development (Khairunissa, 2017). "As classroom manager, the teacher plays a role in observing, planning, settling, directing, judicature, and giving fit treatment" (Oratmangun, 2020, p. 166). As a motivator, teachers encourage students to follow instructions to achieve successful learning outcomes (Rahmayanti, 2016, p. 215). As an evaluator, the teacher is responsible for evaluating and nurturing students' development in order to improve their competency.

Conclusion

Based on the study and discussion above, it can be concluded that the opportunities that primary school teachers have in the era of the industrial revolution 4.0, especially in terms of the internet, are as follows: 1) easier to manage various academic and non-academic administrative data of students, 2) easy access to images, videos, and supporting learning materials can be easily reached, 3) student response in participating in the teaching and learning process is happy, enthusiastic, and active, 4) learning can be more interesting, smooth, active, enthusiastic, and fun. Primary school teachers face the following obstacles in the era of the Fourth Industrial Revolution, particularly in terms of the internet: 1) limited facilities or infrastructure, 2) difficulty in adapting to technology at this time, and 3) students' diverse personalities or learning styles. In the fourth industrial revolution, primary school teachers play a variety of roles, including facilitator, mentor, classroom manager, motivator, and evaluator. During this study, several limitations should be considered by future researchers. One limitation was the short timeframe, as only about 1.5 months were allotted for the research. With more time, the data collected could have been more varied and robust. Additionally, the questionnaire included just over 70% of the teachers at the school. Including a larger percentage of participants would allow for more comprehensive and accurate mapping of the school's condition

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Authors' Note

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