

Literature Review: Teacher Innovativeness in Learning in the Digital Era

Efri Gresinta^{1*}, Martinus Tukiran²

¹Universitas Indraprasta PGRI, Jakarta, Indonesia

²Universitas Pakuan, Bogor, Indonesia

*Corresponding Author: gresintaefri@gmail.com

Abstract — Teachers play an important role in education because the teacher's character determines educational progress. To implement this, teacher innovation is needed which has a positive impact on the quality of education in learning in the digital era. This research is a qualitative descriptive study using the Systematic Literature Review (SLR) method, the aim is to analyze teacher innovation in learning in the digital era. In this research, the author uses literature sources that are relevant to the research such as articles, journals and documents. The results of the review of several articles show that teachers carry out various innovations in learning, namely by implementing a Smart Learning Project using digital-based applications and platforms, implementing games-based learning education or DGBL (Digital Games Based Learning) which can increase learning motivation. Students, teachers can manage the class well, and the material and assignments are more challenging and varied. Teachers who have good self-confidence in using digital technology report that students' cognitive abilities become more active and the material presented becomes more interesting.

Keywords — Teachers, Innovativeness, Digital Era.

I. INTRODUCTION

Technological developments must be balanced with skilled human resources. Empowering people with the right skills in the digital era can be key to contributing to their country's economic, social and cultural life now and in the future. We are entering the era of the industrial revolution, where technological developments are advancing very rapidly as the gateway to the arrival of the industrial revolution 4.0 (Reflianto, 2018). The era of the Industrial Revolution changed thinking and perspectives on education, as learning occurred where the use of technology was more widely used (Rahman, 2019). Therefore, teachers must be able to optimize learning with all existing changes. Providing new information and training to teachers is one way to ensure teachers are ready to keep up with ongoing changes. This is in line with research findings that education and exposure to the use of technology can create an academic atmosphere for the Industrial Revolution 4.0 (Setiawan et al., 2019). The ever-evolving nature of the digital economy requires society to adapt quickly to changes in demand for skills and technology. Apart from that, teachers must also be collaborative, cooperative, creative, brave to take risks and apply learning holistically so that learning continues optimally and remains student-centered (Rahman, 2019).

The development of digital technology in the education sector must also be supported by all areas of education, namely the government, school principals, teachers and the community. Both principals and teachers must follow educational policies. If the facilities and infrastructure support learning, then the next most important part is human resources, namely teachers. Teachers are the pillars of successful learning. In presenting it, teachers should use different media/methods/strategies so that students don't get bored. Apart from that, teachers must also be able to provide innovation to students so that students are more motivated to learn. Teachers can develop varied but still educational learning content with digital technology. Digital learning can be integrated with other learning by creating technology-based content such as games, competitions and other learning content. Learning is not only done at close range, but can also be done remotely via virtual video conference or online learning. Therefore, creating digital learning content must be in line with what teachers do. This is in line with research conducted by Surani that opportunities for using technology in educational institutions can facilitate the teaching and learning process and other non-academic activities such as management, thereby improving the quality of learning (Surani et al., 2019).

The main problem is the difficulty of developing practice-related knowledge. A teacher's practice and desire to learn and follow existing developments is the key to creating effective and efficient learning (Purnasari and Sadewo, 2020). Therefore, teachers must have the will to continue learning, especially regarding the use of technology in learning. Information and communication technology (ICT) is a source of innovation in the

education system, because it provides various new tools and instruments that can change the technological, organizational and institutional foundations. The use of technology in learning has been widely researched. As has been explained, technological developments are also related to innovation in the world of education. Because, currently we live in the era of the Industrial Revolution, where technology plays an important role in all fields, including in the field of education. Based on this, researchers want to conduct a literature study regarding teacher innovation in learning in the Digital Era.

Teacher Innovativeness

The main focus of Indonesian education is the quality of education. One of the reference values for educational quality is the PISA (Program for International Student Assessment) program. The purpose of the PISA measurement is to evaluate the education system by measuring student performance in secondary education, which is divided into three main areas, namely mathematics, science and literacy. During 2015, PISA results ranked Indonesia 62nd out of 72 countries. In 2018, Indonesia was ranked 70th out of 78 countries surveyed. Indonesia is far behind other Southeast Asian countries such as Singapore (2nd), Malaysia (48th), Brunei Darussalam (50th), and Thailand (55th) (OECD, 2020). If you look at the Global Innovation Index (GII) Innovativeness map published by the World International Property Organization (WIPO), in 2019 Indonesia was ranked 85th out of 129 countries, and in 2020 it was ranked 85th out of 131 countries. and in 2021 it was ranked 87th out of 132 countries surveyed. Indonesia is still far behind Singapore (8), Malaysia (36), Thailand (43), Vietnam (44), and the Philippines (51) (<https://www.wipo.int>).

The ranking data above is a reflective example of how the quality of education can be improved by looking at the metrics used in evaluation. Based on this, the Ministry of Education and Culture is trying to reform national education through an independent study program, one of the essence of which is to provide freedom for each educational unit to carry out reforms. Education does not only pursue skills as in the PISA indicators, but also creates a system that prioritizes innovation. Innovativeness is an activity carried out by someone in changing new ideas or modifying existing ideas into new products, processes and services so that they can be applied to provide benefits (Setyaningsih, 2018). Innovativeness is an action in creating new ideas and implementing them into new products/services that have practical uses and have an impact on organizational progress (Widowati, 2020). Innovativeness involves tangible steps to implement creative ideas into products, services or processes that provide added value (Meilitia, 2023). Innovative behavior is something directed by a person in order to increase effectiveness as a form of contribution to achieving organizational goals: finding creative ideas, promoting ideas, seeking support, and implementing ideas. (Margana et al., 2019).

Learning in Digital Era

One of the innovations in the world of education is the use of digital technology. The introduction of new technology in schools is absolutely necessary, but it must also be adapted to the characteristics of educational students (Blândul, 2015). In several countries, ICT education has been included in every school and curriculum. Among them is Sweden. In Sweden, ICT education is integrated into the curriculum as a learning outcome. Another example is the United States, during the Obama administration it launched the Computer Science for All Initiative to provide opportunities for students throughout the country to study computer science at school. Then Norway is among the highest internet users in all countries. The country launched a two-year national program aimed at reducing the number of citizens unfamiliar with digital technology. The program is run by the Ministry of Local Government and Modernization and collaborates with the ICT industry. The use of digital technology can be seen in the implementation of smart learning, smart classrooms that use Google Classroom. Another thing can be seen in the implementation of adaptive learning using Google Meet and Zoom meetings. This digital era learning has great potential to improve education by reducing the learning gap for students with different socio-economic backgrounds (Fleaca & Stanciu, 2019).

Education with digital technology cannot be separated, because education without digital technology does not experience novelty, and educational practitioners do not experience information developments or novelty in the educational process. Quoted from the opinion of Picatoste et al. (2018, p. 12) that digital technology education is a key factor in helping all levels of society, including education actors, in facing the 4.0 revolution. From this opinion, how important digital technology education is for all levels of society in facing the challenges of increasingly changing times, which includes information and communication technology. Educational innovation is developing not only based on information and communication technology. However, digital educational innovation can also be utilized by creating digital content. A study shows that cultural integration in a person will increase the willingness of individuals and groups to create new ideas in their environment and apply them to grow their cognitive knowledge, academic success, career and social awareness (Sharif, 2019).

The development of digital technology has had a major impact on every nation-building sector. This development can be seen from the development of information that is quickly obtained by the people of a nation. Technological developments can accelerate the dissemination of information among society, these developments

can have an impact on society regarding education for their children. This is in accordance with the opinion of Burbules et al. (2020), that technology is a driving force for educational reform, as a means of developing education in all elements of society. Based on this opinion, information and communication technology today is not only accessed via computers, but can be studied via smartphones today. Digital technology is developing more rapidly because of the internet network which makes it easier to obtain information (Santos et al., 2019).

II. METHOD

The Systematic Literature Review (SLR) method used in this paper was carried out by (1) searching for papers available through online databases, (2) looking for answers to several research questions, and (3) finding relevant academic literature related to teacher innovativeness and modern learning, digital. As suggested by Kraus et al. (2020), SLR should use databases that offer comprehensive research collections; thus, a dimensional database platform was used in this study.

Figure 1 illustrates how literature was selected for this independent systematic review. It started by finding articles published using the keywords "teacher innovation and digital era learning" from 2018 to 2024, resulting in a total of 1818 papers. For the literature review, Kraus et al. (2020) recommends articles in the form of journals used as literature sources, which filters papers into 251 articles. Of these, 32 were found to fit the research category of teacher innovativeness in digital era learning. Finally, three research papers were carefully selected to fulfill the objectives of this literature review.

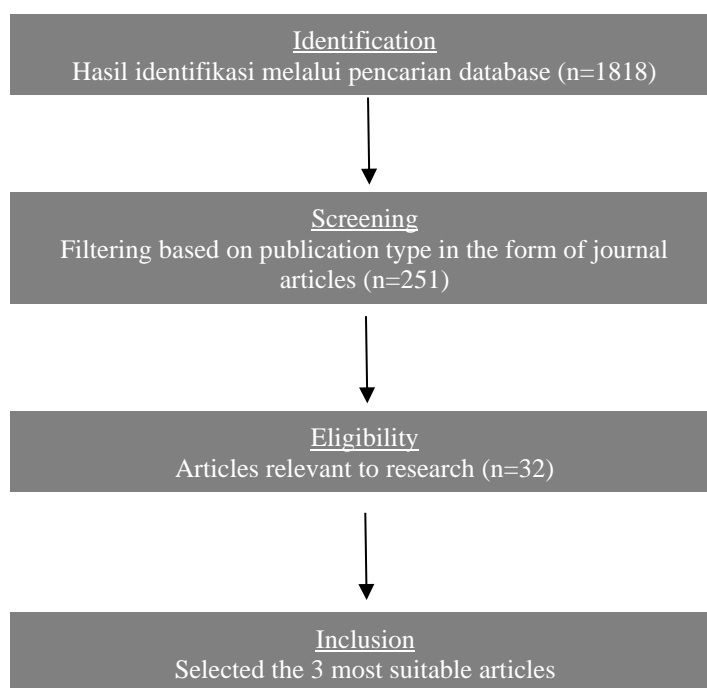


Figure 1. Literature Search

III. RESULT AND DISCUSSION

Table 1 provides an overview of three selected articles in the field of teacher innovation and learning in the digital era, all of which were indexed by Scopus and published in the last few years. The research method used is a qualitative method in the form of questionnaires, interviews and surveys.

Table 1. Selected the 3 most suitable articles

No.	Title	Author/year	Method	Temuan
1.	How teachers manage their classroom in the digital learning environment – experiences from the University Smart Learning Project	Nguyen, et al. (2022). Heliyon	Qualitative (Interview & observation)	<ul style="list-style-type: none"> the superior characteristics of digital learning classroom management are the use of technology, applications, learning content and digital devices in planning and implementing learning activities to create a good learning atmosphere and active learning, students' high-level thinking, skills (creative thinking, analytical thinking, and thinking problem solving) as well as increasing motivation and learning attitudes. Teachers prepare learning content and planning, appropriate technology and teaching methods, solve problems, and organize learning activities to increase student motivation. Digital literacy, online systems, smartphones and learning activities have limitations that hinder the implementation of learning in the classroom.
2.	What do secondary teachers think about digital games for learning: Stupid fixation or the future of education?	Gutierrez, et al. (2023). Teaching &Teacher Education	Qualitative (Questionnaire)	<ul style="list-style-type: none"> DGBL (Digital Games Based Learning) is still a polarized and controversial pedagogical issue among English teachers, requiring the development of curriculum policies to be more aligned with explicit links to DGBL. Professional development for teachers needs to involve teachers in effective learning about the use of DGBL and establishing DGBL as a “valuable good”. The authors recommend professional learning highlighting research that proves the benefits of DGBL learning.
3.	Teacher-reported instructional quality in the context of technology-enhanced teaching: The role of teachers' digital competence-related beliefs in empowering learners	Runge, 2023. Computers & Education	Qualitative (Survey)	<ul style="list-style-type: none"> Teachers who feel able to use digital technology in the classroom to empower students, report that they use digital technology in their teaching to improve classroom management, cognitive activation, and a supportive climate.

In the first article the teacher designs teaching activities according to the characteristics of students, creates a pleasant learning atmosphere, organizes learning activities, and increases learning motivation. The Smart

Learning Project at Khon Khaen University (KKU) focuses on improving students' knowledge, skills and attitudes through innovative pedagogical methods. However, they face challenges such as limited internet connections, lack of digital devices, and digital literacy among teachers and students. Teachers encourage students to use technology, play games, develop problem-solving skills, and manage their groups effectively. This project allows students to use smartphones in class, however some students do not have these devices, and there are limitations in using the platform and applications due to limited technology skills.

The second article is a secondary school teacher's opinion about digital games for learning. This research focuses on secondary school English teachers in Australia and their perspectives on the use of digital games in the classroom. The sample consisted of 201 teachers, with the majority being female (75%) and having more than 20 years of teaching experience (37%). The Australian English Curriculum encourages the use of digital literacy and texts from different cultures and time periods, but many teachers have difficulty using multimodal texts such as digital games. Some teachers see digital games as a social thing worth doing in their classrooms. Augmented reality and virtual reality games have been shown to enhance literacy learning and support the creative design of immersive texts by students. The questionnaire used in this study aims to understand how teachers assess critical literacy, multiliteracies, and digital games in English classes, with 80% of respondents stating that they have not used digital games in their English programs. Some teachers singled out older generation teachers for hindering the integration of digital games in education, and highlighted the importance of embracing change for the future of education.

The way teachers can develop digital technology is by creating digital learning content. Before creating learning content, teachers must look for references for what learning content will be delivered according to the learning, so that the teaching is not outdated. In connection with creating learning content, in research (Juraschek et al., 2020, p. 48), there are several events that are used as references in creating digital learning content, including Gamejam and Editathon, both events aim to create digital learning content and development of educational games. The process of creating digital learning content must be in accordance with the teacher's teaching process, so that teachers can pay attention to the following things (OECD, 2016, pp.31-32). 1. Teaching based on educational games or educational games. Educational games must be able to improve conceptual understanding and increase students' imagination, thereby making students' thinking processes creative in solving problems. 2. Education supported by the use of technology can expand teaching opportunities for teachers and learning for students. For example, online laboratories that carry out experimental activities, this can be done by students by learning while doing a wider range of work. So that students do not feel bored with the learning. 3. Technological development can increase intercultural cooperation, both local and long distance, so that students can expand their knowledge of foreign cultures other than Indonesia. 4. Technological development can be used by teachers to assess students' current learning by adapting their teaching according to needs and identifying the skills that students need to acquire in a more comprehensive way. So the 3 learning assessments do not need to be done manually as usual, this can take advantage of today's digital technology.

Article 3 focuses on examining teachers' competency-related beliefs regarding student empowerment, differentiation, and active involvement of students in the context of using digital technology to improve the quality of classroom teaching. Teachers reported using digital technology to improve the quality of classroom teaching through cognitive activation, supportive climate, and classroom management. This research also highlights the shift from analog to emergency remote teaching due to the COVID-19 pandemic, leading to increased research on the application of digital technologies in remote teaching to promote quality teaching. High-quality teaching in the classroom is characterized by well-organized classroom management, emotional and cognitive support from teachers, and cognitively challenging materials and assignments. Recent studies show that teaching quality can be supported by digital technology in both analog and digital classrooms.

Teachers are the determinants of success in learning, therefore in developing digital technology teachers must have adequate skills. This is related to the professional competence of teachers as educators, where (Sappaila, 2017) believes that teacher competence influences student learning achievement. Apart from that, teachers must also be prepared for the changes that will occur in the future. Apart from teacher innovation, what teachers must have in developing digital technology is that delivering interesting teaching will make students understand learning better. Therefore, it is necessary to have strategies and learning methods, this is in accordance with the opinion of (Burbules et al., 2020), in teaching teachers must think about what strategies are conveyed, so as to make learning effective.

IV. CONCLUSION

In summary, from the three articles presented, it can be concluded that the main focus of each article is about teacher innovation in the use of digital technology in the context of learning and teaching. The first article shows the innovativeness of teachers at Khon Kaen University's Smart Learning Project in managing their classes in a digital learning environment. This article also highlights the importance of integrating digital technology in education and the need for understanding and developing teacher professionalism in facing the challenges and opportunities offered by digital learning environments. The second article discusses the perspectives of English teachers in Australian secondary schools regarding the use of digital games in learning. Teacher innovation is shown by the use of Augmented Reality & Virtual Reality in learning. Meanwhile, the third article discusses teacher innovation regarding digital competence by using digital technology to improve the quality of learning. The results of the review of several articles show that teachers carry out various innovations in learning, namely by implementing Smart Learning Projects using digital-based applications and platforms, implementing games-based learning education or DGBL (Digital Games Based Learning), using Augmented Reality (AR) & Virtual Reality (VR) in creating teaching media that can increase student learning motivation, teachers can manage the class well, as well as more challenging and varied material and assignments. Teachers who have good self-confidence in using digital technology report that students' cognitive abilities become more active and the material presented becomes more interesting. We hope that all elements of society can support teachers' innovation in learning in the digital era by optimizing facilities and infrastructure in the education sector.

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