Proceeding International Conference on Islamic Education
"Exploring Contemporary Challenges and Innovations in Education"
Faculty of Tarbiyah and Teaching Training
Universitas Islam Negeri (UIN) Maulana Malik Ibrahim Malang
October 17th, 2024
P-ISSN 2477-3638 / E-ISSN 2613-9804
Volume: 9 Year 2024

Teacher Innovation in Elementary School Education: Improving the Quality of Learning in the Digital Era

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Abstract In the increasingly advanced digital era, the need for innovation in the world of education is increasing. It is increasingly urgent, especially in the context of elementary school teacher education. The purpose of this study aims to explore in the education of elementary school teachers based on digital technology and its impact on the quality of education. The method in this study uses a descriptive qualitative approach. This research was conducted at MI Al-Lathifiyah by involving teachers who have applied digital technology in the learning process. Data were collected through in-depth interviews, participatory observations, and documentation analysis. The results of the study show that the application of digital technology can increase student activity, teaching creativity, and teachers' digital use competence. Nonetheless, challenges such as infrastructure limitations and technology access gaps have also been identified. These findings underscore the importance of ongoing support for teachers and development in technology infrastructure to maximize digital innovation in education.
Keywords Teacher innovation; Primary school; Digital Era Learning

A. INTRODUCTION

All facets of life and work are changing in modern society, mostly due to the quick advancement of science and technology (Tegegn, 2024). The area of ICT has transformed how modern society functions in recent decades, to the point that it is now inconceivable for civilization to exist without ICT (Brodowicz, 2024). In such a situation, schools, as educational institutions, play an important role to keep pace with these changes, education continues to undergo reforms (Abbaspour et al., 2024). To address the current situation in education, there is a constant search for new approaches. The introduction of innovation has become a must in schools (Pietsch et al., 2024). While there are ongoing efforts to modernize the teaching process, we can not, in general, be completely satisfied with the current state of teaching practice. Other research conducted by (Macfarlane, 2024) also revolves around innovative teaching methods being one of academic freedom. The results of research conducted by (Moate et al., 2024a) stated that in the educational process, teachers must prepare education that has been designed innovatively in accordance with the development of the times but still pay attention to needs and characteristics.

In recent years, innovations in education have been reflected in their planning, implementation, and evaluation (Awidi & Paynter, 2024). According to (Sliwka et al., 2024) that the success of education is based on innovative approaches, especially in an innovative education system that can improve learning outcomes. Learning according to methods and models in the digital era has

its own characteristics. The main difference compared to traditional learning lies in the changing roles of teachers and students (Shvardak et al., 2024). Students are no longer passive participants and recipients of information, but active participants in education, while teachers increasingly become students' partners in teaching and learning based on innovative educational systems, teaching in natural and social sciences is also carried out (Qablan, 2024).

The teaching process is planned, implemented, and evaluated in accordance with an innovative education system, the roles of teachers and students have changed (Mohzana et al., 2024). Teachers take on roles such as accommodators, facilitators, moderators, organizers, and partners for students (Burton, 2021). Students' roles in education have also evolved; they are no longer passive learners but rather explorers and researchers who, via individual, collaborative, or pair work, come up with answers to issues and complete tasks. This approach is known as student-centered learning (Hadiyanto, 2021; Supriyatno et al., 2020). Students may use the knowledge they acquire in this way outside of the classroom since it becomes fundamental knowledge. Following every class, the goals and procedural aspects of the lesson, the effort of the teacher, and the involvement of the students are noted. This is in line with research findings that education and exposure to the use of technology can create an academic atmosphere for society 5.0 (Mulyadi, 2019; Utami, 2019). The ever-evolving nature of digital technology requires society to adapt quickly to changing demand for skills and technology. In addition, teachers must also be collaborative, cooperative, creative, dare to take risks and implement learning holistically so that learning takes place optimally and remains student-centered (Hadiyanto, 2021; Kapkir, 2024; Siddiq et al., 2024)

The results of the research conducted by (Shermukhammadov, 2022) Inform students that the integration of teacher creativity and innovation can improve the quality of learning because each teacher strives appropriately in providing knowledge according to the needs of students and teaching schedules (Yang et al., 2022). Research conducted by (Kusumawati, 2022) found that one of the keys to success in improving the quality of education is to innovate learning. Learning innovations carried out can include digital-based methods, models or media. In developing digital innovations, educators can do it in various ways, such as participating in skills training in their respective fields, participating in various scientific study forums that can add knowledge and experience (Bizami et al., 2023; Ribers et al., 2024). The lack of adequate support and supervision for teachers is also an obstacle in improving their performance. In some cases, teachers may not receive the adequate training, guidance, or feedback needed to improve the quality of their teaching. Lack of supervision and support can hinder teachers' professional growth and hinder the implementation of innovative learning. Through the right strategies, such as effective educational planning, continuous professional development, and objective performance evaluation, education can innovatively play a role in improving the quality of student learning in primary school (Basri et al., 2024)

In the increasingly advanced digital era, the need for innovation in the world of education is increasing. It is increasingly urgent, especially in the context of elementary school teacher education. Elementary school teachers play a very crucial role in shaping the basis of students' knowledge and character, which will be an important foundation for their development in the future. They are not only teachers, but also mentors and motivators who influence students' mindsets and attitudes from an early age. In this context, improving the quality of learning at the elementary school level is very important, and innovation is a key element to achieve it (Moate et al., 2024b). Digital technology opens up new opportunities for more effective and engaging teaching methods, which can help teachers deliver material in a more interactive and relevant way. In addition, innovation in teacher education also involves the development of new skills, increased professionalism, and adaptation to curriculum changes and dynamic student needs. Therefore, the integration of technology and innovative approaches in primary school teacher education will not only improve the teaching and learning process, but also better prepare students to face future challenges. Innovations that are done well can create a learning environment that is more inclusive, adaptive, and responsive to the individual needs of students, thereby improving the quality of education and overall learning outcomes at the elementary level (Boubker, 2024).

Digital technology presents a great opportunity to transform the way learning is delivered and received, with the potential to create a more dynamic and interactive learning environment. However, this innovation requires significant adaptation from all parties, especially teachers, who

play a central role in integrating technology into the learning process (Ersozlu et al., 2024). Teachers are not only required to understand the technical use of technology, but must also be able to design creative and relevant learning experiences for students. In this case, primary school teacher education needs to focus on developing in-depth digital skills as well as the implementation of innovative learning strategies. These skills should include the use of digital devices to support collaborative, project-based, and personalized learning, which can help students develop 21st-century skills such as problem-solving, critical thinking, and creativity. Through this approach, teachers not only become facilitators, but also agents of change capable of providing a more interactive, meaningful, and enjoyable learning experience, ultimately increasing student engagement and preparing them for future challenges (Pan et al., 2024). So that this research will focus on teacher innovation in developing education in elementary schools to improve the quality of learning in the digital era. It is hoped that it can make a new contribution to the current scope of education.

B. METHODS

This study uses a qualitative descriptive approach with a case study design, which aims to explore and understand various innovations in elementary school teacher education that can improve the quality of learning in the digital era. The location of the research was carried out at MI Al Latifiah Jl. Wirosentanan Gedog Wetan, Malang Regency. The participants who took part in this activity were 40 elementary school teachers, who are known to have applied digital technology in the learning process. Research participants include elementary school teachers, school principals, and other education personnel who are directly involved in the application of this technology. Data was collected through in-depth interviews, participatory observation in the classroom, and analysis of documentation such as lesson plans and technology-based teaching materials. The interviews conducted are semi-structured, providing flexibility in exploring participants' views and experiences related to educational innovation. Observation in the classroom allows researchers to see firsthand how digital technology is being used, as well as its impact on interactions between teachers and students.

Data analysis was carried out using thematic analysis methods, ranging from the interview transcription process, data coding, to the identification of the main themes that emerged. The triangulation method is applied to ensure the validity and reliability of the data, by comparing the results of various data collection techniques. In addition, the researcher also conducted member checking to participants to ensure the accuracy of data interpretation. The ethical aspect is well maintained, where all participants are provided with complete information about the purpose of the research, and first obtain their consent before data collection. The identities of the participants were also kept secret, and the results of the study were presented anonymously to protect their privacy.

C. RESULT & DISCUSSION

This study reveals that innovations in technology-based elementary school teacher education have a significant positive impact on the quality of learning in the classroom. The results of the analysis obtained through interview, observation, and documentation methods show several main findings related to the application of this innovation. First, the integration of digital technology in education has helped teachers develop a more interactive and interesting learning approach, so that it can increase students' motivation to learn. Teachers involved in the study reported that the use of digital devices, such as learning apps, interactive presentation tools, and online platforms, made it easier for them to convey complex material in a way that was easier for students to understand.

At this stage, the teachers also explained that in the learning process it is required to carry out the planning stage. Learning planning and mandating teachers in education units to prepare learning plans. Every educator in the classroom is obliged to prepare complete and systematic learning resources so that learning is dynamic, interesting, fun, and challenging, encourages active participation, and provides enough space for students to be initiated, creative, and independent

according to their skills and interests, as well as their physical and psychological development. In addition, teachers' readiness for innovative activities is determined by several indicators, such as: a) understanding the importance of incorporating pedagogical innovations into their own teaching practices; b) being up to date on the newest pedagogical technologies and innovative working methods; c) being focused on developing one's own creative tasks, methods, and willingness to try new things; d) being willing to overcome the challenges related to the organization and content of innovative activities; and e) having the practical skills necessary to master pedagogical innovations and create new ones. The stages carried out by teachers are as follows.

Table 1 Stages of Innovative Learning Planning

No.	Aspects	Explanation
1	Deepening Innovative Learning Materials	Deepening the material on innovative learning models achieves the expected goals. Teachers understand the meaning of innovative learning models, the different types of innovative learning models in elementary schools, and how to integrate them in learning. The level of achievement reaches the Very Good category. This means that the presentation of material regarding innovative learning models can be carried out well and achieve the target.
2	Formulation of Authentic Learning Planning and Assessment	The formulation of learning plans and authentic assessments also went as expected. Teachers are able to formulate authentic lesson plans and assessments effectively. The lesson plan formulated reflects the integration of innovative learning models in it. Likewise, authentic assessments have been formulated and simulated in learning well. The success rate of the implementation of activities is in the Very Good category. This means that in general, the formulation of learning plans and authentic assessments can be carried out properly and according to expectations.
3	Learning Simulation	Learning simulations reflect learning that integrates innovative learning models into them. This reflects that teachers understand how to integrate innovative learning models in learning. The level of program achievement during the learning simulation reached the Very Good category. This means that teachers are very good at implementing learning simulations related to the integration of innovative learning models in elementary school learning.

The existence of innovative learning that uses models, methods or media and teaching materials that are integrated with current technology will have a good influence on students, because the application of learning in the independent curriculum requires a learning process that must be student-centered in order to achieve success and welcome the sustainability of education in the era of society 5.0. The strategies that can be carried out by teachers in designing student-centered learning include the following.

Table 2 Student-centered Learning Strategies

No.	Student-Centered Strategies	Teacher and Student Activities
1	Build good relationships with students	Teachers need to create a comfortable and supportive environment for learning, as well as build good relationships with students. In such an environment, students will be more open to expressing opinions and actively participating in learning.
2	Providing freedom and support	Students need to be given freedom in choosing topics and learning methods, and teachers need to provide adequate support in learning. Students also need to be given the opportunity to work independently and in groups, and be given support in exploring, developing, and evaluating their ideas.

3	Provide relevant resources	Teachers need to provide relevant resources to support student learning, including books, online materials, and tools for experiments or projects. Teachers also need to help students access these resources and guide them in using them.
4	Encouraging students to think critically and creatively	Teachers need to encourage students to think critically and creatively by assigning tasks and challenges that require them to solve problems or find innovative solutions. Teachers also need to provide constructive feedback and guide students in improving their work output.
5	Involve students in learning evaluations	Students need to be involved in the evaluation of their learning, and given the opportunity to evaluate themselves and their peers. Teachers need to provide constructive feedback and help students plan their next steps in learning.

However, this study also found several challenges faced by teachers in implementing innovation. Key challenges include limited access to adequate technology infrastructure, varying digital skills among teachers, and a lack of in-depth training on how to best use technology in teaching. In addition, there are challenges in terms of students' adaptation to the use of technology, especially in regions with limited internet access or with less supportive socioeconomic backgrounds. However, the positive impact felt by teachers and students is clear, with increased student participation, ease of managing classes, and teachers' ability to personalize learning materials according to the needs of individual students. Thus, the study highlights the importance of ongoing support in terms of training and infrastructure to ensure the sustainability and effectiveness of technological innovations in teacher education.

So that to help teachers in developing more in-depth innovations, teachers are also given training to overcome the problems they face. Mentoring must be consultative, interactive, communicative, motivating, and able to negotiate. The term consultative refers to the process of setting up an environment where mentees and companions can collaborate to solve problems; interactive refers to a mentee and a mentee who must be both active; communicative refers to the ability of the mentee and the companion to understand each other's messages; motivating refers to the companion's ability to encourage self-confidence; and negotiation refers to the ease with which modifications can be made.

Based on interviews conducted by many teachers, they feel able to increase their confidence to integrate technology into their learning process. The students feel more prepared and competent in using various digital devices to enrich teaching and support students. In addition, teachers also develop more creative and effective teaching methods, which not only make learning more engaging for students but also increase efficiency in achieving curriculum goals. Thus, digital technology not only improves the quality of teaching but also empowers teachers to be more innovative and adaptive in meeting the needs of education in the digital era(Aditya & Suranto, 2024; Mohamed & Nadia, 2024)

Basically, the learning process in elementary schools in addition to requiring digital-based learning innovations also requires learning model innovations. Learning model innovations have several types that can be implemented in education. Innovative learning models have five basic elements(Joyce & Calhoun, 2024; Munir, 2024), Among them: (1) syntax, which refers to the steps involved in learning; (2) social system, which refers to the environment and standards that apply in the classroom; (3) the principle of reaction, which outlines how teachers should understand, handle, and react to students; (4) support systems, which refer to all resources, equipment, materials, or learning environments that facilitate learning; and (5) instructional and parenting effects, which are learning outcomes that directly stem from targeted goals and non-targeted learning outcomes. Reasoning and problem-solving models, inquiry training models, problem-based teaching models, conceptual change learning models, and group investigation models are five aspects of learning approaches that describe how they typically adhere to the constructivist paradigm of learning in the digital age.

In essence, learning is a process that allows students to engage with their environment in ways that were previously impractical, resulting in positive behaviour changes in students. As stated by (Ren, 2022) Learning is the process by which a person's surroundings are deliberately controlled

to allow him or her to engage in certain actions under certain circumstances or generate responses to certain events. According to the aforementioned viewpoint, learning is a process in which teachers actively teach students to change certain behaviour that will produce positive outcomes. Learning is a process used by educators to foster original thinking, which can increase the capacity to generate new information in an effort to improve students' understanding of the material. Because the learning process is essential for building students' knowledge, instruction should involve students directly to ensure that they understand the subject matter as well as remember it.

Developing the proper attitude toward innovation and conquering uncertainty are components of innovative competencies. These qualities include the ability to act swiftly in such circumstances and to take proactive, well-informed decisions. Readyness for education and ongoing development, dedication to self-directed learning and retraining, professional flexibility, curiosity, critical thinking abilities, the capacity to work both independently and cooperatively, and a readiness to succeed in a competitive setting are all examples of key innovative competencies. In terms of curriculum, teaching strategies, and technology, the educational system at all levels beginning with preschool must provide guidance on how to build the skills and competences required for creative endeavors.

Implementation is the implementation of a design that has been prepared and detailed carefully. In the independent curriculum, its implementation must go through several stages such as planning, implementation, and evaluation. These stages must be planned as best as possible by being able to provide guidance to teachers regarding independent curriculum materials. In the implementation of the independent curriculum, students carry out project-based learning. The project here means that the Pancasila Student Profile Strengthening Project (P5) is an integrated cross-subject initiative. In this project-based learning method, students will observe a problem, then provide concrete solutions to the problem. This method is one of the things that can be done to develop learning innovatively and integrated using digital.

Innovative learning carried out by teachers during the learning process will provide a meaningful learning experience for students. In addition, innovative learning designed by teachers can take the form of various things, namely the application of innovative learning in the lower grades can be through songs and singing according to the material taught. In addition, in the upper grades, teachers can make teaching materials that are tailored to the material. Learning in the current era of society 5.0 must be able to provide meaningful learning to students. The goal is to train students' memory in the long term. In addition, students have provisions for the next life. Therefore, teachers must be able to develop digital-based innovative learning by utilizing technology, and another alternative is that teachers can take advantage of what is in the surrounding environment as a source of learning. Such as by relating to the uniqueness that exists in the surrounding environment.

D. CONCLUSION

Based on the explanation that has been described, it can be concluded that the use of innovative learning can help students to improve learning outcomes and provide better quality education. Education is currently carried out in accordance with the independent curriculum which requires student-centered learning and utilizing technology in the learning process in order to welcome learning in the 21st century of the society 5.0 era. The success of this learning is evidenced by the success of students in achieving learning goals, providing an interesting learning experience and being able to fully engage students. On the other hand, teachers are also more confident in developing their abilities using innovative elementary school-based learning. So that the two can gain experience from each other. It is hoped that in the future this research will be able to contribute to the world of education, especially regarding learning innovations carried out by elementary school teachers and provide theoretical support that the current digital technology can be used properly according to the needs and characteristics of students.

ACKNOWLEDGMENTS

The researcher would like to thank all parties involved and helped in this research process to be completed and helped to complete this article.

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