Implementation of Deep and Digital Learning Approaches to Teachers of Al-Mutmainna Islamic Boarding School to Enhance Pedagogical Competence for the Implementation of the SDGS of Quality Education

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Abstract: The goal of this PKM activity is to improve teachers' knowledge and skills in implementing deep learning and digital learning approaches. The method used in this activity is outreach, training, and mentoring for teachers at the Almutmainnah Islamic Boarding School in Leseng Village. This activity was carried out with the primary objective of enhancing teachers' pedagogical competence so that they are able to design and implement learning in accordance with the demands of the 21st century. Through this program, teachers were not only introduced to the concept of deep learning, which emphasizes mastery of critical, creative, collaborative, and communicative skills, but also trained in the utilization of digital learning technologies that support more interactive and adaptive instruction. The implementation of this activity was divided into three main stages: preparation, implementation, and evaluation. The execution of this community service program (PKM) has successfully improved the pedagogical competence of teachers at Pondok Pesantren Al-Mutmainnah through the application of deep learning and digital learning. Based on the evaluation results, it was evident that most teachers experienced an increase in their understanding of designing deep learning-based instruction that fosters students' critical, analytical, and creative thinking skills. In addition, teachers' ability to operate digital learning applications (such as Canva, Quizizz, and Google Classroom) improved significantly. Teachers were also able to produce innovative digital learning products and became more confident in integrating technology into the classroom. Another achievement was the establishment of a teacher learning community, which serves as a platform for the sustainability of the program. This indicates that the PKM activity has generated positive and continuous impacts in supporting the achievement of SDG 4 (Quality Education).

Keywords: Deep Learning Approach, Digital Learning, Pedagogical Competence, SDGs Quality Education.

Introduction

Pedagogical competence is one of the fundamental competencies that must be possessed by a teacher in order to create meaningful, educational learning that meets the needs of students. This competence includes the teacher's ability to understand student characteristics, design and implement learning, conduct evaluations, and optimally develop students' potential. An effective strategy to improve teachers' pedagogical competence is through the implementation of

innovative learning approaches, such as deep learning and digital learning. However, the implementation of these two approaches requires teachers to have a profound understanding of how to design learning that fosters students' critical, creative, and analytical thinking skills, as well as the ability to integrate the latest technologies into the learning process (Adji, 2022).

Pondok Pesantren Al-Muthmainnah, located in Dusun Seminar, Pernek Village, Moyo Hulu District, Sumbawa Regency, was established in 1993 under the foundation named Yayasan Pendidikan dan Dakwah Al-Muthmainnah. The total number of students and staff under this institution is 120 individuals. The pesantren has four classroom buildings, one library, and one office. In the 2023/2024 academic year, the pesantren had 84 students. There are 30 teachers serving in the institution, supported by one principal and one head of administration. Access to transportation to the pesantren is relatively good and can be reached within one hour. Pondok Pesantren Al-Muthmainnah plays an important role in education within the community of Leseng Village, Moyo Hulu. However, the challenge of improving learning quality remains a major focus. Based on initial observations and interviews conducted by the PKM team with the school principal, Mr. Jamal Hikam, S.PdI., MM, and the teachers at Pondok Al-Muthmainnah Leseng, several fundamental issues were identified, including:

a) Low Pedagogical Competence in Designing Meaningful Learning. Many teachers in Pondok Pesantren Al-Muthmainnah still apply traditional teacher-centered approaches, focusing on memorization rather than deep understanding. This leads to less contextual learning and fails to cultivate students' critical thinking skills.

b) Lack of Understanding and Implementation of the Deep Learning Approach. Teachers are not yet familiar with deep learning, a strategy that encourages students to understand concepts deeply, think reflectively, and connect new knowledge with prior experiences. As a result, learning becomes shallow and unsustainable.

c) Limited Use of Digital Technology in Learning (Digital Learning). Although digital devices are increasingly available, their use in the learning process at the pesantren remains minimal. Teachers lack sufficient competence in utilizing digital technologies (applications, online learning platforms, and interactive media) optimally.

d) Absence of Collaborative Practice-Based Training. Most teacher training remains theoretical and one-directional. There is no training program that integrates the practical, collaborative application of deep learning and digital learning tailored to the pesantren's educational context.

e) Challenges in Supporting SDG 4: Quality Education. As a religious-based educational institution, pesantren face particular challenges in aligning with the targets of the SDGs, especially in providing inclusive, equitable, and quality education. Enhancing teachers' pedagogical competence becomes a strategic step for pesantren to contribute meaningfully to achieving the SDGs.

f) Limited Facilities and Infrastructure to Support Technology Use. Unequal internet access, particularly within the pesantren, hampers teachers' digital literacy and their ability to fully utilize technology in learning. From these identified problems, the PKM team concluded that it is necessary to enhance teachers' pedagogical competence through the implementation of deep learning and digital learning approaches for the teachers at Pondok Pesantren Al-Muthmainnah to help achieve SDG 4: Quality Education.

Teachers hold an essential role in education, and in carrying out their teaching responsibilities, they should continually improve their qualifications and competencies (Uspayanti, 2022; Kaleka, 2022). This is supported by (Sao, 2023), who argues that teachers are obligated to enhance their competence and qualifications to advance education. The development of human resource competence in education plays a vital role in improving education quality. This suggests that the improvement of learning quality depends not only on material aspects but also on the enhancement of teachers' capacity as educators (Hayati, 2024). To increase the effectiveness of the learning process, teachers are required to be creative, innovative, and highly competent (Adji, 2022). Furthermore, (Sumar, 2019) emphasizes the importance of implementing continuous professional development programs for teachers, particularly through zone-based learning competence improvement. (Rizaldi, 2021) also highlights the urgency of developing teacher competence in the digital era to enhance learning quality. Therefore, enhancing teacher competence becomes a strategic key in creating more effective learning.

Method

To ensure the successful implementation of this Community Service Program (PKM) as expected, a systematic method was developed to help facilitate and address the identified problems. The stages are described as follows:

1. Preparation Stage
   At this stage, coordination was carried out with related stakeholders, including the Sumbawa District

Office of Religious Affairs and the target partners, namely the teachers at Pondok Pesantren Al-Mutmainnah, Leseng, Moyo Hulu. This was intended to strengthen the commitment of the partners in supporting the success of the PKM program. In this stage, the PKM team also prepared task distribution, procurement of necessary equipment and materials, as well as the preparation and duplication of training materials.

2. Implementation Stage

In this stage, teachers at the pesantren were provided with training on the implementation of the deep learning and digital learning approaches. The materials delivered included: Implementation of deep learning in classroom learning with an emphasis on mindful learning, joyful learning, and meaningful learning. Introduction and development of digital learning media applications in schools. Direct practice of applying deep learning and digital learning in classroom activities. The applications used to support digital learning included Canva, Quizizz, and Google Forms. These were chosen due to their attractive design, user-friendly interface, and compatibility with devices that do not require high specifications. These applications are effective for interactive learning activities and assessments that allow teachers and students to communicate and interact with each other. The data generated from these tools also helps teachers design adaptive learning according to individual student needs, develop adaptive learning applications, or use classroom management software to monitor student progress and provide customized materials. This was facilitated through training workshops followed by independent tasks.

a) Socialization and Workshop Program

This activity was carried out at the beginning of the program, involving all 30 teachers as partner participants. Its purpose was to strengthen the overall understanding of the PKM program to be implemented and to introduce the technologies that could be utilized by the participants. The methods used were lectures, discussions, and demonstrations.

b) Training, Mentoring, and Application of Technology

Conducted after the socialization, this stage also involved all 30 teachers. This was the core activity of the PKM, as teachers were taught how to implement deep learning approaches in their classrooms. In addition to deep learning, teachers were trained in creating digital learning media using the applications introduced. The purpose was to enable teachers to move beyond solely relying on textbooks as teaching media, by integrating digital technology into their lessons.

c) Evaluation Stage

The evaluation stage was essential to measure the level of success of the PKM program. Evaluation was conducted at every stage of implementation to assess achievements and serve as a basis for improvements in future activities. A comprehensive evaluation was carried out at the end of the program, focusing on partner participation and the achievement of the targeted outputs of the provided solutions. Following evaluation, the final activities included reporting and publication of the PKM results as accountability of the PKM team, along with the preparation of a teaching material handbook.

d) Role of Partners

To support the program, the pesantren was responsible for preparing participants and training facilities, providing additional refreshments for the participants, and ensuring the availability of laptops or smartphones as well as reliable internet connectivity throughout the training sessions.

e) Program Sustainability

For sustainability, it is expected that after the PKM program is completed, the partner teachers will serve as role models for other subject teachers in Sumbawa Regency and beyond in implementing deep learning and digital learning approaches. Through publication in scientific journals, print and online media, and documentation in the form of PKM activity videos, the dissemination of this program is expected to be wider, thereby encouraging replication by other educational institutions.

Result and Discussion

In recent years, digital technology has significantly transformed the landscape of education worldwide, including in Indonesia. One of the technologies that has played a major role in this transformation is deep learning. This technology enables computers to analyze large amounts of data and identify complex patterns without explicit human instructions. With its capability to process text, images, and sound, deep learning can be utilized to create more adaptive and personalized learning systems (Taruklimbong et al., 2023). The community service program (PKM) carried out at Pondok Pesantren Al-Mutmainnah represents an initial step toward implementing both deep learning and digital learning approaches. The first stage undertaken by the PKM team was the preparation stage, which

served as a crucial foundation to ensure that the program would run smoothly and meet the needs of the partner institution. At this stage, the PKM team conducted coordination meetings with the leadership of Pondok Pesantren Al-Mutmainnah to discuss the urgency of improving teachers' pedagogical competence, particularly in relation to the rapid development of digital technology. The initial activity was conducted in the form of a needs assessment survey, which involved distributing questionnaires and conducting interviews with teachers. This process allowed the PKM team to gather relevant data regarding the existing challenges and the specific needs of the teachers, thereby ensuring that the program interventions would be well-targeted and impactful.

Figure 1. Initial coordination with partners

The survey results indicated that most teachers demonstrated a high level of enthusiasm for improving their pedagogical competence; however, they still faced limitations in utilizing digital technology as a medium of instruction. Many teachers were still accustomed to relying primarily on traditional lecture methods, while the integration of deep learning and digital learning had not yet been optimized. As a follow-up, the PKM team developed a training module that included: a) The basic concepts of deep learning in education, focusing on strategies to foster critical thinking, analytical skills, and problem-solving abilities; b) Introduction to and practice with digital learning, including the use of educational applications, digital platforms, and interactive media relevant to teachers' needs; c) Simulation of instructional design development, covering lesson plans (RPP), teaching materials, and technology-based assessments. In addition to module development, other preparations included the provision of facilities and infrastructure such as laptops, projectors, internet access, and supporting applications. This preparation stage also encompassed program socialization, the creation of an activity schedule, the distribution of roles among the PKM implementation team, and the development of evaluation instruments to be used at the end of the program.

Figure 2. Program Socialization

The implementation stage was carried out in the form of training, workshops, and direct mentoring for the teachers of Pondok Pesantren Al-Mutmainnah. The activities were divided into several phases as follows:

Theoretical Reinforcement Session

Teachers were provided with an in-depth understanding of the concepts of deep learning and digital learning. In this session, the differences between conventional teaching and deep-learning-based instruction were explained, with an emphasis on the development of higher-order thinking skills (HOTS). Teachers were encouraged not only to deliver subject matter but also to design learning activities that involve students in analysis, evaluation, and creation processes.

Figure 3. Strengthening Theory

Digital Learning Workshop Session

In this stage, teachers practiced using various digital applications such as Google Classroom for learning management, Canva and interactive PowerPoint for creating teaching media, as well as Quizizz and Kahoot for digital-based learning evaluation. During the workshop, teachers had the opportunity to directly develop digital teaching materials according to their respective subject areas. Their enthusiasm was evident when they successfully created interactive presentations and online quizzes that could be implemented in the classroom. The PKM team provided individual mentoring for teachers who still faced difficulties, particularly in the technical aspects of using the applications. This mentoring was carried out

to ensure that all teachers could fully benefit from the training. Overall, the implementation stage ran smoothly. Teachers expressed that they felt more confident in integrating digital technology into their teaching and had a deeper understanding of the importance of applying deep learning strategies to foster 21st-century skills in students.

Figure 4. Handover of technology and innovation and teacher mentoring

Formative evaluation was carried out during the activity by observing teacher engagement, fluency in digital practice, and their ability to design learning tools. The results of the evaluation showed that most teachers were able to follow the training well, although there were differences in digital literacy levels. Summative evaluation was conducted after the activity through questionnaires, interviews, and analysis of the learning products produced. Based on the evaluation results, the following findings were obtained:

1. Improvement in Pedagogical Competence
   Teachers were better able to design lesson plans (RPP) and learning materials based on deep learning, oriented towards critical and collaborative thinking skills
2. Digital Learning Skills
   Most teachers successfully mastered the use of digital applications, from simple to more complex ones, to support learning activities.
   Motivation and Self-Confidence: Teachers felt more confident using technology and demonstrated high motivation to continue innovating in learning.
3. Sustainability
   A teacher learning community was established, based on WhatsApp groups and Google Classroom. This community functions as a platform for sharing experiences, discussions, and providing mutual inspiration related to the use of deep learning and digital learning. In addition, the PKM team, together with the pesantren, agreed to schedule periodic follow-up training so that teacher competence

continues to develop in line with the needs of the times.

The integration of digital learning makes a significant contribution to enriching the learning experience for teachers and students. The use of applications such as Canva, Quizizz, and Google Classroom not only makes it easier for teachers to create digital learning tools but also opens up opportunities to develop adaptive and interactive learning. Previous research confirms that the use of digital technology in learning can increase student motivation, engagement, and learning outcomes (Redecker, 2017; OECD, 2019).

The evaluation results of this Community Service Program (PKM) activity indicate that teachers at Al-Mutmainnah Islamic Boarding School were able to improve their pedagogical skills through two main aspects. First, teachers were able to design lesson plans and teaching materials that emphasize meaningful learning processes based on deep learning. Second, teachers became more skilled in utilizing digital technology to create a more engaging, interactive learning environment that aligns with students' learning styles. This aligns with the findings of Voogt et al. (2015), who stated that the integration of digital technology in learning has the potential to strengthen teachers' pedagogical content knowledge.

The formation of a teacher learning community was a significant achievement of this activity. The community serves as a collaborative platform for sharing good practices, discussing, and developing learning innovations sustainably. From a program sustainability perspective, the results This Community Service Program (PKM) activity is directly relevant to achieving Sustainable Development Goal (SDG) 4, namely Quality Education. By improving teachers' pedagogical competencies based on deep learning and digital learning approaches, this activity supports the creation of more inclusive, equitable, and high-quality education (UNESCO, 2017). This is especially important in the context of Islamic boarding schools (pesantren), which have traditionally faced challenges related to limited digital literacy and modern learning approaches. Therefore, it can be concluded that the implementation of deep learning and digital learning approaches through PKM not only contributes to improving the quality of individual teachers but also strengthens the overall Islamic boarding school education ecosystem. This activity reflects the importance of synergy between pedagogical innovation and digital technology in achieving quality education in the era of digital transformation.

Conclusion

The implementation of this PKM activity has successfully enhanced the pedagogical competence of teachers at Pondok Pesantren Al-Mutmainnah through the application of deep learning and digital learning. Evaluation results indicated that most teachers demonstrated significant improvement in designing deep learning-based instruction that fosters students' critical, analytical, and creative thinking skills. In addition, teachers' ability to operate digital learning applications (such as Canva, Quizizz, and Google Classroom) increased substantially. Teachers were also able to produce innovative digital learning products and became more confident in integrating technology into their classrooms. Another achievement was the establishment of a teacher learning community, which serves as a platform for the sustainability of the program. This indicates a continuous positive impact of the PKM activity in supporting the achievement of SDG 4 (Quality Education).

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