



# Enhancing Teacher Competence in Deep Learning–Oriented Instructional Design: A ChatGPT–Supported Training at SMPN 5 Indralaya Utara in the Era of Artificial Intelligence

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**Abstract:** The integration of Artificial Intelligence (AI) in education presents opportunities to enhance teacher competence and promote Deep Learning–oriented pedagogy. This study reports on a community service program conducted at SMP Negeri 5 Indralaya Utara, aimed at improving teachers' skills in designing lesson plans that foster higher-order thinking and meaningful learning experiences with the support of ChatGPT. Ten teachers participated in a structured training program, which included pre-assessment, theoretical orientation, hands-on workshops, collaborative lesson plan development, mentoring, and post-assessment. Teachers' understanding and application of Deep Learning principles were evaluated using pretest and posttest instruments, and the magnitude of improvement was measured using Normalized Gain (N-Gain). Results indicated an average N-Gain of 0.53, categorized as medium, demonstrating significant enhancement in formulating higher-order learning objectives, designing reflective and analytical activities, and utilizing AI to generate contextualized instructional materials. The findings highlight the effectiveness of practice-based, collaborative, and mentored training in improving both technological literacy and pedagogical skills. Moreover, teachers began transitioning from traditional knowledge-transfer approaches to constructivist, student-centered practices, positioning AI as a reflective pedagogical partner. This study provides evidence that structured professional development integrating AI can foster innovation, adaptability, and reflective instructional design, supporting Education 5.0 objectives and enhancing the quality of classroom learning experiences.

**Keywords:** Artificial Intelligence, Deep Learning, ChatGPT, Teacher Training, Lesson Plan, Professional Development.

## Introduction

State the objectives of the work and provide an adequate background, avoiding a detailed literature survey or a summary of the results. The integration of Artificial Intelligence (AI) into educational contexts has increasingly become a cornerstone of innovative pedagogical design. In recent years, AI tools such as ChatGPT have shown promise in assisting teachers to generate instructional materials, scaffold student thinking, and provide adaptive feedback (Smith & Brown, 2022). Such applications align with pedagogical

shifts toward Deep Learning – an educational paradigm that prioritizes conceptual understanding, critical reasoning, and reflective thinking over superficial memorization (Johnson et al., 2021). Deep Learning–oriented instructional design supported by AI thus enables educators to construct more meaningful learning experiences that respond to individual learner needs and challenge students to engage in higher-order cognitive processes.

Empirical studies have documented the benefits of teacher training programs focused on AI and Deep Learning design. For instance, Wang et al., (2023)

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demonstrated that professional development involving AI-based lesson planning significantly improved teachers' self-efficacy and willingness to integrate technology into their pedagogy. Similarly, Garcia-Lopez and Martinez (2022) found that teachers trained to use generative AI systems reported greater creativity in designing assessments and more diverse modes of student engagement. On the other hand, research has also revealed persistent barriers: limited digital literacy, lack of institutional support, and concerns about the ethical use of AI remain formidable problems in many school settings (Lee & Kim, 2021; UNESCO, 2020).

A situational analysis at SMP Negeri 5 Indralaya Utara further confirms these challenges. Field observations and interviews with school leaders and teachers revealed that, despite relatively stable internet access, classroom practices remain largely conventional. Teachers expressed limited familiarity with AI-enhanced instructional design; their lesson planning does not currently leverage generative tools like ChatGPT for creating learning tasks, assessments, or differentiated content. This is consistent with previous findings indicating that many educators lack both the confidence and the training to effectively use AI in pedagogical contexts (Miller et al., 2021).

Given these conditions, there is an urgent need for a targeted professional development initiative. Strengthening teacher competence in understanding and applying AI for Deep Learning-based lesson plan development is essential. Equally important is enhancing their technological literacy so they can leverage digital media and collaborative platforms effectively. This community service program is therefore designed with two primary objectives: (1) to improve teachers' competence in applying AI in the creation of Deep Learning-oriented lesson plans, and (2) to elevate their technological literacy so that digital instructional media can be utilized more fully in classroom practice.

By addressing these objectives, the program aims to bridge the gap between current teacher practices and the potential for AI-driven, conceptually rich pedagogy. Ultimately, this initiative seeks to foster innovation, adaptability, and reflective instructional design that aligns with the demands of Education 5.0, equipping teachers to support meaningful, student-centered learning in the age of artificial intelligence.

## Method

This community service program was designed as a strategic solution to enhance the competence of teachers at SMP Negeri 5 Indralaya Utara in utilizing modern educational technologies, particularly AI, and applying Deep Learning approaches in lesson planning.

The methodology integrates a structured sequence of activities aimed at developing both technological literacy and pedagogical skills.

The program began with a pretest assessment to evaluate the teachers' initial understanding of technology literacy, AI concepts in education, and their ability to design lesson plans emphasizing conceptual depth. This baseline assessment helped identify competency gaps and informed the customization of the subsequent training activities.

Following the pretest, teachers received a structured introduction and theoretical orientation covering the role of AI in lesson plan development, strategies for creating high-order thinking indicators, and the principles of Deep Learning-oriented instructional design. This phase provided a conceptual framework that prepared teachers for the practical application of AI tools in designing learning experiences.

Next, teachers participated in hands-on workshop sessions where they applied AI tools to generate learning objectives aligned with higher-order thinking skills, design learning activities that encourage elaboration, analysis, reflection, and concept application, and develop assessments supporting Deep Learning principles. These practical exercises allowed teachers to translate theoretical knowledge into actionable lesson plan components under direct guidance from facilitators.

During the collaborative lesson plan development and mentoring stage, teachers drafted Deep Learning-based lesson plans (RPPs) with continuous support from the facilitation team. Collaborative activities included peer reviews, idea exchanges, and integration of digital learning platforms to strengthen technological literacy. This iterative process emphasized both individual skill development and collective pedagogical innovation.

Once the RPPs were completed, teachers presented their lesson designs to the facilitators and their peers to receive constructive feedback. This reflective process helped refine learning objectives, activities, and assessment strategies while reinforcing the practical application of AI and Deep Learning principles in classroom settings.

Finally, the program concluded with a posttest, reflection sessions, and sustainability planning. The posttest measured improvements in teachers' competencies, while reflection sessions encouraged teachers to evaluate the effectiveness of their lesson designs. Sustainability planning involved forming school-based working groups to ensure ongoing practice and integration of AI, technological literacy, and Deep Learning-oriented instructional design into routine teaching practices. Overall, the methodology employed a practice-oriented, participatory approach combining

assessment, structured learning, hands-on application, collaborative mentoring, reflective feedback, and sustainability planning to ensure measurable improvements in both technological and pedagogical competencies.

The evaluation aims to determine the level of improvement of teachers regarding deep learning after participating in the training program. The evaluation is conducted using pretest and posttest instruments. To measure the magnitude of teachers' improvement in understanding deep learning based on the pretest-posttest results, the Normalized Gain (N-Gain) analysis is applied, as shown in Equation (1).

$$\langle g \rangle = \frac{(\text{Posttest Score}) - (\text{Pretest Score})}{(\text{Ideal Score}) - (\text{Pretest Score})} \quad (1)$$

The interpretation of the N-Gain score is categorized as shown in Table 1 (Hake, 1999).

**Table 1.** Interpretation Categories of N-Gain

N-Gain Score	Category
$\langle g \rangle \geq 0.70$	High
$0.30 \leq \langle g \rangle \leq 0.70$	Medium
$\langle g \rangle < 0.30$	Low

## Result and Discussion

The community service activity attended by 10 teachers from SMP Negeri 5 Indralaya Utara yielded *deep learning* scores, as presented in Table 2.

**Table 2.** Summary of Pre-test, Post-test, and N-Gain Result

Component	Average Score
Pretest	66
Posttest	84
N-Gain	0.53 (Medium)

Table 2 shows that the average N-Gain is 0.53, which, according to Hake (1999), falls into the medium category since it is within the range of  $0.30 \leq g \leq 0.70$ . This indicates that the training program was sufficiently effective in improving the teachers' understanding of designing deep learning-based instructional materials supported by artificial intelligence.

The training results demonstrated a substantial improvement in teachers' ability to comprehend concepts and implement Deep Learning-based instructional designs with the support of ChatGPT as an AI technology. The average N-Gain score of 0.53, categorized as medium, reflects that the training contributed meaningfully to enhancing teachers' understanding and skills, although there remains room for further improvement. This improvement suggests

that practice-based interventions, direct examples, and mentoring in preparing lesson plan components (RPP) can measurably enhance the quality of instructional design.

After participating in the training, teachers showed improved competence in (1) Formulating learning objectives oriented toward higher-order thinking processes, (2) Designing learning activities that stimulate analysis, exploration, and deep reflection, and (3) Utilizing ChatGPT to generate activity ideas, contextual questions, differentiated instructions, and supporting teaching materials, which were subsequently incorporated into RPPs aligned with the Kurikulum Merdeka.

This indicates that teachers are beginning to transition from knowledge-transfer-based teaching toward approaches emphasizing meaning construction, dialogic learning, and more complex cognitive experiences consistent with Deep Learning principles.

These findings align with Rahmawati (2024), who emphasized that the use of ChatGPT can enhance teachers' creativity in designing instructional materials, broaden the variety of learning media, and increase pedagogical flexibility in addressing students' learning needs. Similarly, Prasetyo (2023) reported that integrating AI in learning encourages teachers to be more adaptive and reflective while enabling them to develop teaching strategies that facilitate gradual reasoning and concept development.

The improvement in teachers' understanding, as reflected in the training outcomes, supports Yusuf (2021), who stated that hands-on, practice-based training is significantly more effective in boosting teachers' confidence and digital competence compared to purely theoretical training without application. The training also demonstrated participatory and collaborative dynamics among teachers, consistent with Nurdin (2020), who highlighted the importance of active engagement approaches for sustainable implementation of instructional innovations in schools.

Overall, these achievements show that the training not only enhanced technological skills but also strengthened teachers' pedagogical capacity to design meaningful learning experiences in line with Deep Learning principles. Teachers began to perceive ChatGPT not merely as a content automation tool but as a reflective partner in pedagogical thinking, higher-order questioning, and developing more contextual and humanistic RPPs. Consequently, this program provides a critical foundation for transforming the role of teachers in the era of artificial intelligence, while also opening opportunities for further development toward more innovative, adaptive, and student-centered learning.

## Conclusion

The community service program at SMP Negeri 5 Indralaya Utara effectively enhanced teachers' competence in designing Deep Learning-oriented lesson plans supported by AI, particularly ChatGPT. The evaluation results, with an average N-Gain of 0.53, indicate a moderate level of improvement, demonstrating significant gains in formulating higher-order learning objectives, designing reflective and analytical learning activities, and employing AI to generate contextualized instructional materials. The training facilitated a transition from traditional knowledge-transfer approaches to constructivist, student-centered practices, positioning AI as a reflective pedagogical partner rather than a mere automation tool.

To sustain and further develop these competencies, it is recommended that ongoing professional development initiatives continue to strengthen teachers' technological literacy and pedagogical skills. Future programs should integrate regular mentoring, collaborative lesson plan development, and iterative feedback processes to consolidate the effective application of AI in Deep Learning-oriented instruction. Continued practice, institutional support, and a structured framework for reflection will be essential to embed AI, student-centered teaching, ensuring that learning experiences remain meaningful, adaptive, and aligned with the principles of Education 5.0.

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