In House Training on the Use of AI with Gemini in the Implementation of the Independent Curriculum at SMP Negeri 1 Bahorok

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Kata Kunci
Artificial Intelligence
Kurikulum Merdeka
Gemini

Abstrak

Kegiatan In House Training (IHT) yang diselenggarakan di SMP Negeri 1 Bahorok bertujuan untuk meningkatkan literasi digital dan keterampilan guru dalam memanfaatkan kecerdasan buatan (Artificial Intelligence/AI) melalui platform Gemini dalam mendukung implementasi Kurikulum Merdeka. Pelatihan ini dilaksanakan selama dua hari dan melibatkan seluruh guru sebagai peserta aktif. Hasil pre-test dan post-test menunjukkan peningkatan signifikan dalam pemahaman peserta terhadap penggunaan AI dalam pendidikan, dengan rata-rata skor meningkat dari 58,3 menjadi 83,7. Data kualitatif menunjukkan bahwa pelatihan ini meningkatkan kepercayaan diri guru dalam menyusun modul ajar berdiferensiasi dan asesmen diagnostik berbantuan AI. Pelatihan ini merekomendasikan penguatan infrastruktur serta pelatihan lanjutan berbasis praktik langsung.

Keywords
Artificial Intelligence
Merdeka Curriculum
Gemini

Abstract

The In House Training (IHT) activity held at SMP Negeri 1 Bahorok aims to improve digital literacy and teacher skills in utilizing artificial intelligence (AI) through the Gemini platform in supporting the implementation of the Merdeka Curriculum. This training was carried out for two days and involved all teachers as active participants. The results of the pre-test and post-test showed a significant increase in participants' understanding of the use of AI in education, with an average score increasing from 58.3 to 83.7. Qualitative data showed that this training increased teacher confidence in compiling differentiated teaching modules and AI-assisted diagnostic assessments. This training recommends strengthening infrastructure and further training based on direct practice.

1. Introduction

The Independent Curriculum, as stated by the Ministry of Education, Culture, Research, and Technology (2022), requires junior high school teachers to conduct initial assessments, develop differentiated teaching modules, and reflect on adaptive, student-centered learning. However, the implementation of these principles still faces various obstacles, particularly low digital literacy and teachers' limited experience in utilizing artificial intelligence (AI) such as the Gemini platform (Yulianti, 2022). In this context, Technology-Based Learning Theory is a crucial foundation, emphasizing that technology, including AI, can improve the efficiency, effectiveness, and personalization of learning. AI enables teachers to develop adaptive assessments, create modules tailored to student needs, and reflect on teaching practices based on data. The innovation adoption theory (Rogers, 2003) also explains how teachers navigate the process of introducing, evaluating, and ultimately implementing AI in learning. However, many teachers remain stuck at the initial stage due to a lack of training and support.

A national study by Rahmawati (2023) showed that AI training can improve teacher competency, but the spread of implementation within the Merdeka Curriculum framework remains limited. The TPACK (Technological Pedagogical Content Knowledge) model is also relevant, as the effectiveness of AI use such as Gemini depends not only on mastery of the technology, but also on pedagogical understanding and teaching materials. In the local context, North Sumatra Province has demonstrated progressive initiatives, such as the workshop "Creating Differentiated Teaching Modules Using AI" by BBGP North Sumatra on July 25, 2024, which was attended by around 100 junior high school teachers. Furthermore, the ICT utilization training held by BBGP North Sumatra in April and May 2024, as well as the TEFLIN UINSU workshop on October 5, 2024 for English teachers, further expand digital literacy and familiarity with AI in the learning context.

While these trainings mark progress, empirical evaluations of the impact of using AI platforms like Gemini on initial assessments, adaptive module development, and learning reflection are still lacking.

No literature has quantitatively measured the correlation between teachers' digital literacy, AI adoption rates, and learning quality within the Independent Curriculum. Furthermore, longitudinal studies considering infrastructure readiness, ethical AI use, and student data privacy protection are limited. In this regard, the Technology Readiness Index (Technology Readiness Index – Parasuraman, 2000) can explain how teachers' perceptions of technology, both optimism and anxiety, influence the success of AI implementation. Constructivist theories, such as those proposed by Piaget and Vygotsky, emphasize that AI can enhance active, collaborative, and differentiated learning when used appropriately. Therefore, this article plays a strategic role by providing theoretical analysis and empirical data, both from trainings in North Sumatra and national contexts, including from Gemini Academy, which has reached over 200,000 teachers. This approach is expected to be an important contribution in bridging the gap between the Independent Curriculum policy and the actual practice of AI-based learning in schools.

2. Method

2.1 Activity Design

This writing uses a descriptive qualitative approach with an action study method (action research) in the form In House Training (IHT). This activity aims to improve teacher competency in integrating application-based artificial intelligence (AI) technology. *Gemini* into learning in accordance with the principles of the Independent Curriculum.

2.2 Subject and Location

The participants were all 34 teachers at SMP Negeri 1 Bahorok, covering various subjects, such as Indonesian, Mathematics, Science, Social Studies, English, Civics, Arts and Culture, and Physical Education. The participants had diverse educational backgrounds, ranging in age from 28 to 55, and had teaching experience ranging from 3 to over 25 years. Prior to the training, an initial survey was conducted to assess participants' digital literacy and experience in using learning technology.

Survey results show that the majority of teachers (around 70%) have never used artificial intelligence (AI)-based platforms in their teaching activities. Approximately 60% of participants still use basic software such as Microsoft Word, PowerPoint, and Excel in their learning activities, relying on conventional lecture methods or written exercises. Only 15% of participants have used digital learning platforms such as Google Classroom, Canva for Education, or Quizizz, but their use is still limited and has not yet explored aspects of data-driven adaptive learning.

This relatively low level of technological expertise presents both a challenge and a key starting point in training planning. The IHT training materials are designed with a step-by-step approach, starting with an introduction to basic AI concepts and the Gemini platform interface, and progressing to practical application development for initial assessments and differentiated teaching modules aligned with the principles of the Independent Curriculum. Taking into account the participants' backgrounds, the training is tailored to be practical, interactive, and provides space for hands-on exploration of the Gemini application.

These diverse digital literacy backgrounds influenced the speed of adaptation and the achievement of training outcomes. Participants with prior experience with digital platforms grasped the Gemini interface more quickly and were able to develop more complex teaching modules. Meanwhile, participants unfamiliar with the technology required more guidance and exploration time. Nevertheless, the two-day training demonstrated a significant increase in teachers' confidence in using AI, as evidenced by the increasing number of teachers who were able to independently produce differentiated modules on the second day of training. The training took place in the teachers' lounge of SMP Negeri 1 Bahorok from July 14-15, 2024, with training facilities including projectors, internet connections, and individual laptops.

2.3 Activity Procedures

In House Training (IHT) activities are carried out in three main stages, namely:

- **Level 1: Advance IHT**

  The activity began with**pre-test**to identify teachers' initial understanding of the basic concepts of artificial intelligence (AI) and the principles of the Independent Curriculum. Afterward, the facilitator presented theoretical material on the role of technology, particularly AI, in transforming learning, as well as the urgency of differentiated, student-centered learning.

• **Stage 2: Technical Training**

At this stage, participants are introduced directly to **AI Gemini platform**. Technical training includes:

- ✔ Using Gemini to develop differentiated teaching modules;
- ✔ Application of AI for analysis of student learning outcomes, including the use of data processing and learning diagnosis features;
- ✔ AI-based adaptive assessment creation simulation, tailored to student characteristics.

During this stage, non-participatory observations were conducted by the author regarding participant interactions, responses to the material, and the technology exploration process demonstrated by the participants.

• **Stage 3: Independent Practice and Reflection**

Participants were asked to develop AI-based learning products relevant to their respective subjects. The results were then presented and discussed in an open forum, where other teachers provided feedback. At the end of the session, participants took a post-test and completed individual reflection sheets. Additionally, semi-structured interviews were conducted with a sample of teachers to explore their experiences during the training, challenges they faced, and perceptions of the benefits of using AI in learning.

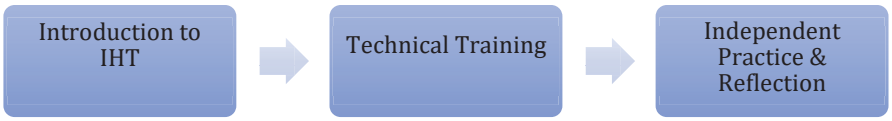

Figure 1. Stages of IHT Activities

2.4 Data Collection Techniques

Data is collected through four main techniques: participant observation, pre-test and post-test questionnaires, activity documentation, as well as semi-structured interviewswhich is done after training.

1. **Participatory Observation**
   Observations were conducted throughout the training, covering participant interactions, responses to materials, and engagement in practical sessions. Researchers systematically recorded participant behavior using observation sheets containing indicators of active participation, understanding of the material, and use of the Gemini AI platform. The data from these observations were analyzed using thematic analysis, starting with an open coding process (identifying behavioral patterns such as "initial difficulty accessing the platform" or "daring to try new features"), then axial coding (grouping into categories such as*initial resistance*, *active participation*, *change of attitude*), to selective coding to draw key conclusions about learning dynamics during training.

2. **Pre-Test and Post-Test Questionnaires**
   Pre-test and post-test instruments were used to measure participants' initial and final knowledge regarding the concept of AI in education and its application in the Independent Curriculum. The resulting data was quantitative and descriptive in nature and analyzed by calculating average scores and score differences to determine any improvement in understanding.

3. **Activity Documentation**
   Documentation includes photos, videos, participant work (teaching modules, AI-based assessments), and individual reflection sheets. These documents are used as supplementary data to support the results of observations and interviews. Analysis is conducted through**review the content** (content analysis), with a focus on evidence of participants' ability to apply AI in practice.

4. **Semi-Structured Interview**
   Interviews were conducted with several participants purposively after the training, with open-

ended questions about their experience attending the training, challenges in using AI, and their perceptions of its potential application.

2.5 Data Analysis

Data analysis in this study was conducted qualitatively and descriptively using manual thematic analysis with the aid of Microsoft Excel. This approach was chosen because it was easily accessible to field researchers and still allowed for systematic data organization and interpretation. The primary data analyzed came from semi-structured interview transcripts, field observation notes, and participant work documents during the training.

The analysis process is carried out in several stages as follows:

1. **Data Transcription**
   All data from interviews, group discussions, and observation notes during the training were manually transcribed into text format. Each data point was assigned a participant code (e.g., G1 for Teacher 1, G2 for Teacher 2, etc.) to maintain anonymity.

2. **Preparing an Analysis Matrix in Microsoft Excel**
   The researcher compiled a thematic analysis matrix in Excel with the following columns:

   - Participant Code,
   - Main Statement,
   - Open Code,
   - Category,
   - Temporary Theme, and
   - Analytical Commentary.

This helps trace the analysis trail and see patterns between participants.

3. **Open Coding**
   Researchers reread the data and began marking important pieces of information, such as participants' perceptions of AI, experiences with technical difficulties, responses to Gemini features, and so on. These pieces were labeled with initial codes such as *"never used AI"*, *"internet connection difficulties"*, or *"easy to understand Gemini display"*.

4. **Axial Coding**
   The initial codes are then grouped into larger categories such as:

   - Early experience using technology,
   - Technical and infrastructure constraints,
   - Response to AI training,
   - Changes in teacher perception.

These categories show relationships between data and help develop a thematic narrative.

5. **Selective Coding**
   After all the data was coded and categorized, the researcher compiled several**main theme** which represents the dynamics that occur during training, for example:

   - *The digital literacy gap in AI implementation*,
   - *Increased confidence in the use of learning technology*, And

- *The need for practical assistance in AI-based training*.

6. **Triangulation and Validation of Findings**
   To ensure data validity, triangulation was conducted between data sources: interviews, direct observations, and learning products. Informal validation (member checking) was also conducted by confirming data interpretations with several participating teachers.

3. Results and Discussion

Activity In House Training which was implemented over two days had a positive impact on improving teachers' understanding and skills in utilizing artificial intelligence technology (Artificial Intelligence/AI) especially through the platform Gemini.

Figure 2. Implementation of IHT

Figure 3. *Pre-Test* and *Post-Test*

The results obtained based on the pre-test and post-test showed an increase in the average comprehension score from 58.3 in the pre-test to 83.7 in the post-test. Statistical tests*paired sample t-test*shows a significance value (p) of 0.003 < 0.05, which means the increase is statistically significant.

Assessment	**Mean Score**
Pretest	58.3
Posttest	83.7
Difference	+25.4

Table 1. Average Pretest and Posttest Scores

The significant increase in teachers' understanding after participating in the training indicates that hands-on training interventions are an effective method for improving teachers' digital literacy, particularly in the use of AI. This supports the findings of Rahmawati (2023) who stated that*"AI training based on hands-on practice can improve teachers' readiness in designing adaptive learning according to students' needs."*Furthermore, teachers' increased confidence in using Gemini demonstrates that the AI platform is accessible and relatively easy to learn with proper training. Fitriyani and Hidayat (2021) also stated that*"AI can help teachers develop teaching materials efficiently and personally, in accordance with the principles of differentiated learning."*These results also align with the principles of the Independent Curriculum, which emphasizes the importance of student-centered learning, through a differentiated approach based on students' needs, interests, and learning styles (Ministry of Education, Culture, Research, and Technology, 2022).

This training revealed several challenges in integrating AI into schools, such as limited hardware, unstable internet connections, and the low initial digital literacy of some participating teachers. As noted by Prasetyo and Lestari (2020),*"The biggest challenge in integrating AI in schools is infrastructure readiness and teacher adaptation to technological changes."*Not all features within the Gemini platform are fully contextualized to the needs of junior high school learning, requiring adjustments or further exploration by teachers. To address these challenges, the training implemented various strategic measures, such as forming small groups with peer coaching facilitators to help participants practice. The school also facilitated the use of computer labs and provided equipment loans to teachers who lacked adequate facilities. Unstable internet connections were addressed through the rotational use of subsidized data plans and personal hotspots.

The training materials were designed in modular formats accessible offline, such as PDFs and short video tutorials, so they could be learned even with limited connectivity. The Gemini platform was chosen for its user-friendly and lightweight interface, which doesn't require high device specifications. The trainers adapted the materials to the context of junior high school learning and encouraged teachers to modify the available templates to suit the curriculum's needs. In the final reflection session, participants were asked to identify personal barriers and the solutions they found, which were then used to develop follow-up training and refine the training modules.

Furthermore, active involvement from schools and related parties is crucial to reducing these barriers. Principals can support this by allocating dedicated time for digital experimentation through internal MGMP (Student Working Groups) and allocating BOS funds for equipment procurement and additional training. Partnerships with educational technology communities or universities can also strengthen knowledge transfer and technological updates. Training should be conducted in stages and tiers (scaffolding), from introduction to application in real-life learning contexts, with the level of difficulty tailored to the teacher's initial abilities. With structural support and an adaptive approach, the integration of technology such as AI into the learning process can be more effective, strengthening the implementation of the Independent Curriculum, which prioritizes the needs and potential of each student.

The implications of this training demonstrate the importance of developing advanced and ongoing training programs that are more tailored to field conditions. Furthermore, the integration of coaching and mentoring approaches among teachers within learning communities is highly recommended to strengthen technology practices in learning. Unlike conventional training models, which are generally one-way and theoretical, AI-based training, as implemented in this study, emphasizes hands-on practice, contextual exploration of technology, and solving real-life problems in the classroom. Conventional models often do not provide opportunities for teachers to directly test digital skills, thus limiting their impact on behavioral change and technological competency. On the other hand, AI training allows teachers to interact directly with digital tools, such as Gemini, and understand how these technologies can be applied in differentiated learning designs.

However, AI training also requires greater infrastructure and technical support than traditional training. While conventional training can be conducted offline without the need for sophisticated equipment, AI-based training requires stable internet access, digital devices, and the support of tech-savvy facilitators. Therefore, the selection of a training model needs to consider the initial readiness of teachers and the school environment. For further research, longitudinal studies are recommended that examine the impact of AI use on student learning outcomes and teacher work efficiency on an ongoing basis. These findings provide a strong basis for demonstrating that digital transformation in education does not depend solely on technological innovation but must be accompanied by adaptive school policies, ongoing training, and collaboration among educational stakeholders. Thus, AI-based training has great potential to become a more contextual and responsive alternative to current demands, but still needs to be synergized with a mature pedagogical approach and adequate systemic support.

3.1 Conclusion

AI-based training conducted through a hands-on approach has proven effective in improving teachers' digital literacy, particularly in utilizing technologies like Gemini to develop adaptive teaching tools. The training results demonstrated significant improvements in teachers' understanding and confidence, which also supported the implementation of differentiated learning principles as emphasized in the Independent Curriculum. However, the effectiveness of this training was significantly influenced by the participants' initial conditions and the school environment, such as device availability, internet connection quality, and teachers' level of digital readiness. Therefore, future training needs to be tailored to local challenges through several strategies.

First, training materials can be modularized for flexible access online and offline, depending on the infrastructure available at each school. Second, training should utilize lightweight and easy-to-use supporting applications, such as Canva, Google Forms, or Padlet, which can help teachers be creative without requiring high-spec devices. Third, training should also be designed as a hybrid format by integrating online and in-person sessions based on learning communities, so that teachers can mentor each other and share best practices. Furthermore, optimizing local resources, such as rotating device usage and collaborating with external parties (e.g., CSR or the Education Office), can be a solution to overcome limited resources.

Coaching and mentoring approaches between teachers after training are also crucial to ensure the sustainability of AI practices in learning. Community-based follow-up training programs and collaborative reflection will strengthen the technology's contextual application. Furthermore, training should be integrated with school curriculum development policies and programs to ensure its benefits are more structured and sustainable. Therefore, digital transformation in education relies not only on technology but also on local adaptation, ongoing training, and collaboration among educational stakeholders. These recommendations demonstrate that to create real change, training must be designed as a continuous, participatory process, tailored to the context of the school's needs and capabilities.

For future research, it is recommended that a focus be directed toward in-depth longitudinal studies to explore the long-term impact of AI use on teaching and learning processes in schools. This research is crucial to determine the extent to which the integration of AI technologies, such as the Gemini platform, can contribute sustainably to improving the quality of learning and teacher professionalism. Furthermore, a systematic evaluation of AI's impact on student learning outcomes needs to be conducted, taking into account indicators of academic achievement, student engagement, and critical and adaptive thinking skills. Further research should also consider contextual variables such as school background, infrastructure readiness, and school digital culture, to ensure more representative and applicable results. Thus, the study findings can provide a strong foundation for formulating educational technology policies that are inclusive, effective, and oriented toward future learning.

Author Contributions

Mestika Pudan Purba: Conceptualization, Data curation, Methodology, Investigation, Formal analysis, Visualization, Writing – original draft, Writing – review & editing, Supervision, Project administration.

The authors declare that all contributions to this research and the writing of the manuscript were made independently. The authors have read and approved the final manuscript.

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Declaration of Conflicting Interests

The authors declare that there are no financial or non-financial conflicts of interest that could have unduly influenced the results of the research or the writing of this article. The authors have no professional, financial, or personal relationships with any individuals or organizations that could be construed as having a potential conflict of interest related to this work.

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