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Adaptive Artificial Intelligence (AI) Utilization to Support Inclusive Learning for Prospective Primary School Teachers: Technology-Based Interactive Training

Hidayah [a)], Sukmawati, Ria Ristiani, Chelsi Yuliana, Marsuki, Achmad Ihwanul Fadil Dhiyaudin

Primary School Teacher Education Study Program, Cenderawasih University, Jayapura, Indonesia

[a)]Corresponding author: hidayahmarsuki2812@gmai.com

ABSTRACT

The training program "Adaptive AI Integration for Inclusive Learning: Training Prospective Elementary School Teachers" addresses the critical gap in teacher education curricula in Indonesia regarding the integration of adaptive AI technology for inclusive education, particularly for prospective teachers facing challenges in designing adaptive learning for diverse student needs. Conducted with 30 prospective teachers from Cenderawasih University's PGSD program who were undergoing Field Experience Practice (PPL) in Jayapura, Papua, the training employed a Participatory Rural Appraisal (PRA) method across three systematic stages: preparation, implementation, and reflection. Results demonstrated significant improvements across all competency indicators: conceptual understanding of inclusive learning increased by 62.5% (from 52.4 to 85.2), and 92% of participants successfully explained AI applications for elementary education, with 85% demonstrating practical mastery of at least two adaptive AI features. The program's key contribution lies in its successful integration of adaptive AI into inclusive education training, producing replicable training modules on "Designing Needs-Based Inclusive Lesson Plans" and "Utilizing Adaptive AI for Inclusive Learning," while fundamentally transforming participants' perceptions of AI from a potential threat to an empowering educational tool. This model offers a scalable blueprint for Teacher Training Institutions (LPTK) across Indonesia to enhance 21st-century teaching competencies and accelerate the implementation of technology-based inclusive education.

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INTRODUCTION

The implementation of inclusive education at Jayapura Elementary School, Papua, faces complex challenges due to the diversity of student characteristics that require a learning approach that is responsive to individual needs. Students at the Elementary School Teacher Education Study Program at Cenderawasih University who are undergoing Field Experience Practice (PPL) face significant obstacles in applying effective teaching practices to diverse classes.

Observations of PPL students in various elementary schools in Jayapura identified a critical gap: despite having a relatively good theoretical understanding, students found it difficult to translate this knowledge into practice. Limited opportunities for hands-on practice during college caused them to lack confidence in identifying diverse learning needs, designing curriculum adaptations, and implementing differentiated learning strategies. The context of Papua complicates these challenges. Limited technological infrastructure, minimal access to the latest technology-based training, and geographical conditions that hinder the equitable distribution of educational resources create unique gaps in preparing prospective teachers. Amidst a shortage of experienced mentors and observable models of inclusive learning, students need alternative training approaches that are both effective and accessible. Although artificial intelligence (AI) technology has been extensively researched in the context of global inclusive education, its application in the training of prospective teachers in Papua, especially for the context of differentiated learning in elementary schools, is still very limited. Based on in-depth observations, two priority issues were identified. First, limited practical skills in designing differentiated learning: difficulty identifying the diverse learning needs of students, developing lesson plans with clear adaptations, selecting responsive teaching methods and media, and managing the classroom with effective communication and empathy. Second, a lack of mastery of adaptive technology: minimal understanding of technology applications for basic education, limited skills in operating and integrating technology into learning, and an undeveloped mindset to see technology as an empowering tool. The training program "Utilizing Adaptive Artificial Intelligence to Support Inclusive Learning for Prospective Elementary School Teachers: Technology-Based Interactive Training" was designed with two main solutions:

First, intensive training in designing lesson plans based on learning needs with group and individual guidance. The training provides step-by-step guidance in formulating concrete lesson plans that accommodate student diversity, including the formulation of learning objectives that are accessible to all students, the development of differentiated success indicators, the selection of responsive teaching methods and media, and the design of flexible learning activities. Target achievements: a 75% improvement in the quality of lesson plans, 80% of participants mastering at least 4 different learning strategies, and 70% of participants being able to design 2 adaptive assessment tools.

Second, training in interactive adaptive technology through an introduction to basic concepts, demonstrations of relevant applications, and practice integrating them into lesson plans. Participants are introduced to the mechanisms and benefits of adaptive technology in supporting differentiated learning, including the use of interactive digital platforms and microsite technology for delivering personalized material. The training session included demonstrations of various applications/platforms for basic education and practice in using basic features, followed by integration into lesson plans that focused on content personalization, task differentiation, and the provision of adaptive feedback. Target: 80% of participants mastered at least 3 applications for elementary schools, a 25% increase in pre-test scores, and 70% of lesson plans showed the integration of relevant technology.

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The main objective of this activity is to improve students' knowledge and practical skills in integrating adaptive technology applications for learning that is responsive to student diversity. This program benefits students by improving their conceptual and practical competencies; the PGSD Study Program by obtaining empirical data on the needs for implementing responsive teaching practices; and partner elementary schools by obtaining prospective teachers who are more competent in managing heterogeneous classes.

This activity contributes to the University's Key Performance Indicators (KPIs) by enhancing student experiences outside the campus, the quality of teaching staff, partnerships with schools, and solutions to community problems. Research support from Adeleye et al. (2024), Saputra et al. (2024), Ismail et al. (2024), and Handayani & Septia (2024) proves the effectiveness of the adaptive technology approach, with an increase of up to 85% in academic achievement and a satisfaction rate of 82%. This training is a strategic step in empowering prospective Papuan teachers with 21st-century competencies to create personalized and effective learning for all students.

METHOD

The method applied in this training is the Participatory Rural Appraisal (PRA) approach, which emphasizes active community involvement in all stages, from problem identification to solution implementation and evaluation. This method is divided into three stages: Preparation, Implementation, and Reflection (Marsuki et al., 2023).

Research Sample

This training involved 30 elementary school teacher education (PGSD) students from Cenderawasih University who will carry out teaching practice in schools. The sample was selected purposively based on the criteria of students who are preparing for teaching practice and have access to digital technology.

Preparation Stage

The preparation stage includes: (1) Internal coordination for conceptual planning and determining the location and time of implementation in accordance with student availability; (2) Development of a comprehensive training module covering inclusive learning concepts, identification of student learning needs, and strategies for utilizing and integrating adaptive artificial intelligence (AI) for personalized learning experiences (Liu 2024; Abbas et al. 2023); (3) Preparation of tools, materials, and training socialization; (4) Development of pre-training instruments (pre-tests) in the form of questionnaires with a Likert scale to measure the level of understanding and confidence, as well as knowledge tests (multiple choice and short essays) on the concepts of inclusive learning and the use of adaptive AI.

Implementation Stage

The training was conducted face-to-face over two days with the following activities: (1) Opening and introduction to the program; (2) Presentation of four interactive topics combining theory and practice by the community service team according to their respective areas of expertise; (3) Hands-on practice in

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small groups to use adaptive AI applications, customize learning materials with AI features, and design an AI-integrated inclusive learning implementation plan; (4) Individual guidance and consultation to facilitate in-depth understanding through direct question and answer sessions. The development of prospective teachers' professional competencies in this training is in line with the research by Febriana et al., which states that professional competencies play an important role in increasing teachers' confidence and learning effectiveness (Febriana et al. 2020). At the end of the program, there was a closing session with a summary of the material, the completion of a post-training instrument (post-test) identical to the pre-test to measure changes in knowledge and skills, and the completion of a qualitative evaluation questionnaire containing open-ended questions about the learning experience, the benefits of the training, challenges, and suggestions for improvement.

Reflection and Data Analysis Stage

The reflection stage was conducted after the training to analyze the results and plan follow-up actions. Final data collection was carried out through the distribution of post-test instruments identical to those used in the pre-training to enable direct comparison. **Quantitative Data Analysis**. Pre-test and post-test data were analyzed using descriptive statistics (mean, standard deviation, and percentage increase) to measure changes in participants' knowledge and skills. A paired sample t-test was used to test the significance of the difference in scores before and after training. The data was then visualized in graph form to clearly show changes in participants' competencies. **Qualitative Data Analysis**. Qualitative feedback from the evaluation questionnaire was analyzed using thematic analysis to identify patterns, main themes, and categories of participant responses. Coding was performed to group data based on program strengths, weaknesses, implementation challenges, and suggestions for improvement. The results of the thematic analysis were then used to complement the quantitative findings and provide an in-depth understanding of the participants' learning experiences. Data triangulation from pre-tests, post-tests, and qualitative feedback was conducted to validate the findings and gain a comprehensive understanding of the effectiveness and impact of the training.

The results of this analysis form the basis of a report that documents the entire training process, the achievement of objectives, challenges, and recommendations. Follow-up includes planning for the development of advanced modules, additional guidance, and improvements to the training design based on the evaluation findings.

RESULT AND DISCUSSION

Results

The training activity was held in Jayapura, Papua, involving PGSD students from Cenderawasih University who were participating in the Field Experience Program (PPL). The preparation stage began with a preliminary survey, which showed that most prospective teachers had a limited understanding of adaptive AI and its application in inclusive learning. The service team prepared facilities in the form of computers/laptops, internet access, and training materials tailored to the local context of Papua. The activities were conducted interactively using a Participatory Rural Appraisal (PRA) approach through adaptive AI platform demonstration sessions, group discussions, real case studies from the context of Papuan elementary schools, and hands-on practice in designing AI-based inclusive learning. Participants showed great enthusiasm when trying out the AI application and discussing their field challenges, especially in identifying individual student needs and designing differentiated learning

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strategies.

The dynamics during the training revealed the need to adjust the learning pace as some participants needed more time to understand the technical concepts of AI. The facilitators responded by adding individual mentoring sessions and simplifying the technical terminology to make it more contextual. Participants actively shared their experiences regarding student conditions at their teaching practice schools, which were then integrated into training case studies. During the reflection stage, evaluations were conducted through post-training questionnaires and focus group discussions, where participants presented the AI-based inclusive learning designs they had created. The presentations showed that participants were able to identify the characteristics of students with special needs, select appropriate AI tools, and design more adaptive learning scenarios than before the training. Based on data analysis from the pre- and post-training questionnaires, significant results were found in addressing priority issues.

Improving Practical Skills in Designing Differentiated Inclusive Learning

Practical skills in designing diverse, inclusive learning have yielded several results, as shown in Table 1.

TABLE 1. Discussion for Aligning Perceptions and Plaque Representation

Competency Aspects	Pre-Training	Post-Training	Target	Status
Understanding of the Concept of Inclusion	52,4	85,2	100%	32,8 points
In-depth Understanding of Differentiated Teaching Principles with Concrete Examples	48%	90%	80%	Exceeded +10%
Quality of Inclusive Learning Implementation Plan	42%	78%	75%	Exceeded +3%
Mastery of Differentiated Learning Strategies (Min. 4 Strategies with Examples)	45%	85%	80%	Exceeded +5%
Ability to Design Assessment Tools that Accommodate Student Differences (Min. 2Tools)	40%	75%	70%	Exceeded +5%

The training evaluation results show a significant improvement in all aspects of competence with an average increase of 32.8-42 percentage points, where understanding of the concept of inclusion increased from 52.4 to 85.2, in-depth understanding of differentiated teaching principles increased from 48% to 90% (exceeding the target of 80%), the quality of inclusive learning implementation plans increased from 42% to 78% (exceeding the target of 75%), mastery of differentiated learning strategies increased from 45% to 85% (exceeding the target of 80%), and the ability to design assessment tools that accommodate student differences increased from 40% to 75% (exceeding the target of 70%). These achievements prove the effectiveness of the training in transforming theoretical understanding into practical skills, with 90% of participants able to provide concrete examples of differentiated teaching, 85% of participants mastering at least four differentiation strategies, and 75% of participants successfully developing at least two innovative assessment instruments such as portfolio-based assessment, authentic assessment, differentiation rubrics, and alternative assessments, marking the

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successful transformation of prospective teachers' competencies that not only met but exceeded the set targets and were ready to be implemented in the field.

Improved Mastery of Adaptive AI Technology Utilization

The results of AI training for inclusive learning on the data obtained showed a significant improvement, as shown in Table 2.

TABLE 2. Results of AI Training for Inclusive Learning

Indicator	Pre-Training	Post-Training	Target	Status
Adaptive AI concept comprehension score	50%	85%	75%	Increasing
Ability to explain AI applications for elementary schools	15%	92%	80%	Increasing
Demonstration of AI feature usage	0%	85%	80%	Increasing
Integration of AI into learning plans	20%	75%	70%	Increasing

The training evaluation results show a significant improvement in all indicators, with the adaptive AI concept comprehension score increasing from 50% to 85% (exceeding the target of 75%), the ability to explain AI applications for elementary schools jumped from 15% to 92% (exceeding the target of 80%), the skill of demonstrating the use of AI features transformed from 0% to 85% (exceeding the target of 80%), and the ability to integrate AI into lesson plans increased from 20% to 75% (exceeding the target of 70%), proving that the training successfully equipped prospective teachers with comprehensive adaptive AI technology literacy to support the implementation of inclusive learning in elementary schools.

Discussion

The results of this training show that with the right program design, educators can significantly develop differentiated inclusive learning competencies in a relatively short period of time. This is in line with research by Suwahyo et al., who found that assistive technology can be very effective in supporting students with special needs in inclusive education environments, reducing any barriers that may exist (Suwahyo et al. 2022). The achievement of targets on various indicators shows that participants not only absorbed the training material but also developed the ability to innovate and adapt to their respective learning contexts. Febriani et al. highlight how ICT-based learning media improve the learning process for students and facilitate access to information, which supports the achievement of targets on various indicators (Febriani et al. 2023). Unlike conventional Teacher Professional Education (PPG) programs in Indonesia, which tend to focus on theoretical aspects, this training integrates field practice experience with adaptive technology mastery simultaneously, in line with the practice-based teacher education model in countries such as Finland and Singapore. The combination of strengthening conceptual understanding, developing practical skills, and providing individual guidance has proven to be an effective formula for transforming educators' competencies.

The success of this program provides a strong foundation as a replicable model for other teacher education institutions in Indonesia. Key factors that make this program a potential national model

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include: (1) a training design that can be adapted to the local context while maintaining high quality standards; (2) the use of adaptive AI technology that is cost-effective and accessible to various institutions; (3) integration with existing field experience programs, eliminating the need for massive structural changes; and (4) alignment with Higher Education Key Performance Indicators (KPIs). The comprehensive improvements achieved in various aspects of the evaluation prove that the technology-based interactive training approach not only improves participants' technological literacy but also successfully changes prospective teachers' paradigm regarding the role of AI technology in education from a threat to a learning empowerment tool. This change in mindset is key to the successful implementation of adaptive AI technology in sustainable, inclusive learning practices, an aspect that is often overlooked in conventional teacher training programs in Indonesia. This success is reflected in concrete outputs in the form of training modules entitled “Designing an Implementation Plan for Needs-Based Inclusive Learning” and “Using Adaptive AI for Inclusive Learning,” as well as plans to publish scientific articles in Sinta 4 journals by October 2025, which will enrich the national literature.

Overall, this training has successfully equipped elementary school teacher education students at Cenderawasih University who have carried out field experience practices with competencies in accordance with Higher Education IKU, particularly in preparing prospective teachers who are able to apply adaptive technology-based inclusive learning. AI technology can personalize the learning experience by adjusting the curriculum to the individual needs of students, thereby optimizing the learning process and improving academic achievement (Zhumazhan et al., 2024) (Yang, 2025), which is known as a key strategy in the implementation of inclusive education (Mahdi et al. 2021). The long-term impact of this program is expected to improve the quality of basic education not only in Papua but also nationally if replicated systematically. As a model teacher education program, this training offers a blueprint that can be adopted by Teacher Training Institutions (LPTK) throughout Indonesia to address the challenges of 21st-century education, which requires teachers to not only be pedagogically competent but also able to utilize technology to create inclusive and differentiated learning. The sustainability of the program can be maintained through a continuous mentoring system and the formation of a community of practice among training alumni as a multiplier effect to expand the program's impact.

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FIGURE 1. Implementation of Activities

CONCLUSION

Based on training results that exceeded targets across all evaluation indicators, the program recommends three key strategies for sustainability and replication: first, permanently integrating the adaptive AI curriculum into compulsory courses in the PGSD study program so that technological literacy becomes a standard competency for prospective teachers; second, establishing a continuous mentoring system through a community of practice of training alumni who serve as mentors for the next batch and maintain the sustainability of AI-based inclusive learning in partner schools; and third, developing an integrated digital platform that provides training modules, a bank of adaptive AI applications, and a forum for collaboration among participants to facilitate the sharing of good practices and learning innovations. The success of this program in transforming the competencies of prospective teachers from theoretical understanding to practical skills that are ready to be applied, coupled with the availability of concrete outputs in the form of training modules and scientific publication plans, makes this technology-based interactive training model highly relevant for national adoption. This model can be applied across all Teacher Education Institutions (LPTK) in Indonesia to accelerate the transformation of AI-based inclusive education in line with the demands of 21st-century education and Key Performance Indicators for Higher Education.

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REFERENCES

Abbas, N., Ali, I., Manzoor, R., Hussain, T., & Hussain, M. H. A. L. i. (2023). Role of Artificial Intelligence Tools in Enhancing Students' Educational Performance at Higher Levels. Journal of Artificial Intelligence Machine Learning and Neural Network, (35), 36–49. https://doi.org/10.55529/jaimlnn.35.36.49

Adeleye, O. O., Eden, C. A., & Adeniyi, I. S. (2024). Innovative teaching methodologies in the era of artificial intelligence: A review of inclusive educational practices. World Journal of Advanced Engineering Technology and Sciences, 11(2), 069–079. https://doi.org/10.30574/wjaets.2024.11.2.0091

Ali, A., & Korwa, L. F. (2024). Pelatihan media interaktif Google Earth bagi guru SD Inpres SKP F3 Arso. Jubaedah: Jurnal Pengabdian dan Edukasi Sekolah. https://doi.org/10.46306/jub.v4i3.246

Budi Minarti, I., Nurwahyunani, A., Citraning Rachmawati, R., Kaswinarni, F., Studi Pendidikan Biologi, P., & Kunci, K. (2025). Pelatihan Artificial Intelligence (Ai) Sebagai Upaya Peningkatan Kompetensi Guru Di Sman 1 Mranggen Demak. Doi: 10.31004/cdj.v6i1.42660

Cheong Kee Sin, A., & Mohd Barkhaya, N. M. (2024). Innovations of AI in primary school's learning. Dalam Advances in educational technologies and instructional design book series (hlm. 145–164). IGI Global. https://doi.org/10.4018/979-8-3693-7255-5.ch006

Damhuri, P., Darlian, L., Sabilu, M., & Kolaka, L. (2025). Mutu Pendidikan Berkelanjutan melalui Pembelajaran Berbasis Kebutuhan Siswa dengan Teknologi Adaptif. Amal Ilmiah: Jurnal Pengabdian Kepada Masyarakat, 6(2). https://doi.org/10.36709/amalilmiah.v6i2.345

Febriana, E. P., Listiani, T., & Sitompul, H. (2020). Pentingnya kompetensi profesional bagi mahasiswa calon guru Kristen dalam kegiatan pembelajaran matematika [The importance of profesional competence for pre-service Christian teacher1s in mathematics learning activities]. Polyglot Jurnal Ilmiah. https://doi.org/10.19166/pji.v17i1.2442

Febriani, A., Azizah, Y., Satria, N., & Putri, D. A. E. (2023). Penggunaan media pembelajaran berbasis TIK oleh guru sebagai media pembelajaran yang menarik. https://doi.org/10.55352/edu.v1i1.512

Handayani, U. F., & Septia, T. (2024). Pelatihan pemanfaatan artificial intelligence dalam pembelajaran untuk guru SD/MI di Kalipare. https://doi.org/10.35897/jurnalaksiafirmasi.v5i2.1501

Hidayah, P., et al. (2025). Strategi pembelajaran di sekolah dasar. Sonpedia. www.buku.sonpedia.com

https://doi.org/10.35568/abdimas.v8i4.7226

Ismail, A., Andriyati, Y., Febriani, N., & Kristin Rahel, H. (2024). Efektivitas robot AI adaptif dalam mendukung pembelajaran inklusif bagi mahasiswa dengan learning disabilities di Universitas Darwan Ali. https://doi.org/10.59188/jcs.v3i12.2912

Liu, L. (2024). Survey and analysis of primary school teachers' use of generative artificial intelligence. Lecture Notes in Education Psychology and Public Media, 74(1), 43–52. https://doi.org/10.54254/2753-7048/2024.bo17693

Marsuki, P., Widyanto, Z., Petrus Maniagasi, M., Abdul Muhaemin, I., & Syaiful, A. (2023). Penggunaan aplikasi Canva sebagai strategi untuk meningkatkan technological knowledge guru Penjas di Kota Jayapura. ADM: Jurnal Abdi Dosen dan Mahasiswa, 1(2), 229–234. https://doi.org/10.0000/adm

Mukti, H., Arnyana, I. B. P., & Dantes, N. (2023). Analisis pendidikan inklusif: Kendala dan solusi dalam implementasinya. Kaganga Jurnal Pendidikan Sejarah Dan Riset Sosial-Humaniora. https://doi.org/10.31539/kaganga.v6i2.8559

Saputra, E. R., Hamzah, R. M., Mulyati, S., Hazwati Binti Zaini, S., Guru, P., & Dasar, S. (t.t.). PARTA: Jurnal Pengabdian Kepada Masyarakat Pelatihan Rancang Modul Ajar Berdiferensiasi Dengan Artificial Intelligence Untuk Guru Di Tasikmalaya History Artikel. PARTA: Jurnal Pengabdian Kepada Masyarakat. https://doi.org/10.38043/parta.v5i2.5609

Suwahyo, B. W., Setyosarı, P., & Praherdhiono, H. (2022). Pemanfaatan teknologi asistif dalam pendidikan inklusif. Edcomtech Jurnal Kajian Teknologi Pendidikan. https://doi.org/10.17977/um039v7i12022p055

Zhumazhan, B. A., Zhumadilova, M. B., & Abdykerimova, E. (2024). The future of artificial intelligence in inclusive education. Yessenov Science Journal, 48(3), 63–70. https://doi.org/10.56525/amwi6491.

https://doi.org/10.35568/abdimas.v8i4.7226