Available online at: http://journal.uny.ac.id/index.php/jppm

JPPM (Jurnal Pendidikan dan Pemberdayaan Masyarakat)
11 (2), 2024, 144-157

Analysis of Generative AI Adoption in Self-Directed Learning Among Kejar Paket B Students at SKB Sidoarjo

Alberic Kencana Adhi Pradana[1*], Sjafiatul Mardliyah[2], Wiwin Yulianingsih[3]
[1,2,3]Universitas Negeri Surabaya, Indonesia
Lidah Wetan St., Surabaya 60213, Indonesia
*Author Correspondence. Email: albericpradana@gmail.com, Phone.: +6289699629161

Received: 05 February 2024; Revised: 04 March 2024; Accepted: 21 November 2024

Abstract: This research analyzes the adoption of Generative Artificial Intelligence (Generative AI) in self-directed learning among Kejar Paket B students at Sanggar Kegiatan Belajar (SKB) Sidoarjo. Employing a qualitative descriptive-analytic approach, data was collected through in-depth interviews, participant observation, and document analysis to explore the experiences of students, tutors, and policymakers. The findings indicate that Generative AI plays a significant role in enhancing accessibility to materials, learning flexibility, and student motivation through interactive explanations and instant feedback. However, the adoption of this technology faces complex challenges, such as student dependency on AI outputs, tutor resistance due to limited technical-pedagogical training, and the risk of content inaccuracies. The findings also reveal tutors' strategies in limiting the use of technology and the role of policymakers through tiered training and flexible regulations. Theoretically, this research reinforces the relevance of constructivist theory and the Diffusion of Innovations Theory, emphasizing the importance of technology alignment with local needs, learning scaffolding, and a balance between innovation and human interaction. Practical implications include recommendations for comprehensive training for tutors, development of adaptive curriculum-based guidelines, periodic evaluation to minimize risks, and multidisciplinary collaboration in formulating holistic policies. This research contributes to understanding the dynamics of AI adoption in non-formal education with limited infrastructure and diverse student backgrounds, while offering inclusive solutions to maximize the potential of technology without sacrificing pedagogical values.
Keywords: generative ai, self-directed learning, non-formal education, technology adoption

How to Cite: Pradana et al., (2024). Analysis of Generative AI Adoption in Self-Directed Learning Among Kejar Paket B Students at SKB Sidoarjo. *JPPM (Jurnal Pendidikan dan Pemberdayaan Masyarakat), 11* (2), 144-157. doi: https://doi.org/10.21831/jppm.v11i2.82969

INTRODUCTION

The advancement of digital technology has brought about significant transformations in various sectors, including education. One of the latest innovations that has captured attention is Generative Artificial Intelligence (Generative AI), a technology capable of generating new content such as text, images, and simulations based on previously trained data (Brown et al., 2020). Generative AI, such as ChatGPT, has shown great potential in supporting the learning process, especially in the context of self-directed learning, which is a hallmark of non-formal education (Fui-Hoon Nah et al., 2023).

Non-formal education, such as the Kejar Paket B program, is designed to provide learning opportunities for individuals who cannot access formal education due to various reasons, such as limited time, finances, or geographic constraints. This program emphasizes flexibility and self-directed learning, where learners take full responsibility for their learning

process (Suryono & Tohani, 2016). However, challenges such as limited learning resources, lack of intensive mentoring, and difficulties in understanding abstract concepts often hinder the effectiveness of learning (Darmawan et al., 2024). In this context, Generative AI can be an innovative solution to support self-directed learning by providing tailored materials, instant feedback, and interactive visualizations (Reeves & Lin, 2020).

Several studies have shown the potential of Generative AI in education. For example, Bahar, Raihani, & Nur'Aini (2022) found that the use of technology in online learning can improve the flexibility and accessibility of education, especially during the Covid-19 pandemic. In addition, Yulianingsih et al. (2021) emphasized that interactive virtual learning can enhance learner engagement and motivation. However, the adoption of this technology in non-formal education still faces various challenges, such as the digital divide, infrastructure limitations, and user resistance (Zawacki-Richter et al., 2019). In this regard, AI presents a transformative opportunity to address these challenges and enhance learning experiences. As Helmiatin et al. (2024) state, 'The integration of AI will transform the education and teaching systems through enhancements in individualized learning, automation of administrative activities, and the availability of virtual tutoring.' This advancement is particularly relevant for non-formal education, where learners require greater flexibility and support in accessing educational resources.

The Diffusion of Innovations Theory proposed by Everett Rogers (2003) highlights that the adoption of new technology is influenced by various factors, such as relative advantage, compatibility with user needs, complexity, and ease of use. In the context of non-formal education, factors such as infrastructure limitations, teacher readiness, and the digital divide can be major barriers to the adoption of Generative AI (Mulyati et al., 2023). Additionally, there are concerns related to ethics, privacy, and learner dependency on technology that need to be seriously considered.

Based on the above, the adoption of Generative AI in self-directed learning in non-formal education, specifically in the Kejar Paket B program at SKB Sidoarjo, is urgent to be studied for several reasons. First, learners in this program often face challenges such as limited learning resources, lack of intensive mentoring, and difficulties in understanding abstract concepts (Darmawan et al., 2024). Second, although Generative AI offers great potential to improve the quality of learning, its adoption still faces various obstacles, such as the digital divide, infrastructure limitations, and user resistance (Zawacki-Richter et al., 2019). Artificial intelligence is playing a vital role in upgrading the quality of higher education in numerous ways. AI-powered learning approaches have been employed to evaluate students' performance records, determine their strengths and weaknesses, and provide them with customized learning experiences that are tailored to their individual needs (Rahiman & Kodikal, 2024). Given these capabilities, Generative AI has the potential to address some of the key challenges in non-formal education by offering personalized learning support and adaptive educational content. Third, there is limited research specifically examining the adoption of Generative AI in the context of non-formal education in Indonesia, even though this technology can be an innovative solution to address the challenges of self-directed learning. Furthermore, beyond technical and infrastructural factors, the social dynamics within the SKB learning environment play a crucial role in shaping how Generative AI is perceived and integrated. The interactions between learners, teachers, and the broader community influence the acceptance and effective use of AI-based tools.

Therefore, this study aims to analyze the adoption process of Generative AI in self-directed learning among Kejar Paket B students at SKB Sidoarjo. Through a qualitative approach, this study will explore the experiences of students and teachers in using Generative AI, and identify the factors that influence the adoption of this technology. By understanding the adoption process and the challenges faced, this study is expected to provide practical recommendations for non-formal educational institutions in integrating Generative AI

effectively and responsibly, while also addressing the urgent need for adaptive and inclusive technological solutions for learners who are less accessible to the formal education system.

RESEARCH METHODOLOGY

This research employed a qualitative approach with a descriptive-analytic design. According to Sugiyono (2018), a qualitative approach is a research method used to study phenomena in their natural context, where the researcher acts as the primary instrument in data collection and analysis. This approach was chosen because this study aims to deeply understand the effectiveness of using Generative AI in supporting self-directed learning among Kejar Paket B students at SKB Sidoarjo. The descriptive-analytic design is used to describe the occurring phenomena and analyze the factors that influence it, thus providing a comprehensive picture of the adoption of Generative AI in self-directed learning (Moleong, 2017).

The research location was Sanggar Kegiatan Belajar (SKB) Sidoarjo, a non-formal educational institution that runs the Kejar Paket B program. SKB Sidoarjo was chosen because this institution has started integrating technology into learning and has students with diverse social, economic, and educational backgrounds. According to Sugiyono (2018), the selection of the research location must consider relevance to the research topic, availability of research subjects, and accessibility. The research subjects were Kejar Paket B students, tutors, and policymakers at SKB Sidoarjo. Students were selected because they are the primary target group in the implementation of Generative AI, while teachers were selected because they act as facilitators in the learning process and policymakers were selected because they have a strategic role in designing, managing, and evaluating policies that support the implementation of Generative AI in non-formal education settings.

The research object was the experience of using Generative AI in self-directed learning, which includes the interactions of students, tutors, and policymakers with Generative AI technology. This study focuses on how Generative AI is used in the self-directed learning process by Kejar Paket B students, how tutors utilize this technology to support their role as facilitators, and how policymakers design regulations and implementation strategies that support the integration of this technology.

The data collection techniques used include in-depth interviews, participant observation, and document studies. In-depth interviews were conducted with students and teachers to explore their experiences, perceptions, and challenges in using Generative AI. According to Moleong (2017), in-depth interviews are an interactive process between the researcher and participants to explore in-depth information about the phenomenon being studied. The interview guidelines were developed based on the research questions and predetermined indicators, with open-ended questions allowing participants to provide in-depth answers. Participant observation was conducted to directly observe the interactions of students and teachers with Generative AI during the learning process. According to Sugiyono (2018), participant observation allows researchers to engage in participant activities while observing and recording naturally occurring phenomena. Observation sheets were used to record learning activities, student responses, and the role of teachers in facilitating the use of technology. Document studies were conducted to analyze supporting documents such as curricula, lesson plans, and student learning records. According to Sugiyono (2018), document studies are an effective method for collecting secondary data that can complement and enrich primary data from interviews and observations.

The research instruments used included interview guidelines, observation sheets, and document analysis guides. The interview guidelines contained open-ended questions designed to elicit in-depth information about the participants' experiences and perceptions. According to Moleong (2017), open-ended questions allow participants to provide in-depth and varied answers. Observation sheets were used to record learning activities and interactions of

students with Generative AI. The document analysis guide contained criteria for analyzing supporting documents such as curricula and learning outcomes.

Data analysis was conducted using thematic analysis and data triangulation techniques. Thematic analysis involves the process of coding data, grouping themes, and interpreting themes based on patterns that emerge from interview and observation data. According to Moleong (Moleong, 2017), thematic analysis is a qualitative data analysis method aimed at identifying, grouping, and interpreting patterns or themes that emerge from the data. Data triangulation was conducted by combining data from interviews, observations, and document studies to ensure the validity and reliability of the research findings. According to Sugiyono (2018), data triangulation involves using more than one data source, method, or researcher to ensure that the research findings are consistent and reliable.

Data validity was enhanced through source triangulation and method triangulation, while data reliability was enhanced through audit trails and member checks. According to Moleong (2017), an audit trail is a systematic recording process of all steps taken in the research, from data collection to analysis and interpretation. Member checks are the process of verifying research findings with participants to ensure data accuracy. By using these approaches and methods, this research is expected to provide a deep understanding of the adoption process of Generative AI in self-directed learning among Kejar Paket B students at SKB Sidoarjo, and provide practical recommendations for non-formal educational institutions in integrating this technology effectively and responsibly.

RESULT AND DISCUSSION

RESULTS

Based on data collected through in-depth interviews, participant observation, and document studies, it was found that Generative AI, such as ChatGPT, has begun to be used by students as a tool in the learning process. The majority of students use this technology to seek explanations for lesson materials, complete assignments, and improve their understanding of concepts. Additionally, students also acknowledged that Generative AI helps them understand difficult subjects, such as mathematics and geometry, through simpler explanations and descriptive examples.

Students learned about Generative AI from various sources, such as the internet/social media, friends, teachers, or family. Support from teachers and schools also plays an important role in encouraging the use of this technology. Some students received training or application recommendations from teachers, which helped them utilize Generative AI more effectively. However, there are still students who feel they do not receive such support, indicating that not all teachers or schools are actively facilitating the use of this technology.

From the tutor's perspective, resistance to the use of generative AI was found due to several factors, such as a lack of understanding of the technology, concerns about being replaced by technology, and limited technical skills to integrate Generative AI into the learning process. Additionally, some tutors also feel that Generative AI can reduce direct interaction between tutors and students, which is considered important in building effective learning relationships.

Resistance to the use of Generative AI is demonstrated through the results of interviews with tutors who revealed that they tend to limit the use of this technology in the classroom. This is based on the finding that some students were able to complete the given assignments with the help of Generative AI, but when tested on their understanding, these students did not have adequate competence in the subject matter. On the other hand, tutors also found that Generative AI helped some students who initially had difficulty learning to understand the material better.

Based on these experiences, tutors decided to prohibit the use of Generative AI in the classroom, except in certain situations that have been approved by them. As a step to address this challenge, tutors changed their teaching strategies by giving quizzes at the end of the

learning session and conducting direct understanding evaluations of each material taught, replacing the method of independent assignments that often utilize this technology.

Furthermore, resistance to Generative AI is also caused by a lack of training and support provided to tutors to optimally utilize this technology. This makes them feel less confident in integrating Generative AI into the learning process. Therefore, a comprehensive training and mentoring program is needed so that tutors can effectively utilize this technology without sacrificing the quality of learning.

Moreover, policymakers at SKB Sidoarjo explained that the utilization of Generative AI in the learning process is fully supported. To date, two training stages have been conducted aimed at introducing the technology to tutors and SKB staff. In addition, policymakers are also planning further training that will take place several times throughout 2025. This training program aims to increase the understanding and skills of all levels of SKB Sidoarjo in effectively utilizing Generative AI.

However, policymakers emphasize that the implementation of Generative AI in the classroom remains under the full control of the tutors. They realize that tutors have a central role in adapting this technology to the needs of students and ensuring that its use does not replace human interaction in learning. Therefore, the approach taken is to provide flexibility to tutors to determine the extent to which Generative AI is used in the learning process, while continuing to provide support in the form of relevant training and resources. With this step, policymakers hope to create a balanced learning ecosystem, where technology becomes a supporting tool that enriches the learning experience without reducing the essence of personal and interactive learning.

1. Students' Utilization of Generative AI

Based on the research conducted by Bahar, Raihani, & Nur'Aini (2022), the use of technology in online learning has been proven to increase the flexibility and accessibility of education. By utilizing this technology, students can search for explanations on difficult subjects, especially when they do not have direct access to teachers or conventional learning resources. This was also found in a study conducted at SKB Sidoarjo, where students utilized Generative AI, such as ChatGPT, to understand difficult concepts, particularly in subjects like mathematics and geometry.

Another study by Yulianingsih et al. (2021) revealed that interactive virtual learning can enhance student engagement in the learning process. In this case, Generative AI serves as a tool that allows students to receive more interactive explanations tailored to their needs, making it easier for them to complete tasks and understand more complex materials. Pratikno & Kisworo (2024) added that 62.5% of teachers trained to use generative AI were able to create interactive learning content, such as quizzes and educational videos, which significantly increased student interest (Pratikno & Kisworo, 2024).

Moreover, Generative AI can support the development of critical thinking, creativity, collaboration, and communication among students. As noted by Novitasari et al. (2022), Educators must be able to help children in their growth and development to be more creative, collaborative, communicative, and able to think critically (Novitasari et al., 2022). This aligns with the role of AI generative tools in providing interactive, personalized learning experiences that encourage independent exploration and problem-solving.

Furthermore, a study by Oktavianingsih et al. (2023) highlights the effectiveness of digital encyclopedias in supporting children's learning experiences. They found that "The digital encyclopedia of Bangkalan local tourism developed by researchers was based on the needs analysis results at TK Kartika IV-89 Bangkalan. Media experts validated the digital encyclopedia product with a score of 64, categorized as 'very good' criteria. Material experts assessed the digital encyclopedia with a score of 40, classified as 'very good' criteria. It was tested on 39 children aged 5-6 years with 'very good' response results. The future recommendation is the need to develop other medias in fulfilling the recreation rights for

children" (Oktavianingsih et al., 2023). This finding reinforces the potential of AI generative models to create similar interactive and engaging learning tools tailored to the needs of students in self-directed learning environments.

In line with this, research by Reeves & Lin (2020) stated that AI has the ability to provide instant feedback and present interactive visualizations that help students understand abstract concepts, particularly in subjects that require in-depth understanding, such as mathematics and geometry. This finding was also confirmed in research at SKB Sidoarjo, where students felt that Generative AI made it easier for them to understand material that was previously considered difficult, thanks to simpler explanations and more descriptive examples.

The research by Darmawan et al. (2024) on the equivalency education program in Indonesia also showed that students who use technology in learning tend to be more motivated and have a better understanding of difficult subjects. This reinforces the finding that Generative AI can function as a scaffolding tool that helps students understand complex concepts more easily.

In the context of the spread of educational technology, Mulyati et al. (2023) on innovation diffusion stated that new technologies, such as Generative AI, often spread through social networks and informal communication. Students tend to learn about this technology from friends, teachers, or social media. Similar findings were discovered in research at SKB Sidoarjo, where students learned about Generative AI from various sources, such as the internet, social media, friends, teachers, and family.

Moreover, Zawacki-Richter et al. (2019) highlighted that the adoption of technology in education is often influenced by social factors, such as recommendations from friends or teachers. In this case, the role of teachers and schools in introducing technology to students is crucial to ensure that students can use it effectively. Research by Suryono & Tohani (2016) on non-formal education in Indonesia also emphasized the importance of teachers as facilitators in learning. Teachers are not only responsible for teaching but also for facilitating students in using technology effectively.

Based on the research at SKB Sidoarjo, some students received training or app recommendations from teachers, which helped them use Generative AI more effectively. However, some students felt they did not receive such support, indicating that not all teachers or schools actively facilitate the use of this technology. This aligns with the findings of Zawacki-Richter et al. (2019), which highlighted that resistance from teachers and a lack of training can be major barriers to the adoption of new technologies in education.

2. Challenges in the Utilization of Generative AI by Students

Based on the research conducted by Zawacki-Richter et al. (2019), the adoption of technology in education often faces barriers such as resistance from teachers and infrastructure limitations. This is reflected in the research at SKB Sidoarjo, where some students felt they did not receive adequate support from teachers or schools in utilizing Generative AI. As found by Rustan et al. (2020), technical challenges such as network access and the lack of facilities are major obstacles in remote areas, which are also experienced by non-formal education participants. This imbalance in support can hinder the optimal use of technology by some students. The research by Mulyati et al. (2023) on innovation diffusion in education also highlights that teachers' inability to understand and integrate new technologies is one of the main barriers. Teachers who are untrained in the use of Generative AI may feel hesitant to implement it in the learning process, resulting in limited guidance for students. This indicates the importance of training teachers so they can confidently utilize this technology in the classroom.

Furthermore, Suryono & Tohani (2016) emphasize the importance of the teacher's role as a facilitator in non-formal education. Teachers are not only responsible for teaching but also for facilitating students in using technology effectively. Rustan et al. (2020) assert that, although technology is limited, tutors at PKBM successfully used WhatsApp and SMS to

motivate students, demonstrating that even simple technology adaptations still require active guidance. Without adequate training, students will struggle to maximize the use of technology such as Generative AI. In this context, teachers play a central role in ensuring that the technology used aligns with students' needs and supports the necessary interactions in the learning process.

However, even though technology can provide instant feedback and assist students in completing tasks, research by Reeves & Lin (2020) indicates a risk of dependency that could reduce students' critical thinking abilities and deep understanding of the material. Research at SKB Sidoarjo also found a similar issue, where some students who successfully completed tasks with the help of Generative AI did not have adequate understanding when tested further. Therefore, although technology can be an effective tool, it is still necessary to conduct in-depth evaluations of students' understanding.

The research by Yulianingsih et al. (2021) also shows that although technology can increase learning motivation, excessive dependence on technology can lead students to lose the ability to think independently and understand concepts deeply. This finding aligns with research that shows excessive use of Generative AI reduces direct interaction between students and teachers, which is considered essential for building deeper understanding. As explained in the research by de Grave & Fauziah (2019), integrating learning content with the social environment, such as the traditional pesantren system in Java, shows that separating content from human interaction is almost impossible without sacrificing the quality of understanding. Therefore, although technology offers many benefits, a balance in its use is necessary to prevent it from diminishing the essence of direct interaction in learning.

Moreover, research by Darmawan et al. (2024) on the equivalency education program in Indonesia shows that students who are overly dependent on technology tend to struggle with understanding abstract concepts, especially in subjects like mathematics and science. This finding emphasizes the importance of balancing technology use with a deep understanding of fundamental concepts. Therefore, the use of technology in learning should be accompanied by efforts to ensure that students understand the underlying concepts of the material they are studying.

3. Tutor's Perspective on Generative AI

Based on the findings, tutors show resistance to new technology, which is reflected in interviews with tutors who are concerned that Generative AI could replace their role in the learning process. This concern mainly arises because tutors feel that technology may reduce direct interaction between them and students, which is considered important for building effective learning relationships. As a result, they tend to limit the use of this technology in the classroom because they feel insecure about its application. In line with this, de Grave & Fauziah (2019) in their comparative study emphasize that learning systems that are overly focused on content (such as the use of technology) tend to neglect the social context, leading to side effects like rigid relationships and abstraction of knowledge. Furthermore, Wibowo & Sujarwo (2022) add that teachers' resistance to technology is often rooted in pedagogical unpreparedness, making Outcome-Based Education (OBE) training necessary to equip teachers with the ability to integrate technology without sacrificing human interaction. Tutors who are not familiar with Generative AI may feel hesitant to integrate it into their teaching, resulting in limited use of this technology in the classroom. Gupta & Bhaskar (2020) further highlight that institutional barriers, including lack of proper training and recognition, contribute to teachers' reluctance in adopting AI-based teaching solutions. Without institutional support in terms of time, resources, and recognition, educators may be hesitant to integrate AI, fearing that it may diminish their role or be difficult to implement effectively. Additionally, transparency emerges as a crucial ethical consideration. The opacity of AI models like ChatGPT makes it difficult to comprehend their decision-making processes. Enhancing model interpretability and explainability is vital for accountability and addressing embedded

ethical issues (Alrayes et al., 2024). This lack of transparency may further contribute to tutors' skepticism, as they struggle to understand how AI generates responses and whether it aligns with pedagogical principles.

On the other hand, the experience of tutors at SKB Sidoarjo shows both positive and negative impacts of students using Generative AI. This technology can help struggling students better understand the material. Pratikno & Kisworo (2024) found that trained teachers were able to use AI to generate personalized learning recommendations, allowing students with varying abilities to learn at their own pace (Pratikno & Kisworo, 2024). However, while some students are able to complete tasks with the help of Generative AI, they do not always have a deep understanding of the material they are studying. This highlights the importance of the tutor's role as a facilitator in ensuring that students not only complete tasks but also understand the underlying concepts. Suryono & Tohani (2016) emphasize that tutors play a central role in adjusting technology to the needs of students and ensuring that the technology does not replace human interaction in learning. While Generative AI can assist students in completing tasks, tutors must still ensure that students understand the material well so that this technology can be used optimally without diminishing the quality of deep learning.

4. Tutor Strategies in Overcoming Challenges

Based on the research at SKB Sidoarjo, tutors adopt several strategies to address the challenges in using Generative AI. One of these is restricting the use of Generative AI in the classroom unless approved by the tutor. This strategy emerged in response to concerns that students may become overly reliant on technology without understanding the basic concepts. As explained in the study by Zawacki-Richter et al. (2019), control over the use of technology is necessary to ensure that learning remains focused on developing students' understanding. Astuti et al. (2024) added that restricting technology without active guidance can reduce the effectiveness of digital transformation, so it must be balanced with periodic evaluations. Tutors at SKB Sidoarjo choose to allow the use of Generative AI only in specific situations, such as when students truly need additional help, but still under strict supervision. This strategy is in line with the idea that technology should be used as a tool to enhance, rather than replace, human learning processes. As Sujarwo et al. (2022) highlighted, developing human potential, as well as socialisation, values, and skills, must be carried out through educational activities, with the implementation of practices aimed at upholding humanistic values as a solution to educational challenges. This highlights the importance of balancing technological innovation with human-centered educational values to ensure that learning remains a holistic experience.

Another strategy implemented is replacing independent assignment methods with quizzes and direct understanding tests at the end of lessons. Tutors realize that independent assignments relying on Generative AI could create an illusion of understanding, where students may complete tasks but not fully grasp the material. As stated in the research by Reeves & Lin (2020), direct evaluation through quizzes or interactive discussions can help tutors more accurately measure students' understanding. This approach is also supported by the findings of Darmawan et al. (2024), which show that students accustomed to direct evaluation methods tend to better internalize learning concepts. Furthermore, Yulianingsih et al. (2021) added that interactive methods such as quizzes can increase student engagement without diminishing the essence of learning.

On the other hand, training and mentoring to increase tutors' confidence in utilizing Generative AI are crucial steps in overcoming technical resistance. The research by Suryono & Tohani (2016) emphasizes that teachers or tutors in non-formal education require structural support to adapt to new technologies. Astuti et al. (2024) support this by stressing that continuous training programs by the government or related institutions are key to the successful adoption of technology in community settings. At SKB Sidoarjo, initial training has been conducted to introduce Generative AI to tutors, but ongoing follow-up programs are still needed. As explained by Mulyati et al. (2023), training should not only focus on technical

aspects but also on pedagogical strategies to effectively integrate technology. This aligns with the recommendations of Yulianingsih et al. (2021), who suggest intensive mentoring so that tutors can use Generative AI as a supportive tool, not as a replacement for human roles. Therefore, improving tutors' capacity through training is expected to reduce their lack of confidence and encourage more responsible technology adoption.

Through this combination of strategies, tutors at SKB Sidoarjo aim to create a balance between utilizing technology and maintaining interaction in learning. As reflected in the research by Darmawan et al. (2024), a flexible approach involving control, evaluation, and capacity building for tutors is key to addressing the dynamics of technology adoption in non-formal educational environments.

5. Support from Policymakers

Based on the research at SKB Sidoarjo, policymakers have taken strategic steps to support the implementation of Generative AI in learning. The implementation of two stages of initial training for tutors and SKB staff serves as the foundation to ensure the readiness of human resources. As explained in the study by Zawacki-Richter et al. (2019), structured and tiered training is necessary to reduce resistance to new technologies, especially among educators who are less familiar with digital innovations. This training focuses not only on the technical aspects of using Generative AI but also on its integration with the curriculum and pedagogical methods, as emphasized by Mulyati et al. (2023) in the context of educational innovation diffusion.

Furthermore, the plan for ongoing training throughout 2025 for all levels of SKB demonstrates a continued commitment to enhancing the institution's capacity. The research by Reeves & Lin (2020) states that periodic training programs are essential to address the dynamics of rapid technological development while ensuring that educators remain up-to-date with AI features and usage ethics.

At the same time, policymakers recognize that technology adoption should be accompanied by an understanding of local needs and community dynamics. As Kusumawardani et al. (2023) found, communities often possess awareness and knowledge of how to use ecological resources to sustain life but face challenges due to economic pressures. On an emotional level, they feel satisfied when they see tangible results from using their environment, realizing the value of sustainability for survival. This insight underscores the importance of aligning technological adoption with students' lived realities, ensuring that AI serves as a complement to, rather than a replacement for, the rich experiential learning that emerges from direct interaction with the environment.

The emphasis on flexibility for tutors to determine the extent of Generative AI use reflects an adaptive approach to learning needs. This policy is supported by the findings of Suryono & Tohani (2016), which assert that non-formal education should prioritize local wisdom and the context of learners. By giving autonomy to tutors, policymakers acknowledge that each class has a unique dynamic, and therefore, the use of technology must be tailored to students' levels of understanding and the complexity of the material. This also aligns with the research by Yulianingsih et al. (2021), which shows that flexibility in technology use can increase student participation without sacrificing human interaction.

On the other hand, efforts to create a balanced learning ecosystem between technology and human interaction form the philosophical foundation of all policies taken. As revealed in the study by Zawacki-Richter et al. (2019), technology should function as a supporting tool, not a replacement for human roles in education. Policymakers at SKB Sidoarjo recognize that direct interaction between tutors and students remains crucial to building conceptual understanding and social skills. This approach is reinforced by Suryono & Tohani (2016), who emphasize that the essence of non-formal education lies in the personal relationship between educators and learners.

Through this combination of policies, SKB Sidoarjo strives to build a holistic framework for integrating Generative AI. As reflected in the research by Darmawan et al. (2024), the success of technology adoption in non-formal education depends not only on the availability of infrastructure but also on policies that support collaboration between technology, curriculum, and pedagogical practices. Thus, the approach taken by policymakers at SKB Sidoarjo reflects a deep understanding of the complexities of technology adoption and a commitment to creating an inclusive and student-centered learning environment.

6. Implications and Recommendations

Based on the findings of the research at SKB Sidoarjo, the implications and recommendations related to the adoption of Generative AI in non-formal education can be examined through the integration of research results with relevant literature. First, the development of clear policies to regulate the use of Generative AI is an urgent need, considering the risks of student dependence and the inaccuracy of technology outputs. As explained by Zawacki-Richter et al. (2019), structured policies can minimize the misuse of technology while ensuring ethics and sustainability in learning. This study also aligns with Mulyati et al. (2023), which emphasizes that regulations should cover technical, pedagogical, and ethical aspects to create an inclusive framework. With the integration of AI technologies, ethical considerations become paramount. Awareness of ChatGPT limitations and potential biases is crucial for responsible adoption. Understanding these aspects can influence students trust in the technology and willingness to incorporate it into their learning processes (Shahzad et al., 2024). These concerns highlight the need for transparent policies that guide AI implementation while maintaining trust among educators and learners.

Second, comprehensive training for tutors is necessary to address resistance and technical skill gaps. As stated in the research by Yulianingsih et al. (2021), training should not only focus on mastering technological tools but also on strategies for integrating them with conventional teaching methods. This is reinforced by Suryono & Tohani (2016), who emphasize that tutors in non-formal education need ongoing support to optimize their roles as facilitators. The lack of appropriate AI training hinders teachers' ability to create effective and meaningful learning and to apply appropriate learning approaches, which also affects their students learning (Mustafa et al., 2024). Without sufficient training, tutors may struggle to incorporate Generative AI into their teaching practices effectively, leading to underutilization of its potential benefits. Holistic training, as recommended by Reeves & Lin (2020), should include concrete case studies and simulations of using Generative AI in local contexts.

Third, the development of practical guides tailored to the characteristics of non-formal education is key to the successful adoption of technology. Research by Darmawan et al. (2024) shows that the guide should be flexible, easily accessible, and include examples of applying Generative AI in learning materials such as mathematics or language. This study aligns with the findings of Bahar et al. (2022), which recommend integrating guides with a curriculum based on the needs of learners. Additionally, Mulyati et al. (2023) add that the guide should be accompanied by self-assessment tools for tutors to evaluate the effectiveness of technology use.

Fourth, continuous monitoring and evaluation are needed to ensure that the use of Generative AI does not compromise the quality of learning. As explained in the research by Zawacki-Richter et al. (2019), the evaluation mechanism should include both cognitive (understanding of the material) and non-cognitive (motivation, social interaction) aspects. Herlambang et al. (2023) also emphasize that data-driven evaluations—such as pretest-posttest score analysis and participant feedback—are key to measuring the success of technology training programs. Darmawan et al. (2024) also recommend the use of mixed methods, such as student satisfaction surveys, classroom observations, and analysis of learning outcomes, to measure long-term impact. On the other hand, Suryono & Tohani (2016) emphasize that

evaluation should involve all stakeholders, including students, tutors, and policymakers, to create collective accountability.

Through this approach, the research at SKB Sidoarjo highlights that policy recommendations are not only technical but also philosophical—maintaining a balance between technological innovation and humanistic educational values. Herlambang et al. (2023) add that the success of technology adoption in non-formal education requires multidisciplinary partnerships between educational institutions, communities, and governments, as seen in the university-SMK collaborations they studied. This is reinforced by the findings of Fui-Hoon Nah et al. (2023), who explain that the success of AI adoption in education depends on multidisciplinary collaboration among practitioners, researchers, and regulators to create a sustainable and student-centered ecosystem.

Discussion

The results of this study indicate that the adoption of Generative AI in self-directed learning for students in the Kejar Paket B program at SKB Sidoarjo provides significant benefits, such as improved accessibility to learning materials, greater learning flexibility, and increased student motivation. However, challenges such as student dependency on technology, tutor resistance due to a lack of training, and the risk of AI output inaccuracies remain key obstacles that need to be addressed. These findings emphasize the importance of tutor guidance and clear regulations to ensure responsible technology use in non-formal education.

One approach to addressing these challenges is the cultural-based community empowerment model, which integrates information technology training for target groups. This training not only equips participants with essential digital literacy skills but also helps them effectively utilize technology according to their specific learning needs and contexts. Tristanti, Sujarwo, & Kusumawardani (2022) highlight that this approach has proven to be effective in enhancing participants' ability to integrate technology into their respective fields, including education. Thus, structured and continuous AI training programs are crucial to ensuring that tutors can successfully adopt and utilize AI in the learning process. Such training is not only aimed at reducing tutor resistance but also at enhancing their ability to strategically manage technology, allowing them to play a more optimal role in guiding students.

This study's findings align with several previous studies that highlight the potential of Generative AI to enhance learning interactivity (Yulianingsih et al., 2021) and the flexibility of educational access (Bahar et al., 2022). Harsya et al. (2024) add that ChatGPT can support students' creativity by providing innovative ideas, although scaffolding is necessary to ensure critical understanding. However, as stated by Zawacki-Richter et al. (2019), barriers such as the digital divide and user resistance also consistently emerge in non-formal education contexts. Ali & Hasanah (2024) emphasize that infrastructure gaps and teachers' digital literacy are key hindering factors, even in schools with adequate facilities. This research also supports constructivist theory, where students need active interaction and scaffolding to build understanding, as well as Rogers' Diffusion of Innovations Theory (2003), which highlights the need for technology alignment with local needs and social network support.

Theoretically, this study enriches the understanding of AI integration in non-formal education by highlighting the dynamics of technology adoption in environments with limited infrastructure and diverse learner backgrounds. It also underscores the importance of balancing technological innovation with humanistic pedagogical values, such as direct interaction between tutors and students.

This study has several limitations that need to be acknowledged. First, the scope of the research is limited to one institution (SKB Sidoarjo), so the findings may not be generalizable to other non-formal education contexts. As Ali et al. (2024) noted, generalizing findings requires replication in different locations with varying infrastructure and socio-cultural conditions. Harsya et al. (2024) also mention a similar limitation, with their study being

limited to UNNES students who have relatively good access to technology. Second, the qualitative method used focuses more on depth of analysis rather than statistical generalization. Third, the study has not measured the long-term impact of Generative AI use on students' learning outcomes.

Overall, this study provides practical contributions in designing adaptive policies and training for integrating Generative AI in non-formal education. Recommendations such as improving tutor capacity, developing AI usage guidelines, and continuous evaluation are key to maximizing the benefits of technology while minimizing its risks. Further research is needed to explore the implementation of Generative AI in more diverse contexts and to quantitatively measure its effectiveness.

CONCLUSION

Based on the analysis conducted, this study concludes that the adoption of Generative AI in self-directed learning for students in the Kejar Paket B program at SKB Sidoarjo holds great potential to enhance the quality of non-formal education. This technology has proven effective in improving accessibility to learning materials, learning flexibility, and student motivation through interactive explanations and instant feedback. However, its implementation faces significant challenges, such as student dependency on technology, tutor resistance due to a lack of technical and pedagogical training, and the risk of inaccuracies in AI-generated content.

The findings of this study emphasize the importance of active tutor guidance to ensure students' conceptual understanding, as well as the need for clear regulations to minimize technology misuse. Additionally, digital infrastructure and skill gaps are key barriers that need to be addressed through the enhancement of human resource capacity and the development of context-based practical guidelines.

Theoretically, this study strengthens the relevance of constructivist theory and the Diffusion of Innovations Theory in the context of educational technology adoption, highlighting that the success of AI integration depends on its alignment with user needs, social network support, and the balance between innovation and human interaction.

To optimize the benefits of Generative AI, practical recommendations include:

1. Continuous training for tutors to enhance technical competence and AI integration strategies.
2. Development of adaptive usage guidelines that align with the curriculum and learner characteristics.
3. Regular evaluations to ensure learning quality and reduce dependency risks.
4. Multidisciplinary collaboration among stakeholders in designing holistic policies.

This study also acknowledges limitations, such as the geographically limited scope and the lack of long-term impact measurement. Therefore, further research is needed to explore the implementation of Generative AI in various non-formal education contexts and to test its effectiveness quantitatively. In conclusion, Generative AI can become a sustainable solution that is inclusive and centered on the needs of learners.

REFERENCES

Ali, M. K., & Hasanah, A. (2024). Efektivitas Fitur ChatGPT, Gemini dan Claude AI dalam Membantu Guru Membuat Bahan Ajar. *PEDAGOGIC: Indonesian Journal of Science Education and Technology* , *4*(1), 58–71.

Alrayes, A., Henari, T. F., & Ahmed, D. A. (2024). ChatGPT in Education–Understanding the Bahraini Academics Perspective. *Electronic Journal of E-Learning*, *22*(2), 112–134.

Astuti, D., Kisworo, B., Shogbesan, Y. O., & Herwina, W. (2024). The Effect of Local Community Empowerment on Digital Transformation in Cultural and Tourism Preservation. *JPPM (Jurnal Pendidikan Dan Pemberdayaan Masyarakat)*, *11*(1), 1–13.

Bahar, S. C., Raihani, A. H., & Nur'Aini, J. D. (2022). Pergeseran Minat Masyarakat terhadap Lembaga Bimbingan Konvensional oleh Lembaga Bimbingan Online. *Seminar Nasional Ilmu Ilmu Sosial (SNIIS) 2022*, *604*.

Brown, T. B., Mann, B., Ryder, N., Subbiah, M., Kaplan, J., Dhariwal, P., Neelakantan, A., Shyam, P., Sastry, G., Askell, A., Agarwal, S., Herbert-Voss, A., Krueger, G., Henighan, T., Child, R., Ramesh, A., Ziegler, D. M., Wu, J., Winter, C., … Amodei, D. (2020). Language models are few-shot learners -- special version. *Conference on Neural Information Processing Systems (NeurIPS 2020)*, *NeurIPS*.

Darmawan, D., Karlina, T., & Hanafi, S. (2024). Pelaksanaan Pembelajaran Program Pendidikan Kesetaraan Paket C di Satuan Pendidikan Non Formal (SPNF) Sanggar Kegiatan Belajar (SKB) Kota Serang. *Jurnal Ilmiah Profesi Pendidikan*, *9*(1). https://doi.org/10.29303/jipp.v9i1.2022

De Grave, J.-M., & Fauziah, P. Y. (2019). Learning content versus social environment. A comparative analysis from traditional initiation and modern high-schooling in Java (Indonesia). *JPPM (Jurnal Pendidikan Dan Pemberdayaan Masyarakat)*, *6*(2). https://doi.org/10.21831/jppm.v6i2.27844

Fui-Hoon Nah, F., Zheng, R., Cai, J., Siau, K., & Chen, L. (2023). Generative AI and ChatGPT: Applications, challenges, and AI-human collaboration. In *Journal of Information Technology Case and Application Research* (Vol. 25, Issue 3). https://doi.org/10.1080/15228053.2023.2233814

Gupta, K. P., & Bhaskar, P. (2020). INHIBITING AND MOTIVATING FACTORS INFLUENCING TEACHERS' ADOPTION OF AI-BASED TEACHING AND LEARNING SOLUTIONS: PRIORITIZATION USING ANALYTIC HIERARCHY PROCESS. *Journal of Information Technology Education: Research*, *19*. https://doi.org/10.28945/4640

Harsya, N. H., Claudia, Z., Wulandari, M., Kumala, A. W., & Rismawati, N. S. (2024). Evaluasi Pandangan Mahasiswa UNNES Terhadap Dampak Positif dan Hambatan Penggunaan AI (ChatGPT) dalam Pembelajaran. *Jurnal Majemuk* , *3*(2), 365–374.

Helmiatin, A. H., & Kahar, M. R. (2024). Investigating the adoption of AI in higher education: a study of public universities in Indonesia. *Cogent Education*, *11*(1), 2380175.

Herlambang, A. D., Rachmadi, A., & Wijoyo, S. H. (2023). Git and GitHub Application Training Program to Support Vocational High School Students in Collaborative Computer Programming Learning. *JPPM (Jurnal Pendidikan Dan Pemberdayaan Masyarakat)*, *10*(1). https://doi.org/10.21831/jppm.v10i1.58550

Kusumawardani, E., Nurmalasari, Y., & Rofiq, A. (2023). Ecoliteracy Competence Assessment to Improve Innovation Capability in a Rural Community. *Journal of Education Research and Evaluation*, *7*(1). https://doi.org/10.23887/jere.v7i1.54103

Moleong, L. J. (2017). *Metodologi Penelitian Kualitatif (Revisi)*. PT Remaja Rosdakarya.

Mulyati, I., Mansyuruddin, M., Adrianus, A., Bahari, Y., & Warneri, W. (2023). Proses Difusi Inovasi dalam Penerapan Metode Pengajaran Baru. *EDUKATIF : JURNAL ILMU PENDIDIKAN*, *5*(6). https://doi.org/10.31004/edukatif.v5i6.5769

Mustafa, M. Y., Tlili, A., Lampropoulos, G., Huang, R., Jandrić, P., Zhao, J., & Saqr, M. (2024). A systematic review of literature reviews on artificial intelligence in education (AIED): a roadmap to a future research agenda. *Smart Learning Environments*, *11*(1), 1–33.

Novitasari, K., Utami, N. R., Handoko, H., & Suminar, Y. A. (2022). The Effectiveness of STEAM-Based Multisensory Model Implementation Training for Strengthening Teachers' Competence. *JPPM (Jurnal Pendidikan Dan Pemberdayaan Masyarakat)*, *9*(1), 83–93.

Oktavianingsih, E., Fitroh, S. F., & Wardani, R. K. (2023). A Digital Encyclopedia "Perjalanan Joko Tole": Fulfill Recreation Rights for Children in Bangkalan. *JPPM (Jurnal Pendidikan Dan Pemberdayaan Masyarakat)*, *10*(1). https://doi.org/10.21831/jppm.v10i1.58003

Pratikno, H., & Kisworo, A. Y. (2024). Peningkatan Kompetensi Guru Melalui Pelatihan Kecerdasan Artifisial Generatif Di Sdk Vincentius Surabaya. *BESIRU: Jurnal Pengabdian Masyarakat*, *1*(7), 440–445.

Rahiman, H. U., & Kodikal, R. (2024). Revolutionizing education: Artificial intelligence empowered learning in higher education. *Cogent Education*, *11*(1). https://doi.org/10.1080/2331186X.2023.2293431

Reeves, T. C., & Lin, L. (2020). The Impact of AI on Education: A Review of the Literature. *Educational Technology Research and Development*, *68*(4), 1779–1805.

Rogers, E. M. (2003). Diffusion of Innovations. In *5th Edition*. Free Press.

Rustan, E., Baderia, B., & Tamrin, R. (2020). Optimalisasi pembelajaran self-study pada program Paket A di pusat kegiatan belajar masyarakat di masa pandemi. *JPPM (Jurnal Pendidikan Dan Pemberdayaan Masyarakat)*, *7*(2). https://doi.org/10.21831/jppm.v7i2.35097

Shahzad, M. F., Xu, S., & Javed, I. (2024). ChatGPT awareness, acceptance, and adoption in higher education: the role of trust as a cornerstone. *International Journal of Educational Technology in Higher Education*, *21*(1), 46.

Sugiyono. (2018). *Metode Penelitian Kuantitatif, Kualitatif, dan R&D*. Alfabeta.

Sujarwo, S., Tristanti, T., & Kusumawardani, E. (2022). Digital literacy model to empower women using community-based education approach. *World Journal on Educational Technology: Current Issues*, *14*(1). https://doi.org/10.18844/wjet.v14i1.6714

Suryono, Y., & Tohani, E. (2016). *Pendidikan Nonformal: Konsep dan Aplikasi*. Pustaka Pelajar.

Wibowo, S. E., & Sujarwo, S. (2022). The Development of Teaching Materials Based Outcome-Based Education Curriculum to Encourage Teacher Skill. *JPPM (Jurnal Pendidikan Dan Pemberdayaan Masyarakat)*, *9*(2). https://doi.org/10.21831/jppm.v9i2.53785

Yulianingsih, W., Soedjarwo, Nugroho, R., Roesminingsih, M. V., & Widyaswari, M. (2021). Virtual Learning in English Course at LKP Mahesa Institute Kampung Inggris Pare Kediri. *JPPM (Jurnal Pendidikan Dan Pemberdayaan Masyarakat)*, *8*(2), 159–168.

Zawacki-Richter, O., Marín, V. I., Bond, M., & Gouverneur, F. (2019). Systematic review of research on artificial intelligence applications in higher education – where are the educators? In *International Journal of Educational Technology in Higher Education* (Vol. 16, Issue 1). https://doi.org/10.1186/s41239-019-0171-0