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Leveraging AI in Self-Directed Learning: A Phenomenological Study of Master's Students' Experiences

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ABSTRACT

The rapid integration of Artificial Intelligence (AI) in education has reshaped self-directed learning (SDL), yet empirical insights into students' experiences remain underexplored. This qualitative phenomenological study investigates master's students' experiences, awareness, and perceived meanings of AI-driven SDL at Yogyakarta State University. Data from in-depth interviews with nine participants revealed three core themes: (1) AI-enhanced efficiency and personalized learning, (2) awareness of AI's benefits (e.g., accessibility) and limitations (e.g., accuracy, dependency risks), and (3) the dual impact of AI on critical thinking and ethical concerns. While students leveraged AI for task management and information access, they emphasized the necessity of cross-verifying AI-generated content and maintaining academic autonomy. Challenges included reduced deep engagement and potential over-reliance on technology. The study highlights the imperative for balanced AI integration in higher education, advocating for ethical guidelines, educator training, and adaptive curricula that harmonize technological innovation with critical literacy development. These findings inform strategies to optimize AI's educational potential while safeguarding academic rigor and student agency, offering a framework for institutions navigating the digital transformation of learning.

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1. INTRODUCTION

The rapid development of technology, particularly Artificial Intelligence (AI) in recent decades, has revolutionized human lifestyles and interactions across various fields. This phenomenon is marked by the widespread use of digital machines and the internet in daily life. The Industry 4.0 era has enabled humans to connect extensively through technological devices (Supriyadi & Asih, 2021). This reflects how modern technologies like Artificial Intelligence (AI) have permeated various aspects of life, including education. More specifically, AI involves efforts to develop machine intelligence that mimics human behavior (Mulyana, 2022). The phenomenon of self-directed learning among students through AI technology is an increasingly growing trend in the realm of higher education. This paradigm shift toward self-directed learning supported by AI technology seeks not only to revolutionize the educational landscape but also to meet the diverse needs of modern learners (Akgun & Greenhow, 2022). AI technology is now beginning to play a significant role in learning processes at schools and higher education institutions.

The trend of artificial intelligence (AI) technology remains a hot topic of discussion (Dalu et al., 2023). Numerous studies have been conducted to leverage AI in various aspects of life, including education. One example is the research titled "Proposed Artificial Intelligence Algorithm and Deep Learning Techniques for the Development of Higher Education" by Al Ka'bi, which discusses models for implementing AI in universities to enhance students' cognitive abilities (Al Ka'bi, 2023). Students are one of the groups most impacted by advancements in AI technology in their self-directed learning processes. They are increasingly

aware of AI's potential to assist them in their studies and research. The integration of artificial intelligence (AI) in education refers to the utilization of AI-driven technologies, such as machine learning algorithms and natural language processing, to enhance learning effectiveness and personalize students' educational experiences (Alneyadi et al., 2023).

The integration of artificial intelligence (AI) in self-directed learning necessitates learners' autonomy. Through advanced algorithms, AI technology can help learners analyze and interpret information, providing deep insights into students' needs to support self-directed learning (Mambu et al., 2023). AI employs sophisticated algorithms and cutting-edge technologies, including machine learning, natural language processing (NLP), and artificial neural networks, to rapidly and effectively gather, interpret, and manage data (Triansyah et al., 2023).

Based on an online survey of 33 Master's students at UNY, it was found that they are increasingly engaging in self-directed learning with AI assistance. The results revealed varied experiences: many students recognized benefits such as personalized learning and broader accessibility. AI technology is perceived to analyze learning preferences, styles, and individual needs (Manongga et al., 2021;Lase, 2019), some students expressed concerns about AI adoption, aligning with a Pew Research survey where 65% of respondents feared AI could replace human jobs (Anggraini, 2023). This underscores the need for further research to understand factors influencing AI's educational effectiveness and challenges to achieving optimal learning outcomes (Fatimah, 2018).

Developing critical skills to evaluate and select appropriate AI tools is also essential for students to enhance AI utilization in academia. Previously, students relied on books and lecturers as primary references, but they now prefer AI platforms for inquiries and information. Despite rapid advancements, current AI technologies still face limitations in understanding natural language, context, and human reasoning (Suryokta et al., 2023). As educators and learning designers, it is imperative to create environments that enable students to learn effectively. Success in higher education hinges on student readiness, adequate learning resources, and lecturers' efforts to manage learning environments through effective strategies (Cyly et al., 2023). In technology driven learning, maintaining engaging experiences is critical to sustaining student motivation and focus on self-directed learning. AI can offer personalized feedback and enhancement recommendations, facilitating a more tailored and effective learning experience (Jarrah et al., 2022).

AI holds immense potential to support self-directed learning by offering tailored experiences aligned with individual needs (Maufidhoh & Maghfirah, 2023). This study emphasizes the vast potential of AI-enabled self-directed learning, yet more research is required to understand its optimal application for UNY Master's students. Advanced AI tools significantly impact students' thinking and general knowledge, fostering critical and meticulous thinking through sophisticated interactions and access. Even while AI-powered tailored learning has many potential advantages, there are certain issues that must be resolved. The requirement for accurate and dependable data to guide AI systems is one difficulty (Wu et al., 2022).

AI has the potential to reshape how people learn and grow independently. Thus, studying self-directed learning through AI is critical to understanding its functionality, challenges, benefits, and impacts on autonomy, motivation, and self-reflection. Ideally, AI in self-directed learning should provide customized materials, real-time feedback, adaptive support, progress tracking, and enhanced time management and reflection skills. However, real-world implementation faces obstacles like technological limitations, inconsistent feedback, diverse user experiences, and security risks. While AI offers vast potential, its application must address real-world issues and individual needs to achieve optimal results (Sallam, 2023; Wen, 2022).

Purpose of the Study this research aims to explore UNY Master's students' experiences with AI-driven self-directed learning, their awareness of the process, and the meanings they attribute to these experiences. The study seeks to provide deeper insights into the dynamics of self-directed learning in the digital era and its implications for developing more effective educational strategies. The collaboration between student autonomy and AI technology is pivotal, as learning systems must adapt to technological advancements. AI can offer recommendations to help students manage their learning independently for optimal outcomes (Rusmiyanto et al., 2023). Therefore, this research will investigate this phenomenon through a study titled: "Leveraging AI in Self-Directed Learning: A Phenomenological Study of Master's Students' Experiences at UNY." This study aims to understand the experiences of UNY Master's students in AI-based self-directed learning through three main aspects: (1) direct experiences—interactions with AI tools, benefits, obstacles, and their impact on learning habits; (2) awareness—whether students recognize AI's role in their learning strategies or merely use it passively; and (3) subjective meanings—whether AI is perceived as a supporter, disruptor, or just a supplement. Additionally, this study examines AI's influence on learning autonomy and motivation, as well as its challenges and opportunities, to formulate more effective educational strategies in the digital era. The findings are expected to provide valuable contributions for educators and policymakers regarding the use of AI in self-directed learning.

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2. METHOD

This study adopts a qualitative phenomenological approach, which focuses on exploring human experiences (Moustakas, 1994). Phenomenology is regarded as an approach to understanding or studying human lived experiences (Helaluddin, 2019), with the aim of uncovering the "essence" of the meaning of phenomena. This phenomenological research employs a hermeneutic phenomenological approach. Hermeneutic phenomenology focuses on the description and interpretation of experiences, metaphorically referred to as the art of reading the text of life (Moustakas, 1994). The primary focus is on students' experiences and awareness of self-directed learning (SDL) through AI technology as a support for their learning autonomy.

The researcher selected Yogyakarta State University as the research site due to its ideal environment for observing self-directed learning (SDL) processes through AI technology, featuring adequate technological infrastructure and active support for technology integration in learning. This study was conducted from May to July 2024 with nine participants from UNY's Master's program (2022-2023 cohort). The participants, all pursuing advanced degrees across various disciplines, represented mid-career professionals with substantial academic experience. Their ages ranged from 25 to 35 years, ensuring participants had sufficient maturity and educational background to reflect meaningfully on technology-enhanced learning processes. Primary data was collected through in-depth interviews that allowed these graduate students to thoroughly express their experiences, perceptions, and understanding of AI-supported SDL. The interviews specifically explored how these advanced learners navigated AI tools, addressed challenges, and leveraged technological resources to enhance their independent learning journeys. This qualitative approach captured nuanced insights into the interplay between AI technology and self-directed learning behaviors in higher education, while maintaining participant anonymity through careful de-identification of all personal and program-specific details.

Data collection followed a phenomenological approach, emphasizing in-depth, semi-structured interviews as the primary method. Each interview lasted approximately 25–35 minutes and was conducted in a private setting to ensure confidentiality. The interviews were audio-recorded using an iPhone smartphone to maintain high sound quality. Following each session, recordings were promptly transferred to a secure, password-protected laptop for processing. To protect participant anonymity, all recordings and transcripts were de-identified, with pseudonyms replacing real names and any identifiable details removed. Participants were given the opportunity to review their transcripts for accuracy through member checking, ensuring that their perspectives were accurately represented. This step also enhanced the credibility of the findings. The researcher served as the primary instrument in planning, collecting, and analyzing data. To ensure validity, triangulation, member checks, and external audits were employed (Creswell, 2015). Triangulation involved cross-referencing primary and secondary data sources to confirm consistency.

Moustakas' phenomenological analysis framework was applied systematically to explore students' experiences with AI in SDL. The three stages include: (1) Horizonalization: Ensuring data purity by eliminating researcher bias, focusing solely on participants' lived experiences. (2) Cluster of Meaning: Identifying patterns in students' understanding of AI, such as its use as a virtual tutor or information-searching tool. (3) Description of Essence: Synthesizing students' experiences to reveal how they perceive and engage with AI in self-directed learning.

3. RESULTS AND DISCUSSION

RESULTS

This study aims to explore students' experiences in self-directed learning (SDL) through AI technology. The purpose of the research is to identify and describe the experiences and awareness of master's students at Yogyakarta State University (UNY) in AI-assisted self-directed learning. Data were collected through interviews and documentation with students, followed by analysis of the findings. During interviews, the researcher used semi-structured questions based on an interview protocol to ensure discussions remained focused. The questions were designed to explore students' experiences, awareness, and perceived meanings. An informal language approach was adopted during interviews to create a comfortable environment, and confidentiality of participants' identities and data was assured.

Using a phenomenological approach, the analysis revealed three main themes: (1) Experiences of Self-Directed Learning via AI Technology, (2) Awareness of Self-Directed Learning via AI Technology, (3) Meaning of Self-Directed Learning via AI Technology. This chapter presents the researcher's reflexivity, horizonalization units, clusters of meaning (textural and structural descriptions), essence descriptions, and a final synthesis of the phenomenon's essence regarding master's students' experiences and awareness of AI-supported SDL at UNY.

3.1. Horizinalization

In the horizonalization stage, the researcher constructed units of meaning and experiences related to self-directed learning (SDL) through AI technology. Based on transcriptions of interviews with nine UNY

master's students, the researcher inventoried significant statements relevant to the SDL process assisted by AI technology. Horizontal analysis revealed three main themes in the context of AI-supported SDL. The first theme, *Experiences of Self-Directed Learning with AI Technology*, includes aspects such as AI usage, encountered confusion, the role of peers, personal initiative, support, facilitation, the effectiveness and efficiency of the learning process. The second theme, *Awareness of Self-Directed Learning with AI Technology*, encompasses autonomy, accessibility, information verification (cross-checking), source credibility, content limitations, and critical thinking skills. Lastly, the third theme, *Meaning of Self-Directed Learning with AI Technology*, covers understanding learning awareness, the positive and negative impacts of AI-driven independent learning, and its implications for the future of education.

3.2. Textural description

Textural description is the interpretation of meaning derived from experiences recog nized within a phenomenological research approach, as lived by the subject as a phenomenon. Moustakas explains that each participant's experience is generally considered to hold equal value in the effort to uncover the essence of an object, termed *horizonalization* (Moustakas, 1994: 180–184). This stage aims to analyze the activities of students who have volunteered as participants. In the textural description, the researcher writes about what was experienced, i.e., a description of what Master's students at Universitas Negeri Yogyakarta (UNY) experienced regarding the meaning and significance of self-directed learning through AI technology. The researcher's reflexivity is used to describe their understanding of the phenomenon being analyzed and their role in the study. The results of the data analysis process are foundational categories derived from the data as follows: (1) Experience of self-directed learning through AI technology, (2) Awareness of self-directed learning through AI technology, and (3) Meaning of self-directed learning through AI technology. Data from these three themes are reported to illustrate what individuals experienced.

3.2.1. Experience of self-directed learning through AI technology

The majority of Master's students at UNY state that the experiences they gained through self-directed learning using AI technology offer significant benefits, although there are challenges to address. These opinions reflect both positive and critical views on the implementation of AI technology in higher education. Their experiences serve as an evaluation for students in overcoming challenges in the digital era. Their experiences, of course, vary. Some students may struggle to adapt to new technologies or feel isolated due to the lack of intensive face-to-face interaction. Additionally, the quality and reliability of AI technology are crucial factors influencing their self-directed learning experiences.

There are many important aspects related to self-directed learning experiences through AI technology that have been undertaken by Master's students at UNY. Here, the researcher categorizes student experiences into several key sub-themes for analysis. The following is a textual description from informants, divided into sub-themes: Use of AI, Confusion, Friends, Initiative, Help, Facilitated, Effective, and Efficient.

3.2.2. Awareness of Self-Directed Learning (SDL) Through AI Technology

Awareness of self-directed learning (SDL) through AI technology involves an individual's understanding and ability to effectively utilize AI tools in their learning process. This includes personal initiative in setting learning goals, identifying suitable resources, and leveraging AI tools like ChatGPT. The technology is used to access information, obtain explanations, and complete academic tasks. This awareness also encompasses recognizing the benefits and limitations of AI, such as the need to verify information, understand accessibility constraints, and the ability to overcome challenges through creative solutions and knowledge sharing. Below is a textual description from informants, divided into five key sub-themes: Independent, Accessibility, Cross-Check, Credibility, and Content Limitations.

3.2.3 The Meaning of Self-Directed Learning Through AI Technology

Most students perceive AI-driven self-directed learning as a meaningful, awareness-building experience, framed by three key themes: recognition of AI's supportive role, its mixed impacts, and implications for learning's future. While acknowledging AI's utility in streamlining tasks, accelerating learning, and broadening perspectives, informants caution against overreliance, warning it may erode critical thinking and memory retention. Many stress balancing AI with traditional resources (books, journals, educators) and verifying AI-generated information rather than accepting it uncritically. Curiosity is noted as a key motivator for adopting AI, yet a judicious approach leveraging AI as a supplementary tool alongside trusted sources is deemed vital. Overall, students advocate for a balanced integration of AI into education, emphasizing its potential to enrich self-directed learning when paired with mindful, diversified resource use.

a) Awareness of Negative Impacts

Several informants expressed that while AI offers efficiency in accessing information, it also carries

negative consequences such as reduced interest in reading books and diminished critical thinking skills. They acknowledged that over-reliance on AI could lead to less critical mindsets and lower reading literacy. Concerns were also raised about the potential lack of validity or accountability in AI-generated information. Some individuals expressed skepticism about the sources AI uses, noting that AI might not always retrieve data from credible references. Based on the informants' statements, despite AI's significant contributions to facilitating self-directed learning, it is crucial for students to recognize and address its potential negative impacts.

b) Awareness of Positive Impacts

Many informants emphasized that AI provides positive benefits in terms of time efficiency and ease of access to information. AI technology used in self-directed learning can accelerate the process of searching and delivering information. Additionally, AI helps students complete assignments more quickly. Students recognize that while AI can provide rapid information, such information must be verified against credible academic sources. They understand the importance of not relying entirely on AI and continuing to engage in indepth research and literacy practices.

c) Meaning Related to the Future of Learning

The future of learning with AI technology is not merely about adopting tools but also about building meaningful experiences and fostering a deep awareness of how such technology can enhance education. Statements from informant ORK highlighted that the future of learning demands educators to develop critical and adaptive skills. Based on informants' perspectives, future education must teach learners to leverage AI as a supportive tool in their self-directed learning processes. This approach is vital for cultivating learners' critical thinking and independence, ensuring they do not become overly reliant on technology when facing educational challenges. Aligning with this, informant EN's statement underscores that AI facilitates self-directed learning, signifying that in the future, AI will become an integral part of the learning process, providing access to resources that help students learn independently and more efficiently.

3.3. Structural Description

Structural description explores the context, dynamics, and conditions shaping AI-driven self-directed learning (SDL), synthesizing themes into a cohesive narrative of student adaptation. Central dynamics include a shift from initial skepticism referring traditional tools like Google to pragmatic adoption after recognizing AI's efficiency, exemplified by informants like SYN transitioning from uncertainty to experimentation. Driven by academic pressures (heavy workloads, diverse demands), students turned to AI for task management, though reliance on shortcuts risked superficial learning. Peer influence further normalized AI as a practical aid. While AI alleviates stress and accelerates productivity, students stress balancing its use with verification against credible sources and critical engagement to mitigate over-reliance. Ultimately, they envision AI evolving as a supplementary tool that upholds academic rigor and self-discipline, reflecting its dual role as both facilitator and challenge in modern education.

3.4. Essence Description

The essence description constructs a comprehensive account of the experiences and meanings of self-directed learning (SDL) through AI technology. Self-directed learning via AI transforms information access and processing, offering efficiency through tools like ChatGPT, which streamline complex tasks, accelerate retrieval, and enhance productivity. Master's students at UNY highlight time savings and easier information access but acknowledge risks: diminished critical analysis (e.g., deep reading) and the need to verify AI-generated content. While AI provides practical solutions, learners face challenges in balancing its integration, recognizing its dual role as both an efficiency facilitator and a potential disruptor of intellectual depth. Students must leverage AI's convenience while prioritizing credible sources and cultivating independent critical thinking, ensuring technological adoption supplements rather than substitutes academic rigor and personal growth.

DISCUSSION

The exposition from several informants, who are Master's students at UNY, reveals that this study explores students' experiences of self-directed learning through AI technology, uncovering three main themes: Experiences of self-directed learning through AI technology, Awareness of self-directed learning through AI technology, and The meaning of self-directed learning through AI technology.

The research findings on the experiences and awareness of self-directed learning through AI technology highlight critical insights into AI's potential to support self-directed learning, a vital component of modern educational systems. One significant innovation is the development of AI based learning systems (Soelistiono & Wahidin, 2023). Research innovations generate knowledge and technology that can be directly applied to real-world contexts (Kabanda, 2022). This study also emphasizes the importance of self-directed learning in enhancing problem-solving skills and the use of AI technology to identify experiences and

awareness of such learning. Additionally, it examines how UNY Master's students interpret the meaning of their experiences and awareness in self-directed learning through AI technology.

3.1. Experiences of self-directed learning through AI technology

Experiences in the learning process involve complex situations encompassing theory and practice, shaping learners' experiences and influencing their future emotions, thoughts, and actions (Salsabilla & Prasetyawan, 2022). The constructivist learning concept frames learning as an active process where students construct meaning through texts, dialogue, physical experiences, or other forms (Waseso, 2018). Gagne and Briggs (1979) define learning as a system designed to facilitate education. Efforts to facilitate learning involve leveraging diverse learning environments (Prawiradilga, D.S & Chaeruman, 2018). Experience is a reality within consciousness or the mind (Prasetyawan, 2019). The use of AI technology in this study reflects broader trends in leveraging technology to promote self-directed learning. This aligns with Beckers et al.,(2016) systematic review, which highlights technology's role in fostering self-regulated learning behaviors.

Findings from this study show that self-directed learning with AI technology is useful by showing how AI can work as a virtual tutor to help UNY master's students understand difficult material while they are learning on their own. This finding aligns with research on the application of AI in education, which shows that AI enhances learners' interest by tailoring educational experiences through adaptive programs, making learning more engaging and easier to understand (Muchamad, et.al, 2020). Personalized learning through AI fosters SDL skills, resonating with Loeng (2020) and Caffarella (1993) emphasis on SDL's importance in adult education. SDL is foundational for lifelong learning and empowering adult learners (Caffarella, 1993; Laupichler et al., 2022).

SDL involves students setting goals, planning, selecting resources, and evaluating outcomes (Brockett & Hiemstra, 2018). Similarly to the experiences of UNY master's students, the findings of this study originate from the frequent confusion they face when encountering tasks with challenging materials, tight deadlines, and a lack of direct guidance. This confusion enables students to pinpoint gaps in their understanding or skills. When confronted with such challenges, they seek solutions through self-directed learning by leveraging AI technology to address these issues. These findings resonate with the concept of self-directed learning, defined as an intentional process of directing oneself to acquire knowledge and develop problem-solving strategies (Waskito et al., 2020). Active engagement in setting goals, planning, selecting resources, and evaluating the learning process is key to overcoming confusion and achieving success in self-directed learning. Aligned with constructivism theory, this approach emphasizes empowering learners to actively discover competencies, knowledge, and technologies, as well as other necessary skills, to foster their personal and intellectual development (Thobroni, 2013).

Similarly to the experiences of UNY master's students, when confusion arises, self-reliance is not the sole response; peer motivation and recommendations also emerge as solutions to address challenges in their self-directed learning process. These findings are supported by Carl Rogers' theory of self-directed learning, which emphasizes the importance of willingness, self-evaluation, and self-motivation in the learning process (Aziz et al., 2022; Sutisna et al., 2022). Furthermore, peers serve as a pivotal factor in motivating UNY master's students to pursue self-directed learning through AI technology, which continuously supports them in seeking information to enhance their competencies (Khoo, 2018).

The findings of this study also highlight initiatives among UNY master's students in self-directed learning through AI technology. These initiatives stem from their desire and efforts to identify their learning needs within the autonomous learning process. This aligns with Guglielmino (2013) assertion that proactive individuals exhibit self-initiative, resourcefulness, and a commitment to lifelong learning. Additionally, the findings resonate with self-directed learning theory, which posits that readiness for independent learning is characterized by self-initiated actions such as setting learning goals, identifying resources, strategizing, and evaluating outcomes without external guidance (Zamnah & Ruswana, 2018).

Another finding from the reflections of UNY master's students highlights that self-directed learning through AI technology is perceived as meaningful because it facilitates their autonomous learning process. Facilitating learning is conceptualized as the effort to create an effective learning process through program design, provision of appropriate human resources, establishment of supportive physical environments, and conditions that motivate UNY master's students to engage in continuous learning by managing appropriate technological processes and resources (Januszewski, A., & Molenda, 2013). AI systems can recognize and respond to individual student needs and preferences (Astuti, 2021; Mahessa et al., 2023; Rulyansah et al., 2022). This study shows AI offers personalized support, enabling students to learn in ways that suit their needs. AI's rapid, data-driven decisions reduce human error and enhance efficiency across fields (Misnawati, 2023).

UNY students report AI makes SDL effective through customized recommendations (Hikmawati & Sufiyanto, 2023; Maran Chanthiran et al., 2023; Sperling et al., 2022). Systematic reviews, such as Gracia et al., (2018) confirm AI tools effectively support self-regulated learning strategies. AI integration is vital for innovative, effective digital education. UNY students design personalized learning experiences, improving

efficiency and quality (Chai et al., 2021; Firmansyah, A. U., & Amalia, 2021; Sugihartono, 2020). However, challenges like unrealistic expectations, AI biases, and individual learning limitations must be addressed (Alam, 2021; Ouyang & Jiao, 2021).

The findings of this study support the perspective that self-directed learning experiences through AI technology among UNY master's students are heavily influenced by curriculum structure and intense workload demands. Students frequently adopt a pragmatic approach, prioritizing rapid task completion, thereby leaving limited time for reflection and deep comprehension. In this context, the use of AI is primarily aimed at efficiency such as retrieving information quickly or expediting assignments rather than fostering in-depth conceptual exploration.

3.2. Awareness of self-directed learning through AI technology

According to Husserl (as cited in Hasbiansyah, 2005), consciousness is characterized by intentionality, which constitutes the essential structure of an individual's awareness. Intentionality refers to the mind's orientation toward an object. In the context of self-directed learning, consciousness implies that individuals are aware of the learning process and capable of managing it effectively. Hasbiansyah (2005) further posits that the active attribution of meaning is integral to consciousness (Hasbiansyah, 2005).

Findings reveal that some UNY Master's students oscillate between awareness and unawareness. Many adopt a pragmatic approach, uncritically accepting AI-generated information without filtering its relevance. In phenomenology, intentionality refers to the belief that every act of consciousness is directed toward specific objects (Hasbiansyah, 2005). While AI-driven SDL helps students become more independent, focused, and efficient, they must consciously cultivate comprehensive knowledge and skills (Huriah, 2018).

Ethical awareness is crucial for students engaging in self-directed learning with AI tools like ChatGPT. According to Hadian, T., & Rahmi, (2023) ChatGPT functions as a virtual mentor in self-directed learning. Unlike search engines like Google, which require users to sift through information, ChatGPT provides direct responses tailored to student inquiries. Merentek, et al (2023) note that ChatGPT is perceived as more effective and efficient, as users avoid repetitive clicking for answers, and its responses mimic human-like interactions. Findings in this study reveal that UNY master's students predominantly use ChatGPT to seek information for assignments or problem-solving. However, some students remain unaware of the need to consult relevant sources (e.g., books, journals) or consult lecturers directly to ensure validity and credibility. This awareness ensures their learning remains effective, holistic, and grounded in credible information. These findings align with Munawar, et al (2023) and Ramli (2023), who highlight ethical concerns in AI use, such as plagiarism and inaccuracies. Thus, AI integration in academic research must adhere to legal and ethical standards. It is essential to consider ethics, privacy, and data security in educational AI applications to maximize benefits (Wiratama, 2021).

Critical thinking defined as mental activities to solve problems, analyze assumptions, reason, evaluate, investigate, and make decisions (Nuryanti et al., 2018; Ratnaningtyas, 2016). While some UNY students demonstrate analytical skills in evaluating AI-generated content, many remain unaware of its importance. They must also cultivate critical thinking skills to remain intellectually engaged and avoid losing analytical abilities. While AI's role in self-directed learning is expanding, students must critically evaluate AI-generated information, as algorithms have limitations (Popenici & Kerr, 2017).

Data show AI is often used pragmatically to meet urgent academic demands rather than fostering explorative learning. Heavy workloads and tight schedules push students to treat AI as a quick fix, sidelining deeper conceptual engagement. While AI holds potential for SDL, an overly dense curriculum can hinder holistic understanding (Misnawati, 2023).

3.3. The Meaning of Self-Directed Learning Through AI Technology

David Ausubel posits that individuals learn new ideas by connecting them to their existing knowledge (Bryce & Blown, 2024). He argues that learners, when attempting to assimilate new concepts and ways of thinking, can be guided to integrate these with prior knowledge, leading to meaningful learning. Such learning occurs when learners actively link newly acquired information to their existing understanding (Vaughan et al., 2024). Comprehension of speech through personal experience is complex, relying on the listener's ability to derive meaning (Drożdżowicz, 2023).

Self-directed learning (SDL) via technology aligns with constructivism, which posits that reality and meaning are constructed through human interaction with the world (Prasetyawan, 2019). This study focuses on the experiences and awareness in SDL that generate critical insights into the role of AI technology. Humans must build knowledge and derive meaning through real-world experiences (Thobroni, 2013).

Overreliance on technology can harm mental health, causing anxiety, restlessness, and sleep disorders (Gumelar, 2023). Studies cited by Gumelar (2023) indicate that internet and technology dependence may lead

to obsessive behavior, anxiety when disconnected, and loss of control over usage. Frequent technology use correlates with higher risks of mental health issues. While SDL can meaningfully integrate into daily life to achieve goals (Johnson, 2014)**,** excessive AI reliance in learning risks critical thinking decline, ethical concerns, and negative outcomes for UNY Master's students.

AI use in SDL among UNY students poses risks such as unethical content dissemination, digital inequality, privacy breaches, job displacement, and overdependence. Addressing these requires strict regulation, digital literacy, ethical awareness, and oversight ('Amala et al., 2023). Overuse of AI in academic tasks may erode critical thinking, as students rely on AI for writing and problem-solving (Faiz, A., & Kurniawaty, 2023). Anxiety arises from rapid AI advancements outpacing user understanding. Students must balance AI's benefits with awareness of its limitations and ethical use (Misnawati, 2023).

Research findings underscore the positive impact of AI technology in enhancing learning effectiveness, fostering student engagement, and improving overall educational satisfaction. AI enhances learning effectiveness, engagement, and satisfaction (Muarif et al., 2023). However, overreliance risks stifling creativity in academic work (Setiawan & Luthfiyani, 2023). AI's future in education lies in personalized, interactive learning via chatbots, simulations, and gamification. AI driven analytics can improve assessment accuracy, helping educators identify student strengths and weaknesses (Wardhani, R., & Budiarto, 2018).

Despite challenges and limitations, AI technology holds potential to enhance education through personalized learning experiences, real-time feedback, and adaptive learning systems. To address these challenges, the development of innovative assessment approaches leveraging AI, along with training for teachers, lecturers, and students, is essential to ensure effective AI utilization. Furthermore, it is critical to tackle concerns regarding data privacy and security, as well as to ensure ethical and responsible use of AI in education (Chen et al., 2020; Christou, 2023).

Educators need to adapt to these changes and develop new skills in utilizing AI technology. However, issues of privacy and data security for learners must be addressed to ensure the successful implementation of this technology in education (Mambu et al., 2023). While AI can support personalized learning and evaluation, the role of educators as facilitators, motivators, and mentors remains critical to ensuring a holistic learning experience and fostering students' comprehensive development. Therefore, teachers and lecturers must continuously adapt to technological advancements to enhance their professionalism, enabling students to thrive through innovative and adaptive learning experiences designed by skilled educators (Rifky, S., Paling, S., Arifudin, O., & Narayanti, 2024)**.**

Research findings indicate that UNY Master's students utilize AI technology for content personalization, instant feedback, and progress monitoring to support a constructivist learning approach. Acting as self-directed agents, these students tailor their learning experiences with AI assistance. The evaluation reveals that AI technology can support both cognitive and radical constructivism, depending on its implementation. In conclusion, the use of AI in self-directed learning among UNY Master's students highlights the relevance of multiple constructivist dimensions and underscores the necessity of aligning AI design with constructivist pedagogical principles.

Based on the research findings regarding the experiences and awareness of UNY Master's students in self-directed learning through AI technology, the following prescriptive recommendations are proposed to facilitate education in the digital era. Educational institutions should begin by integrating AI technology into their curricula to support self-directed learning, leveraging tools for content personalization, real-time progress monitoring, and instant feedback. Concurrently, students must be trained to utilize AI tools effectively, emphasizing feature mastery and feedback analysis. Adaptive learning modules should be developed to dynamically align content with individual student progress and needs. AI systems must also incorporate constructive feedback mechanisms to guide learners in identifying and rectifying errors. To deepen metacognitive skills, institutions should encourage reflective practices through progress reports or digital journals. Regular evaluation of AI implementation, informed by student feedback, is critical to refining its effectiveness. Finally, integrating digital competency training into programs will ensure ethical and responsible AI use. By adopting these strategies, institutions can harness AI to enhance self-directed learning experiences and prepare students to excel in an increasingly digital world. Emerging studies suggest that academic organizations can minimize the detrimental effects of AI technologies on education by formulating comprehensive policy frameworks, instituting evaluation protocols that limit AI-generated materials, and implementing proactive strategies to preserve academic integrity (Adeshola & Adepoju, 2024).

4. CONCLUSION

This study highlights the dual role of AI in shaping self-directed learning (SDL) experiences among master's students at Yogyakarta State University (UNY). While AI tools like ChatGPT enhance efficiency, accessibility, and personalized learning by streamlining tasks and accelerating information retrieval, students also grapple with challenges such as over-reliance risks, diminished critical thinking, and ethical concerns like plagiarism and data bias. Their awareness underscores the necessity of balancing AI's convenience with

rigorous verification of sources and preservation of traditional academic practices. Students perceive AI as a supplementary tool valuable for productivity but insufficient without human agency, emphasizing the importance of maintaining intellectual rigor and ethical accountability. To harness AI's potential, educational institutions must integrate structured training programs that cultivate digital literacy, critical engagement, and ethical awareness. Future efforts should prioritize adaptive learning systems that blend AI's efficiency with reflective, creativity-driven pedagogy, while policymakers and educators collaborate on frameworks ensuring equitable access and academic integrity. Ultimately, AI's transformative impact on SDL hinges on mindful implementation that harmonizes technological innovation with pedagogical principles, fostering resilient, self-directed learners equipped to thrive in a rapidly evolving digital landscape. Future research could experimentally test the effectiveness of AI literacy training in reducing student over-reliance, comparing groups trained in critical AI evaluation with untrained groups. Longitudinal studies could measure the impact of AI integration on self-directed learning (SDL) skill development across different cultural or institutional contexts. Researchers could also evaluate adaptive learning systems combining AI personalization with human mentoring, while testing ethical AI policy frameworks in higher education through stakeholder feedback. Cross-disciplinary and comparative studies could explore discipline-specific AI applications and the influence of varying technological infrastructures. Replicating this study with larger samples or different demographic groups (such as undergraduate or doctoral students) could strengthen these findings.

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