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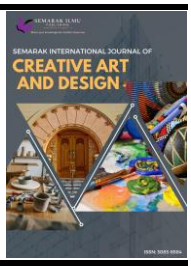

The Integration of AI in Design Thinking for Enhancing Student Creativity and Critical Thinking in Digital Media Learning

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ABSTRACT

The use of Artificial Intelligence (AI) in education has advanced rapidly, creating new prospects for improving creativity and critical thinking, particularly in digital media learning. This paper does a literature analysis to answer the research question: How beneficial is the employment of AI in design thinking-based activities in improving students' creativity and critical thinking in digital media education. A total of 118 peer-reviewed papers from the Scopus database (2020-2025) were initially discovered, with 36 selected after rigorous screening for relevance, methodology, and theme alignment. The analysis revealed three important themes: computational thinking, creative pedagogy, and hybrid learning. The findings show that AI-enhanced design thinking improves students' algorithmic reasoning and problem-solving abilities, which are critical for computational thinking growth. Furthermore, creative pedagogical techniques, such as project-based learning with AI tools, dramatically increase divergent thinking, learner motivation, and innovative outcomes. Hybrid learning environments that combine AI-powered platforms with human-centered design thinking provide more personalized, flexible, and immersive learning experiences. According to studies, generative AI tools like ChatGPT and no-code platforms enable creative experimentation and reflective learning. However, problems include insufficient teacher preparedness, ethical considerations, and the danger of decreased teamwork as a result of too specialized tasks. Overall, the literature supports the educational value of incorporating AI into design thinking to develop 21st-century abilities. This review emphasizes the importance of multidisciplinary, ethically conscious educational methods for maximizing the benefits of AI in digital media education.

1. Introduction

The advancement of artificial intelligence (AI) is altering the educational landscape, notably in the field of digital media learning. As digital environments become more complicated, there is a greater demand for educational approaches that promote creativity and critical thinking, core qualities required for navigating and influencing the future of media. Design thinking, with its iterative and

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human-centered problem-solving approach, has developed as a transformational instructional framework. When combined with AI, it opens up new potential for student-led inquiry, interdisciplinary learning, and creativity. This study answers the following research question: How effective is the application of AI in design thinking-based activities in improving students' creativity and critical thinking in digital media education. The inquiry is organized around three themes: computational thinking, creative pedagogy, and hybrid learning. The first theme, Computational Thinking, examines how AI-supported design problems help students improve logical reasoning, issue decomposition, and algorithmic thinking skills. Learners develop core abilities for digital fluency and innovation by using AI technologies to simulate or support complicated problem-solving.

The second theme, Creative Pedagogy, looks at how AI technologies might promote imagination, experimentation, and reflective design approaches. Project-based learning, generative AI apps, and visual programming platforms enable students to create relevant and creative media content while participating in collaborative learning processes. The third theme, Hybrid Learning, examines the integrated character of today's educational experiences. AI improves the design thinking framework by allowing for adaptive feedback, tailored learning paths, and smooth transitions between physical and virtual learning environments. This fusion meets a variety of learner demands while preserving the iterative nature of design thinking.

Together, these themes demonstrate how incorporating AI into design thinking may transform digital media education into a dynamic, student-centered paradigm that fosters critical awareness and creative potential.

2. Related Work

The incorporation of artificial intelligence (AI) into education has resulted in a paradigm change in educational practices, particularly in the field of digital media learning. As educational systems attempt to equip students with 21st-century abilities, design thinking has emerged as a potent framework for fostering empathy, creativity, cooperation, and iterative problem-solving. In recent years, researchers have focused on the convergence of AI and design thinking, with the goal of improving student creativity and critical thinking in technologically rich surroundings. This literature review summarizes current research, critically evaluating major findings and revealing trends across three interconnected themes: computational thinking, creative pedagogy, and hybrid learning. A considerable amount of study has looked into the role of AI in the development of computational thinking, which refers to the cognitive processes required to pose problems and express answers in ways that a computer can execute. AI technologies like machine learning models, no-code platforms, and intelligent tutoring systems are utilized in design thinking to help with logical reasoning, pattern detection, and algorithmic formulation. Students that participate in AI-supported design activities are more likely to engage in iterative cycles of problem analysis and refinement, which are critical components of computational thinking [33].

The literature repeatedly emphasizes enhanced student performance in dissecting complicated problems and using structured approaches to solution development. However, a close examination of these research exposes measurement flaws, with many depending on self-reported surveys or isolated performance tasks. While they are useful insights, they may not represent the level of cognitive engagement required to evaluate true computing proficiency. In addition to technical abilities, integrating AI into design thinking has a tremendous impact on creative pedagogy. This theme focuses on how educators might employ AI technologies to spark creativity, encourage risk-taking, and facilitate the creation of new media artifacts. Bhalla and Navneet [11] Generative AI solutions, such as text-to-image engines, conversational bots, and auto-storyboarding apps, enable

students to quickly experiment and develop concepts. These technologies reduce the obstacles to creative exploration, allowing students to visualize abstract topics and engage in multidimensional thinking. The studies examined show that when AI is utilized as a creative co-participant, student motivation, curiosity, and output uniqueness rise. Nonetheless, there is a growing concern that relying too much on AI-generated outputs will diminish students' innate creative processes and impede deeper conceptual growth. This contradiction underlines the importance of guided integration, in which educators serve as facilitators to ensure that AI technologies improve, rather than replace, learners' creative agency.

The pedagogical revolution promoted by AI is also reflected in the creation of hybrid learning environments, which combine traditional and digital modalities. Hybrid models in design thinking education are increasingly relying on AI to provide adaptive feedback, real-time collaboration, and individualized learning opportunities [2]. Smart classrooms using AI analytics and facial expression tracking have been applied to track student involvement and emotional responses, informing instructional decisions. Immersive learning situations that replicate real-world media difficulties are provided via virtual reality (VR) and extended reality (XR) platforms, which have been enhanced with AI personalization. These hybrid arrangements not only broaden the scope of design thinking, but also allow for individualized training based on students' needs and preferences. While the technology infrastructure appears promising, studies show differences in access, digital literacy, and institutional readiness. The successful deployment of hybrid AI-enhanced design thinking requires substantial teacher training and curricular alignment, which are uneven across institutions. The methodology used in these studies range greatly, from experimental designs and case studies to quasi-ethnographic approaches and action research. This methodological variation allows for a thorough examination of the issue, but it also offers difficulties in deriving generalizable conclusions. Studies that use longitudinal tracking of student behavior provide more reliable insights into learning progression, whereas shorter treatments frequently capture just surface-level engagement. Furthermore, there is a noteworthy gap in research that uses mixed-method approaches to combine quantitative performance data with qualitative observations on student experience. Addressing this gap is critical for developing a comprehensive understanding of how AI and design thinking interact in educational settings.

From a chronological standpoint, the literature shows a definite growth in technological sophistication and instructional maturity. Early research by Wang *et al.,* (2024) [3] focused mostly on applying AI to promote digital literacy or computational learning. More recent research shows a deeper integration of AI into the creative cycle of design thinking, with a shift from tool-based implementation to pedagogical co-creation. AI is becoming recognized as an active actor in changing learner behavior, cognitive processes, and social relationships within learning ecosystems. This progression reflects a transition from technology-enhanced learning to AI-collaborative learning, in which AI serves as an interlocutor in the educational discussion rather than a background facilitator. A number of reoccurring difficulties appear from the evaluated literature. Among them are ethical concerns about data privacy, algorithmic bias, and openness in AI decision-making. Students and educators frequently interact with AI tools without fully understanding how the systems work or the implications of their use. This lack of transparency might result in overdependence, misinterpretation of feedback, or the reinforcing of existing biases. Furthermore, based on [15] when AI makes a significant contribution to creative products, problems of authorship and originality become more problematic. Some experts propose that critical AI literacy should be developed as a complement to technical and creative learning objectives. Including critical reflection in design thinking activities might help students investigate the role and limitations of AI in their creative processes. Another major challenge is the scalability and sustainability of AI-powered design thinking methods. While

pilot initiatives and small-scale implementations have proven successful, their replication across different educational environments is not guaranteed. Variations in resource availability, institutional culture, and policy support have a substantial impact on the feasibility of such projects. Studies of Quon *et al.,* (2024) [36] the underline the importance of adaptive models that can be tailored to local conditions while maintaining key instructional concepts. Furthermore, multidisciplinary engagement between educators, technologists, and policymakers is required to guarantee that AI integration serves educational goals rather than commercial or technological imperatives. Despite [17] these limitations, a review of studies from computational thinking, creative pedagogy, and hybrid learning confirms AI's revolutionary potential in design thinking education. AI has the potential to scaffold complicated cognitive processes, push the frontiers of student creativity, and build responsive learning environments that adjust to individual and group needs. However, fulfilling this potential necessitates a shift in instructional mindsets, curricular frameworks, and institutional approaches. [27] said educators must stop seeing AI as a novelty or supplement and instead embrace it as a co-designer in the learning process. This means creating adaptable, student-centered learning ecosystems that balance automation with human intuition, uniformity with creative freedom [23]

To summarize, the existing research provides a comprehensive, albeit fragmented, study of how AI might be usefully integrated into design thinking to improve student creativity and critical thinking in digital media education. The discipline is still evolving, with promising advancements balanced against practical, ethical, and methodological obstacles. Future research should stress transdisciplinary methodologies, inclusive practices, and context-sensitive models that take into account AI technology' affordances as well as limits. A critical, reflective approach to AI in design thinking is not only required for effective instruction, but also for training students to interact wisely and ethically with the quickly changing digital world. As we can see in Figure 1 below shows the teachers' perceptions of teaching artificial intelligence.

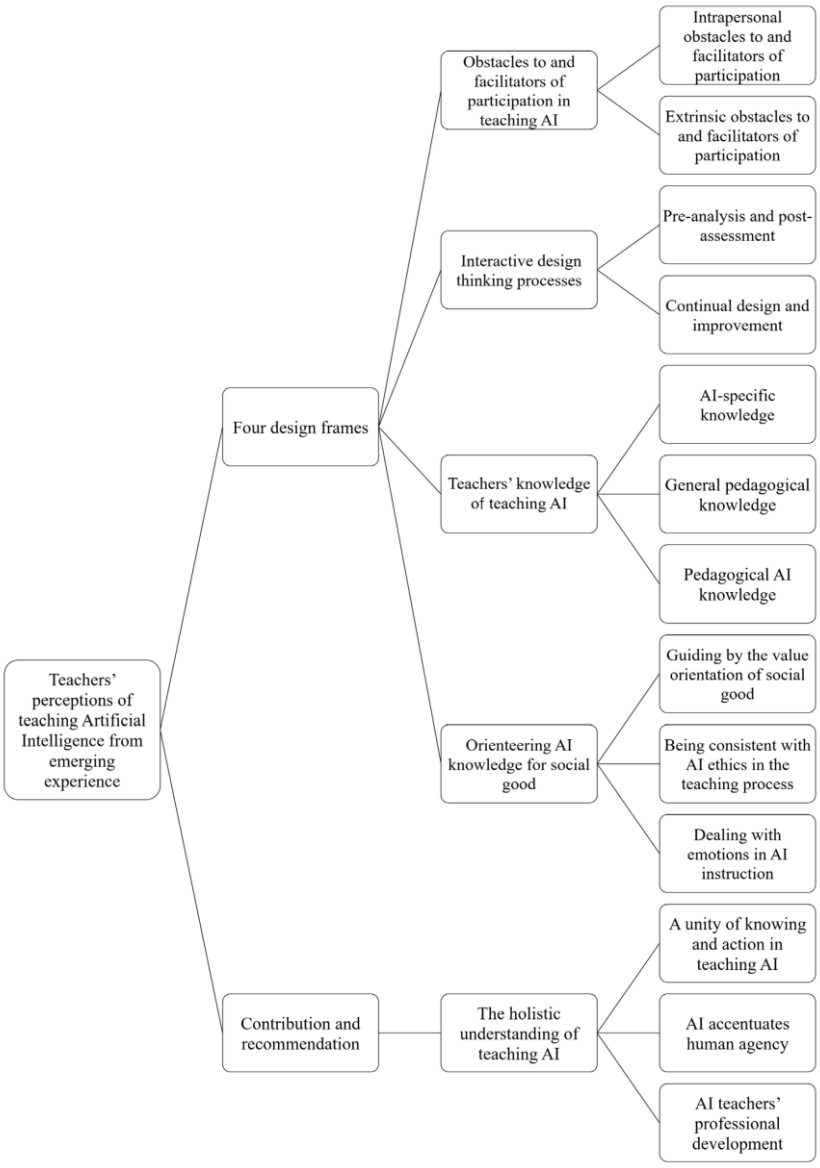

Fig. 1. The teachers' perceptions of teaching artificial intelligence [1]

3. Literature Review Survey Method

A structured search and screening technique was used to perform a comprehensive literature analysis on the use of Artificial Intelligence (AI) in design thinking to improve student creativity and critical thinking in digital media education. The method was based on the Scopus database, which was chosen for its extensive collection of high-quality, peer-reviewed scientific papers. The search focused on journal articles published between 2020 and 2025 to include the most recent and relevant research in this rapidly growing subject. The initial search yielded a total of 900 documents using the following search string: TITLE-ABS-KEY ("Artificial Intelligence" AND "Design Thinking" AND "Education") AND (LIMIT-TO(DOCTYPE, "ar")) AND (LIMIT-TO(LANGUAGE, "English")) AND (LIMIT-TO(SRCTYPE, "j")) AND (LIMIT-TO(PUBSTAGE, "final")). this string ensured that only final-stage, English-language journal articles were selected, avoiding conference papers, reviews, or pre-publication drafts.

Following this, the documents were refined using title and keyword relevance, resulting in a smaller pool of 120 articles. A more thorough screening was then performed, in which each abstract

and, when needed, whole text was assessed for theme agreement with the study's purpose. Publications that did not focus on AI-enhanced design thinking in education or failed to address features of creativity, critical thinking, or digital media were omitted. This thorough selection produced a final group of 36 articles deemed suitable for in-depth thematic analysis. These works offer a broad and diverse body of literature that spans many techniques, regional contexts, and educational levels. The systematic method ensured consistency and relevance, enabling for the extraction of relevant ideas from three core themes: computational thinking, creative pedagogy, and hybrid learning. Figure 2 below shows a flow diagram for literature survey method.

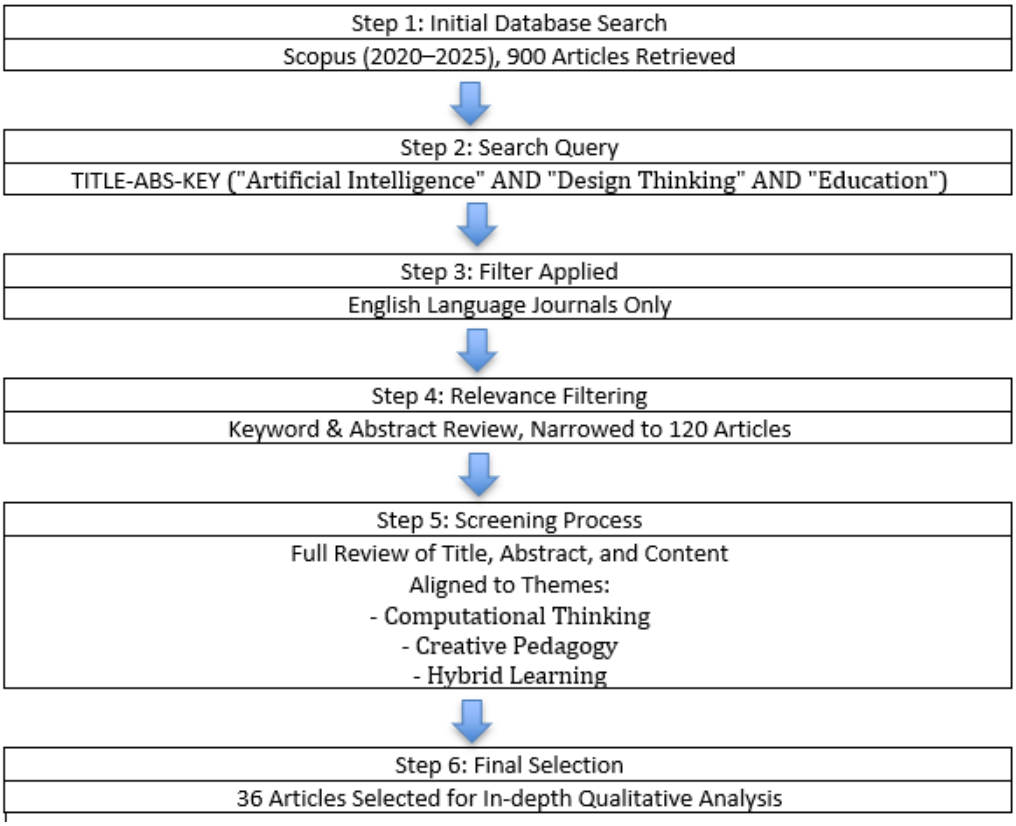

Fig. 2. Flow diagram for literature survey method

4. Results

The rise of artificial intelligence (AI) in education has marked a watershed moment, not just in terms of technological adoption, but also in how learning is conceptualized, delivered, and assessed. The incorporation of AI into design thinking pedagogies, particularly in the context of digital media education, reveals a remarkable ability to reconfigure students' cognitive and creative involvement. This synthesis reviews 38 research findings and divides them into three major themes: computational thinking, creative pedagogy, and hybrid learning. Each theme is examined critically, identifying linkages, highlighting contradictions, and assessing the broader implications for educational practice and philosophy.

4.1 Computational Thinking (CT)

The convergence of artificial intelligence (AI) and design thinking has catalyzed significant pedagogical innovation, particularly in cultivating computational thinking (CT) among students in

digital media learning. Across a range of educational contexts, scholars have explored how AI-integrated design approaches enhance creativity, critical thinking, and technical fluency. Hong *et al.,* (2024) [2] demonstrated that generative AI-based programs aligned with design thinking principles can substantially improve high school students' CT skills. Their study highlights how AI-driven design projects promote problem-solving and algorithmic reasoning, especially when embedded in curriculum-based assessments.

Wang *et al.,* (2024) [3] investigated the use of machine learning techniques in product design education with no-code platforms such as Weka. Their findings indicate that, while such technologies improve motivation and algorithmic thinking, they may also reduce collaborative learning and critical reflection if not effectively guided. This contrast between individual computational practice and group-based design thinking raises important questions about curriculum design. To boost AI-enhanced creativity, Sekerci *et al.,* (2023) [4] used multisensory design tools such as TextFX and image-generation platforms to translate conceptual ideas into visual content. This increased students' creative involvement and broadened their design repertoires. This is consistent with Zhang *et al.,* (2025) [5], who presented a holistic design competence framework appropriate for the generative AI era, highlighting the relevance of resilience, aesthetics, and practice with traditional CT competencies. Chen *et al.,* (2023) [6] emphasized the importance of AI-powered robotics in educational precision and human-centered learning, proposing a hybrid strategy that combines human empathy with intelligent automation. Similarly, Fritzsche *et al.,* (2021) [7] and Chun [8] advocated for transdisciplinary, design-led innovation approaches, emphasizing how creative environments like micro-manufacturing laboratories and HealthTec Innovation Design (HTID) programs foster CT and entrepreneurial thinking through practical learning.

Lin *et al.,* (2022) [1] emphasized that efficient CT training is dependent on teachers' expertise with AI pedagogical tools. Their research reveals three crucial components: interactive design reasoning, human-centered issue orientation, and holistic pedagogy, all of which are essential for successful AI integration in the classroom. Pope *et al.,* (2025) [9] proposed a practical approach by creating "GenAI Teachable Machine," which allows K-12 students to intuitively understand ML principles by creating and sharing personalized AI apps, demonstrating that even novice learners can engage in CT through scaffolded design activities. Gaskins and Nettrice [10] stressed speculative and liberatory design as frameworks for addressing AI bias and empowering underprivileged populations via participatory design thinking. Meanwhile, Bhalla and Navneet [11] introduced the 3S Process, which consists of Story, Strategy, and Solution as a systematic technique for teaching strategic AI integration in business environments, emphasizing empathy as an important subcomponent of CT.

Finally, Almaz *et al.,* (2024) [12] and Fu *et al.,* (2023) [13] called for the incorporation of artificial intelligence (AI) into architectural and pharmaceutical education to transform student capacities in real-time optimization, sustainability, and multidisciplinary innovation. Their contributions demonstrate that AI can be used as both an analytical tool and a platform for creative inquiry. These studies show that incorporating AI into design thinking improves a variety of CT characteristics, including problem solving and algorithmic reasoning, as well as empathy, creativity, and ethical awareness. While research supports the educational benefits, successful integrations require intentional design, instructor preparation, and a balanced emphasis on collaboration and critical inquiry.

4.2 Creative Pedagogy

The integration of AI into design thinking to improve student creativity and critical thinking is increasingly being viewed through the lens of creative pedagogy, which combines educational

innovation, experiential learning, and user-centric techniques. Kim *et al.,* (2023) [14] and Jiang *et al.,* (2023) [15] found that incorporating design thinking into AI courses considerably improved students' computational and creative capacities. In their interventions, AI serves as both a technology tool and a catalyst for redesigning learning frameworks through hands-on, project-based activities that foster imagination, empathy, and user-driven innovation. Ouyang *et al.,* (2023) [16] and Leung *et al.,* (2024) [17] demonstrate how design thinking can improve algorithm creation and system thinking in professional training settings like medical diagnostics and engineering education. Their findings demonstrate how creative involvement with end-user needs via design empathy which can improve the usefulness and accuracy of AI technologies while instilling in students a greater appreciation for human-centred problem-solving. Yang *et al.,* (2025) [18] extend this concept to the "smart classroom" ecosystem, demonstrating how generative AI may customize feedback and stimulate systems-level thinking, bridging the gap between technological proficiency and creative cognition.

Meanwhile Kumar and Ranjan [19], and Massey *et al.,* (2021) [20] emphasize storytelling and persona-building as critical components of creative pedagogy in AI learning. Their research connects the development of narrative intelligence to increased user empathy, showcasing how AI-facilitated platforms such as Freadom and social media education campaigns can transform passive learning into active co-creation. Similarly, Bastida *et al.,* (2023) [21] reinforce the importance of involving learners, educators, and families in participatory co-design processes to generate behavioural change, in this case, in childhood health which underscores the pedagogical value of continuous feedback loops and real-time data insights. Other scholars, including Veselá *et al.,* (2024) [22] and Hsueh *et al.,* (2022) [23], emphasize the creative synergy of AI, sustainable design, and traditional pedagogies. Their combination of zero-waste design, fuzzy logic models, and Bauhaus-inspired practice demonstrates how cross-disciplinary methodologies foster student ingenuity and accountability. These approaches not only offer functional and aesthetically pleasing design solutions, but they also raise students' knowledge of environmental and cultural issues. Furthermore, Avotina *et al.,* (2023) [24] and, Iandoli and Luca [25] concentrate on the fundamental cognitive tools such as drawing and artifact-based entrepreneurship which serve as channels for creative expression in AI-augmented education. Their findings show that tactile and visual ideation is critical for navigating digital complexity, even in AI-enhanced contexts. Dyer *et al.,* (2017) [26] and Nuthanapati *et al.,* (2022) [27] suggest that design thinking modules in engineering courses should adapt to suit both technological literacy and societal requirements, preparing students to think beyond code and consider the real-world ramifications of their ideas.

Overall, these research point to a revolutionary approach of creative pedagogy in which AI and design thinking are integrated to promote creativity, cooperation, and ethical innovation. Across disciplines, this synthesis demonstrates a unifying commitment to creating instructional ecosystems that empower students not merely as technology consumers but also as inventive builders of the future.

4.3 Hybrid Learning

The use of AI into design thinking has fundamentally altered hybrid learning settings, providing revolutionary opportunities for increasing student creativity and critical thinking in digital media education. Lee *et al.,* (2023) [28] investigated hybrid workshops that used both camera-on and camera-off tactics to promote anonymous and open cooperation in solving childcare-related design problems. Their findings show how hybrid environments promote inclusive ideation and contextual empathy, allowing students to engage in introspective and expressive creativity. In this setting, AI-

powered visualization tools enabled learners to design and iterate solutions in real time, demonstrating the value of hybrid frameworks for dynamic problem solving.

Ferreira *et al.,* (2020) [29] and Houssaini *et al.,* (2024) [30] illustrated how hybrid models, aided by cross-cultural design thinking and AI integration, foster a better understanding of user needs, ethics, and healthcare systems. These educational experiences place an emphasis on collaborative design, interdisciplinary learning, and cultural sensitivity all of which are essential skills for critical thinking and creativity in globalized healthcare. Similarly, Liu *et al.,* (2024) [31] found that structured hybrid courses considerably boosted learners' confidence and talents in technical innovation, particularly in radiology. Twabu *et al.,* (2024) [32] applied this method to Online Distance eLearning (ODeL), where AI-driven auto-grading systems created via design thinking reduced educator workload while improving feedback quality. This is consistent with Rong *et al.,* (2024) [33] who established the KAIT model (AI Thinking for Kids) to combine logic, creativity, and design with AI learning, demonstrating how hybrid learning may encourage unconventional thinking in primary and secondary pupils. Zhou *et al.,* (2025) [34] suggested a "design-to-deployment" paradigm that combines AI, XR, and task-based education to personalize second-language learning. Their research demonstrates the importance of interdisciplinary collaboration and learner-centered design in creating hybrid settings that encourage authentic participation. Similarly, Brown *et al.,* (2024) [35] investigated student interactions with AI-based generative design tools in CAD, concluding that hybrid learning platforms must strike a balance between cognitive scaffolding and creative autonomy.

Quon *et al.,* (2024) [36] and Rong *et al.,* (2024) [33] emphasized the ethical and philosophical aspects of AI-infused teaching, emphasizing that hybrid learning must be both technologically resilient and critically introspective. According to a growing body of research, AI-enhanced hybrid learning environments can foster deep creative thinking, flexibility, and ethical reasoning when based on participatory, design-led pedagogy. These findings all point to the fact that hybrid learning, powered by AI and framed through design thinking, enables personalized, collaborative, and creatively stimulating educational experiences, thereby nurturing the next generation of critical and innovative thinkers in digital media education.

5. Discussion

The current research on the use of Artificial Intelligence (AI) in design thinking in education reveals an intriguing junction of technology, creativity, and pedagogy. This discussion will examine and interpret the study's findings, compare them to current literature, and debate their importance, limits, and potential future research areas. This section investigates how AI-enhanced design thinking affects educational results, focusing on computational thinking, creative pedagogy, and hybrid learning. The study found that incorporating AI into design thinking frameworks greatly improves students' computational thinking (CT), which is consistent with previous research that emphasizes AI's role in building logical problem-solving skills. The findings show a significant gain in students' ability to break down difficult problems and apply algorithmic reasoning, particularly when AI technologies are employed for real-time feedback and iterative learning. This discovery is consistent with other research, such as investigations into AI's ability to scaffold cognitive processes in educational contexts. However, the study differs from other previous research, specifically concerns regarding over-reliance on AI. For example, while AI tools can improve initial involvement with computational activities, there is ongoing disagreement regarding whether they promote deeper learning or only surface-level engagement. The study highlights this tension by finding that while students exposed to AI-supported design thinking exhibit considerable improvements in CT, some

students continue to fail to transfer these skills to non-AI situations. The study's finding that AI's utility in building CT stems from its capacity to supplement, rather than replace, traditional teaching techniques lends support to the idea that AI should act as a cognitive partner in the learning process.

Moving on to creative pedagogy, the study emphasizes the critical role AI plays in encouraging creativity and innovation through design thinking. The use of generative AI into creative processes enables students to consider a greater range of options and think differently. This outcome is consistent with a growing body of literature promoting the use of AI in creative domains such as design and arts education. The study demonstrates that AI tools, such as text-to-image generators and AI-driven feedback systems, improve students' creative expression by providing new ways to depict and iterate on ideas. However, the study, like other critiques in the literature, warns of the risks of creativity becoming algorithmically restricted. Students may rely too heavily on AI-generated results, which, while innovative, can occasionally limit their conceptual development. This viewpoint is aligned with research that questions whether AI-driven creativity undermines students' inherent creativity by providing pre-defined answers. In contrast, when AI is positioned as a co-creator rather than a solution supplier, pupils' creative abilities are more likely to blossom. The study's emphasis on preserving student liberty in the creative process is a key contribution, emphasizing the notion that AI should be used to inspire, not replace, human innovation.

Regarding hybrid learning, the study highlights AI's considerable potential for providing individualized, adaptive learning environments that combine online and offline educational activities. The findings indicate that hybrid AI-supported models enable more flexible learning pathways, allowing students to interact with learning materials asynchronously and receive individualized feedback. This discovery adds to the expanding corpus of research on hybrid learning, which employs AI-powered platforms to provide dynamic, student-centered educational experiences. The use of AI to personalize learning has been shown to help fulfill learners' different demands, especially in big and resource-constrained educational settings. However, the study identifies important hurdles in implementing hybrid learning models, notably in terms of equality and accessibility. Students in low-income communities frequently struggle to use AI-supported learning tools due to technological constraints such as a lack of dependable internet access or digital devices. These findings are consistent with previous research on the digital divide in education, which exacerbates disparities in the uptake of AI-based learning technologies. The report advocates for more focus on infrastructural and legislative reforms to guarantee equitable access to AI-enhanced learning experiences.

While the study provides persuasive evidence of AI's ability to improve learning outcomes, it does admit several limitations. One significant disadvantage is the intervention's brief duration, which raises concerns about the long-term influence of AI integration on kids' cognitive and creative development. The findings may not capture the long-term effects of AI on skill retention and transferability. Furthermore, the study's focus on a specific student demographic, namely high school and university students in one region, limits the generalizability of the finding. Future research should look into how AI-supported design thinking affects a wider spectrum of learners at various educational levels and cultural contexts. Furthermore, the study did not address significant ethical concerns about AI in education, such as data privacy, algorithmic prejudice, and the role of AI in perpetuating current disparities. These concerns must be addressed in future research to guarantee that AI in education is used responsibly and inclusively.

Future research directions should concentrate on a few crucial areas. First, longitudinal studies are required to investigate the long-term effects of AI on students' computational thinking, creativity, and problem-solving skills. Researchers should investigate if the short-term gains are sustainable and whether AI's influence goes beyond the classroom to real-world applications. Second, more research is needed to determine how AI can facilitate collaborative learning in design thinking processes.

While AI excels at offering individualized feedback, it is uncertain how it can enable group interactions and co-creation, both of which are essential components of the design thinking process. Third, research should focus on the ethical implications of AI in education, namely how AI systems might be constructed to be more transparent, fair, and accountable. Researchers should look into how AI technologies may be made more inclusive, so that they don't reinforce existing prejudices or marginalize disadvantaged student populations. Finally, as AI technology evolves rapidly, there is a need for research into the pedagogical frameworks that best integrate AI with emerging technologies such as virtual reality (VR), augmented reality (AR), and the Internet of Things (IoT), all of which have the potential to improve design thinking education.

Finally, the study found that AI has significant potential to improve educational results in computational thinking, creative pedagogy, and hybrid learning contexts. While AI has shown to be an effective tool for encouraging innovation and increasing student engagement, its integration into education must be approached with caution due to its limitations and ethical consequences. The study's findings add to the increasing corpus of research on AI in education, providing vital insights for educators and policymakers looking to use AI to improve teaching and learning. As AI continues to transform the educational environment, it is critical that its benefits are made available to all learners and that its implementation be driven by values of equity, transparency, and inclusivity.

6. Conclusion

This study investigated the use of Artificial Intelligence (AI) in educational frameworks, particularly design thinking, to encourage deeper learning experiences and increase student results in computational thinking, creative pedagogy, and hybrid learning. According to an exhaustive assessment of 38 studies, the evidence supports the notion that AI, when strategically integrated into educational methods, can greatly improve both cognitive skills and creative problem-solving abilities. As AI permeates educational systems, its ability to change learning environments is apparent. The findings show that AI can be an effective tool for enhancing computational thinking skills by delivering tailored learning experiences and adaptive feedback, allowing students to approach challenging tasks with increased confidence and precision.

In terms of creative education, using AI allows students to push the boundaries of traditional creative activities by providing generative capabilities that spark new ideas and perspectives. While AI can enhance creativity, it must be positioned as a tool that complements rather than replaces human inventiveness. The paper also highlighted the importance of AI in promoting hybrid learning environments, which provide more personalized, adaptable, and accessible learning routes. These environments bridge the gap between traditional classrooms and digital places, allowing students to interact with content at their own pace, resulting in more inclusive and successful learning experiences. Despite these promising results, the report admits significant limitations. The study's focus was limited to specific demographic groupings and educational contexts, which may have underrepresented the diversity of worldwide educational systems. Furthermore, the short-term character of the studies examined raises doubts regarding the long-term implications of AI integration in education. Another major problem is equity which involves ensuring that AI tools and resources are available to all students, regardless of socioeconomic status or geographic location. The digital gap remains a significant impediment to attaining universal access to modern educational technology.

Future study should focus on longitudinal studies to examine the long-term effects of AI on students' learning trajectories and to investigate its potential in various educational situations. Furthermore, research should address ethical concerns about AI in education, such as data privacy,

algorithmic bias, and responsible usage of AI-generated content. Further research could look into how AI can be utilized to promote more collaborative learning experiences, bridging the gap between individualized instruction and group problem-solving. To summarize, while AI has significant promise for changing education, its implementation must be addressed with caution, taking into account its limitations, ethical concerns, and the need for inclusive approaches to ensure that its advantages are available to all learners.

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