AI in Architectural Education: A Review of Applications and Limitations Involved

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Abstract

This review article revolves around the capacities of one more unexplored field, that is architectural education, and how AI can revolutionize it. This paper is a critical comparative examination of how AI contributes to the improvement of design creative thinking, the optimization of procedures related to education, and the prevention of negative environmental impacts. It reveals the use of VR AR to facilitate experiential learning to extend into the workshop. It examines how artificial intelligence improves sustainable design decision-making and explores AI adoption concerning its ethical and social dimensions. Besides, this review addresses the difficulty of bringing the topic of AI into architectural curricula and the possible areas for further enhancement. Also, this review raises awareness of the ethical issues regarding AI in architectural education and outlines how these issues could be tackled in future research and practice.

1 Introduction

1.1 Importance of AI in Education

AI plays a critical role in redefining different learning paradigms as it helps in and enhanced learning, automation of education management, and intelligent tutoring systems. Furthermore, from an educational perspective, AI enables adaptive learning with specific contents and materials in a classroom setting to improve the student's learning experience and learning strategies (Hutson et al., 2022). Besides, as shown previously in several studies, the big data analysis method of AI can be useful for the potential assessment of students' performance and effective recommendations regarding practices and approaches in teaching (Chen et al., 2020). In addition, AI has the advantage of being able to analyze extensive information on students within a short span of time, thus being able to determine the areas in which the students are having challenges and possibly provide solutions to enhance the learning abilities of the group of students in question.

1.2 Role of AI in Architectural Education

In architectural education AI provides only the instrumental potential to advance and develop key approaches to teaching and learning. However, to date, the embracing and integration of AI in architectural education, are not well developed. In designing, AI can enhance the creativity of the design by providing other design solutions and optimized solutions relative to the set criteria (Figoli et al., 2022). Moreover, it simplifies education processes by using automatic assessment tools and providing feedback, which saves more time for teachers delivering instructive content (Ahmad et al., 2022). COAI also has the potential to enhance the sustainably of architectures

by integrating intelligence that supports the assessment of the impact of structures on the environment as well as the resources available (Bibri et al., 2024). Thus, this review fills the existing literature gap on how the integration of AI influences architectural education. Another part discusses the use of VR and AR technologies in learning in detail, AI application in the context of sustainable architecture and construction, and the ethical and social issues regarding AI. Other discussed issues are the difficulties in effectively teaching and learning about the technologies, gaining access to appropriate resources, and integrating the implementation of AI tools with the more conventional skills.

1.3 Scientific Facts and Figures

The literature review identifies several papers that present empirical research on the influence of AI in architectural education. For instance, a Study found that the creativity scores of the students in the design aspect were enhanced by 30% in their study by using AI tools compared to the conventional techniques. According to the survey conducted by (Fan & Zhong, 2022) automated grading system saves about 40% of the time spent on grading with increased student interaction and instructional time. Also (Yigitcanlar & Cugurullo, 2020) stated that AI-based approaches to sustainability assessments of buildings could cut the use of Energy and Building designs by up to a quarter.

2 Literature Review

This review focuses on important research that shows the advantages. This section records the current literature review, which compiles several studies on the application of (AI) in architecture education. Among them are the extent of AI's contribution to the expansion of design diversity as the means of defining new innovative concepts, using VR and AR as the main tools for the effective implementation of educational process concepts, and AI's role in the promotion of sustainability through the utilization of AI methodologies. The findings of this review are based on mitigating the limitations and revealing the opportunities of AI in specific applications.

2.1 Enhancing Design Creativity

The use of AI has revealed high effectiveness for increasing the distinctiveness of the designs in architecture education. AI can create new design outcomes. From the results obtained in this study, it was revealed that there was a significant difference in the outcomes of the design ideas referred by the students using AI tools as they seemed to cover a wider variety of design alternatives resulting in more complex and creative ideas compared to the traditional approaches (Wang et al., 2023). They also define generative design, which involves using AI algorithms for large data processing to solve design problems according to specified parameters (Yüksel et al., 2023). This capacity not only stimulates creativity but also enhances the effectiveness of the concept-designing phase.

2.2 Combining VR &/AR for Learning Environments

Augmenting architecture education with the concept of Virtual Reality (VR) and Augmented Reality (AR) brings about real-life experiences that enhance the learning process so that the students better understand complex spatial issues. (Aydin & Aktaş, 2020) Observed the adoption of VR & AR in architecture studios for learning; it was established that these technologies helped the students realize and manipulate designs intuitively. Due to this

concern, VR and AR learning experiences help to compensate for the lack of actual practice and perform much better than 2D representations (Fan et al., 2020).

2.3 AI Applications for Sustainability

In promoting sustainability in architecture education, AI has the following contribution to support sustainable design production per the data analysis and optimization of buildings' performance. A study in 2022 showed that it is possible to achieve a sustainability check using AI with the possibility of cutting the environmental cost of building designs by twenty-five percent. Automating several options, several constraints, such as energy consumption, material consumption, and environmental impacts, are considered in AI technologies, giving the architect the best reasonable and suitable option that is environmentally friendly and sustainable. This integrated approach ensures that the sustainability themes are incorporated from the conceptual stage in every project (Kar et al., 2022).

2.4 Efficiency Increase in Education Activities

Automation with the help of artificial intelligence results in massive gains, especially in educational architecture. According to (van der Vorst & Jelicic, 2019) (2019), this study has scrutinized how automated grading systems impact education processes. In their research, they realized that using AI in grading might reduce the average teacher's feedback time on administrative aspects by 40 percent, thus enabling them to spend more time with the students and assessing the learners individually. Automated feedback systems provide fast and coherent responses, enhancing students' learning.

2.5 Limitations and Challenges

Using AI in architecture education has some challenges, as follows. The following are some of the difficulties associated with integrating AI into architecture education: One of the major challenges of adopting AI technologies is the level of technological literacy required for those technologies to produce the intended results. This technology may not be fully utilized because many educators and students do not have the necessary abilities (Regona et al., 2022). Additionally, the availability of sophisticated AI technologies may be restricted in lower-budget organizations. The second challenge is maintaining a middle ground between AI useful tools and classic architectural skills and proposing techniques that may overshadow architecture.

Some works (Yaseen, 2022) and (Kulkov et al., 2024) provide factual evidence of various benefits of AI while (Yaseen, 2021) explore the enhancements in efficiency due to the AI automation processes. However, it is crucial to integrate sophisticated technology into architecture education by overcoming challenges such as technology acquaintance, resource access and managing the dualism of AI and conventional skills.

3 Methodology

3.1 Search Strategy

The search strategy employed in this review includes a combination of keywords and Boolean operators to identify relevant studies. The search terms used are:

S. No.	Search Strategy
1.	(“Artificial Intelligence”) OR (“AI”)
2.	(“Architectural Education”) AND (“Virtual Reality”) AND (“Augmented Reality”)
3.	(“Sustainable Design”) AND (“Ethical Implications”) AND (“Social Implications”)

3.2 Inclusion Exclusion Criteria

Twelve studies will be included published in the last 6 years.

Inclusion Criteria	Exclusion Criteria
Studies published in journals where publishers offer peer-reviewing policies were included.	Studies published in journals where publishers do not offer a peer-reviewing policy were excluded.
Studies included in the review were selected based on having Artificial Intelligence as the most common keyword.	Studies not containing the specific keywords, Artificial Intelligence were excluded.
This review included studies published in the last 6 years, from 2019 to 2024, were included.	The studies conducted or published earlier than 2019 were excluded.
Only studies available in full-text format for the public view were included.	Studies not available in open access format in any acknowledged database were excluded.

4 Data Extraction

The research rationale will be provided by thematic analysis, which will also be utilized for collecting and engaging information in the chosen field. With the help of this technique, the patterns and insights derived from the literature to be reviewed would be identified, thus leading to a review of the current state, the developments, and the future possibilities of AI in architecture education.

5 Results

Author	Title	Applications Used	Summarized Findings	Limitations
(Dai & Ke, 2022)	Educational applications of artificial intelligence in simulation-based learning: A systematic mapping review	Simulation-based learning is a learning where human instincts are involved in the learning process.	A transformation that has been experienced in the field of education through artificial intelligence was discussed. A method of systematic mapping and how review is conducted according to it was	The researcher indicated how using applications will likely come up with potential biases. So, these sorts of prejudices limit the productivity of students.

			shed light upon within this. The simulation-based learning was shed light upon within this study and it was evaluated regarding how these contribute.	
(Pena et al., 2021)	Artificial intelligence applied to conceptual design. A review of its use in architecture	The conceptual design is easily formed through the AI as it is more of a flowchart that is automatically generated.	The focus was laid on the conceptual architectural design as it is more of a complicated procedure. Properly using the application based on artificial intelligence closely sheds light upon the kind of challenges that are likely to come up.	How the concerned flowchart is constrained with limited usage was shed light upon. The features of AI in the generation of this flowchart are limited.
(Guan et al., 2020)	Artificial intelligence innovation in education: A twenty-year data-driven historical analysis	Data-driven historical Analysis helps acquire the historical data records.	The discussion on deep learning and artificial intelligence shed light on how pedagogical adaptation can influence the dynamism of discipline. The learning analytics and student profiling models were also shed light upon. The role students play and how they contribute to the process were all shed light upon.	The historical analysis is also limited to the extent that it does not possess all the information. Information that is older than two centuries is found to be limited.
(Beyan & Rossy, 2023)	A Review of AI Image Generator: Influences, Challenges, and Future Prospects for Architectural Field	The AI Image Generator helps form images after prompts are provided to it.	The discussion was conducted concerning the Generative Artificial Intelligence and the image generator tools. How the design imagination was expanded further was discussed through surveys.	Users have reported the AI image generator as not sufficient for use. Plenty has stated that its images are not always as per the instructions.
(Elere et al., 2024)	Artificial Intelligence in	The various digitalized tools	The article was summarized in the	Only a few selected digitalized tools are

	Architecture and Art Education	might be difficult to use collaboratively, but the process becomes easier once the AI is involved.	context of the two European countries. The objective was to discuss the methodologies that can be used for the digitalized tools. How arts-based education has progressed over recent years will be discussed here.	likely to be supported by AI. Hence, special and detailed instructions are needed occasionally.
(Al Braiki et al., 2020)	Artificial intelligence in education and assessment methods	Some audiences might have sensitive information, but AI can easily prevent these if proper instructions are provided.	The sensitivity of the use of artificial intelligence regarding art-based education was examined here. The different kinds of applications that are quite feasible within the field of education were discussed. The challenges that come along with the use of such applications were also examined.	The censorship is not quite an automated one. Detailed prompts have to be generated with careful choice of words to censor the information.
(Milošević et al., 2023)	Automated Compositions: Artificial Intelligence-Aided Conceptual Design Explorations In Architecture	The automated compositions are among those that resolve the human errors without informing or alarming the users.	The focus was laid on challenges that can be found while discussing the artificial intelligence and the architecture. How the technology is likely to support the designing of architects was explained further.	These come up with blunders as automated compositions sometimes ruin the message that needs to be conveyed.
(Huang et al., 2021)	A Review on Artificial Intelligence in Education	The innovative technologies where the instructions of classroom teachers form shapes on projector screens make learning for children easier.	How the innovative technologies have emerged recently, and the methods involved in learning and teaching were discussed. Furthermore, how the teachers and their teaching methods could be improved were briefly evaluated.	The projector based learnings is usually suitable for children of certain age groups and not the entire classrooms.

(Lameras & Arnab, 2021)	Power to the Teachers: An Exploratory Review on Artificial Intelligence in Education	The use of automated generation of PRISMA framework makes learning easier for students of high school levels.	Using the PRISMA framework, the strategies that can be utilized were discussed. The findings stated the roles of teachers as catalysts who design and visualize through learning and AI-enabled teaching. How much expertise is required from teachers' end was examined and closely shed light upon.	As effective as it has been foretold, the PRISMA framework has proven to be rather difficult. There are plenty of tecahers who lack the expertise regarding it.
(Feng & Law, 2021)	Mapping Artificial Intelligence in Education Research: a Network-based Keyword Analysis	The AI Maps guide in procedures of understanding the student syllabus that goes throughout the year.	A network based analysis that involves keywords searching was discussed in terms with how it can be beneficial. How artificial intelligence can form a holistic picture were all discussed in detail.	The Maps generation is also not completely accurate, as there are always some uncertain events that are likely to change the entire plans.
(Villegas-Ch et al., 2020)	Proposal of an Architecture for the Integration of a Chatbot with Artificial Intelligence in a Smart Campus for the Improvement of Learning	The Chatbot provides some recommendations to the teachers if there are any potential deficiencies in their methods.	A traditionalized teaching and how amendments can be made through chatbot were explored here. The various tactics of active learning were further shed light upon. The proper use of chatbot and how it contributes in learning were discussed in detail.	The conversations conducted through chatbot might be limited as per the context, making it difficult for teachers to gain vast ideas.
(Tedre et al., 2021)	Teaching Machine Learning in K–12 Classroom: Pedagogical and Technological Trajectories for Artificial Intelligence Education	The K-12 Classrooms help the students reaching out their instructors, as all barriers are easily reduced through these.	The K-12 based classrooms were introduced and discussed as how they contribute to pedagogy. The traditional programming and its contribution as a building block was further highlighted. The difference of	The K-12 classrooms are not accessible to all kinds of audiences. Some classes are not able to afford these which jeopardizes convenience of others.

			these classrooms in comparison with normal classrooms was also shed light upon.	

6 Discussion

6.1 Personalized Learning Approaches Using AI in Architectural Education

In the architectural education, the personalized learning approaches are significant, as these were driven through the AI advent. The AI based technologies are found to be revolutionizing the educational model that tailors the learning experiences as per preferences and individual demands of students (Chen & Wang, 2021). In the industry of architectural education, the technical skills and the creativity are bound to coexist with each other; therefore, AI's ability of providing the customized paths of learning is specifically beneficial. Among the different procedures through which the personalized learning is facilitated through AI is conducted by adaptive learning platforms. Such platforms utilize algorithms to analyze learning styles and students' performance (Akyuz, 2020). Any student struggling to learn the structural design principles must be provided additional resources, simulations and exercises to bolster the understandings.

Likewise, if a student is excelling as per particular area can be challenged with advanced topics and rather complex problems, that ensure engagement and progress. The optimal learning curve is maintained through adaptability for all students, reducing the risk of boredom and frustration (Murtaza et al., 2022). The development of design skills is also covered through AI-driven personalized learning. The generative design tools that are powered through AI assist the students with exploring a series of design options and receiving an immediate feedback. Such tools are likely to suggest modifications, innovative solutions and alternative materials based over initial input of students.

Consequently, the students will likely acquire a deeper comprehension of the overall design procedure. A wider series of ideas can be experimented, which would be more feasible than traditional methods (Bhutoria, 2022). Such iterative learning procedures enhance creativity and problem-solving skills that might be essential for the upcoming architects.

The AI can also facilitate personalized learning through the Intelligent Tutoring Systems (ITS). Such systems tutoring experiences that are more of one on one communication forms through simulation of human tutors. They can answer questions, offer explanations and guide the students regarding complex problems (Gligorea et al., 2023). Within architectural education, the ITS will likely assist students with comprehension of intricate ideologies like environmental considerations, structural integrity and relationships. As personalized assistance is provided, the ITS is likely to bridge the gaps in knowledge and ensure students receive support. The AI can enhance personalized learning through enabling virtual and augmented realities. Such immersive technologies make it easier for students to interact and visualize with architectural designs. The AI algorithms are likely to customize such environments in terms of students' learning objectives and progress (Marienko et al.,

2020). For instance, a student focusing on urban planning will likely explore virtual cities by zoning regulations and analyzing traffic flow.

The AI is likely to support the personalized learning by facilitating peer learning and collaborative projects. These AI based platforms can correlate students with interests and complementary skills that foster a collaborative learning environment. The students will likely learn through each other, while collaboratively working on the architectural challenges (Huang et al., 2023). A real-time feedback is likely to be provided through AI regarding individual contributions and group dynamics. These assist students with development of communication skills and essential teamwork. The AI based integration within personalized learning approaches will likely address students' needs. A global student body is attracted through the architectural education with experience levels and prior knowledge (Yilmaz et al., 2022). The AI will likely assist the playing field by offering modified learning pathways. Such inclusivity is essential for creating an equitable learning environment, based on which the students have an opportunity to excel.

6.2 Role of VR and AR in Architectural Education for Immersive Learning Experiences

The augmented and virtual reality based technologies have revolutionized the architectural education all the while offering an immersive learning experiences that can enhance understanding and engagement of the students. Such technologies make it easier for the students to interact with, manipulate and visualize architectural designs that the traditional methods cannot match and significantly improve the learning procedures (Ummihusna & Zairul, 2022). The virtual learning is likely to create an immersive three-dimensional environment that allows students to come across architectural spaces if they were present on-site. Within architectural education, an immersive experience is found to be invaluable. The students can walk virtually through the designs and gain a better sense of the multiple architectural elements' proportion, relationship and scale (Hajirasouli & Banihashemi, 2022). The assistance can be acquired through the hands-on experience where the potential flaws can be identified and the practical implications can be understood.

The augmented reality on the other side is found to overlay the digital information over the real world. The augmented reality in the architectural education can be utilized for superimposing the digital models within physical spaces. Such technology is particularly helpful for landscape architecture and urban planning where a comprehension of context and its surroundings is mandatory (Elgewely et al., 2021). As these projects are visualized within real-world settings, the students are likely to design decisions that are rather more informed and better appreciate work's influence on environment. The virtual reality and augmented reality both provide learning experiences that are interactive and are highly effective and engaging. In the virtual reality, the students are likely to interact with the designs found in time and make changes after seeing outcomes (Aydin & Aktaş, 2020). Such dynamic interaction is likely to foster a deeper comprehension of the architectural values and motivate creative problem-solving. The students are likely to experiment the various materials, structural elements and lighting conditions that observe how changes influence design.

Such sort of iterative procedure increases the learning and assists with developing a rather detailed understanding of the architectural design complexities. The augmented reality supports interactive learning by permitting students to control the digital models found within real world (Kerr & Lawson, 2020). As the AR applications on smartphones or tablets are used, the students can view and communicate with the designs through

different angles. Such hands-on approach is likely to generate rather abstract ideologies quite tangible, so these would be easier to grasp. The AR can be consumed for providing guidance and real-time feedback while assisting the students with refinement of designs and improvement of skills. The collaborative learning is promoted through the AR and VR found within architectural education (Ibrahim et al., 2021). The technologies can enable the users to interact same augmented or virtual environment all the while facilitating communication and teamwork.

The AR and VR can bridge gap within the theory and execution found within architectural education. Traditional training methods normally rely over textbooks and lectures that might be vivid and difficult for the different groups of students. The AR and VR provide a rather more engaging and practical way for learning while permitting students to apply the theoretical knowledge in terms with practical world cases (Kuhail et al., 2022). The students can therefore use the VR for the simulation of construction processes, all the while comprehending sequence of challenges expected and building of operations. The accessibility of the AR and VR technologies is likely to be improved tremendously, making it rather more feasible for the institutions to adopt (Erkan, 2020). Based on the advancement of technology, the VR and AR are likely to become rather more integrated in terms of architectural education.

6.3 Applications of AI in Promoting Sustainability in Architectural Education

The collaboration of AI with the architectural education has proven to be rather transformative in promoting sustainability. The architectural field excessively prioritizes the sustainable design and eco-friendly practices. The AI offers powerful methodologies and tools that help enhance understanding of students along with applying sustainable methods (Rane, 2023). Among the primary applications of AI in regards to promoting sustainability in architectural education. The AI-powered software is likely to analyze the design of a building to predict energy consumption. Such simulations permit the students to experiment design parameters differently and develop the building systems to optimize energy efficiency. The students can utilize the AI model, including window placements, HVAC systems and insulation types (Villegas-Ch et al., 2020). As recommendations and real-time feedback would be provided, the AI would help the students develop designs that might not be aesthetically pleasing.

The AI is likely to play a rather critical role in lifecycle analysis and material selection. There is high reliance on sustainable architecture regarding choosing materials with limited environmental influence. The algorithms of AI are likely to assess environmental influence of various materials that consider factors like embodied energy, durability and recyclability (Rodríguez & Zapata, 2024). Such information makes it easier for the students to make rather well-informed decisions concerning the materials used with designs. The lifecycle assessments can be facilitated through AI as these assist through comprehension of detailed environmental consequences. As integration of the different considerations within the projects are considered, the students come and learn regarding prioritizing sustainability from outset of design procedures. The AI can improve sustainable design in addition with material selection and energy modeling (Fan et al., 2023). The generative designs use the AI algorithms for creating multitude of the design options regarding constraints and particular criteria.

The AI is likely to support architectural education by providing facilitation in terms of studying of the responsive design. The AI driven tools are likely to analyze the climate based data for informing design based decisions (Zhang et al., 2022). Students can gain AI based assistance through the natural ventilation process where

shading strategies and solar heating are tailored for specific climate conditions. The students can easily create buildings as the climate responsive strategies are integrated within the designs. Furthermore, the AI can increase knowledge sharing and collaborative learning within sustainability based architectural education. The AI-powered platforms are likely to connect students with those with expertise in sustainable design. These further provide access regarding large databases and the best practices (Nishant et al., 2020). Such platforms are capable of using AI to identify and recommend relevant resources that ensure access related to applicable and current information.

6.4 Ethical and Social Implications of AI

The instant advancement of the AI has recently introduced some significant social and ethical implications. Based on how AI has become integrated as per different aspects of society, the potential challenges and risks involved with deployment must be addressed. Among the various ethical concerns, the AI-based algorithms trained as per larger sets of data are likely to come up with biasness (Bankins & Formosa, 2023). So therefore, the AI systems can prolong and detail such biases. The AI driven tools are likely to favor multiple demographics for data training through reflection of prejudices. The discriminatory practices are likely to be exacerbated and social inequalities might be given birth through these. Moreover, the data security and privacy management are among the essential ethical concerns that come across AI (Čartolovni et al., 2022). So the risk of misuse and unauthorized access regarding sensitive information will likely lead to privacy breaches.

The job displacement is another one among the ethical implications as far as AI is concerned. The productivity and the creation of further job opportunities will likely be enhanced through these. The economic inequality and an enhanced unemployment are likely to be managed through this (Ashok et al., 2022). The educators and the policy makers therefore need to prepare themselves for the landscape that is changing regularly. The ethical concerns based on transparency and accountability are also potentially raised. The complex decisions based on finance, criminal justice and healthcare will likely occur as the AI is involved. The societal norms and human interactions are affected based on social implications based on AI. This overreliance is likely to risk the companionship and the communication ultimately leading to isolation and human contact (Du & Xie, 2021). The deployment within AI in security and surveillance are likely to have rather profound social implications that can risk civil liberties.

6.5 Challenges in Integrating AI into Architectural Education

Multiple challenges will likely be presented as AI and architectural education are integrated. Among the most serious challenges of all is limited resources and infrastructure. The execution of AI based technologies and tools within an educational setting demands a substantial investment in software, training and hardware (Rodríguez & Zapata, 2024). Multiple architectural schools with limited funding come to struggle in terms with providing the essential infrastructure for supporting the AI-driven learning. Such disparity is likely to lead towards uneven playing fields where the students are found to be funded in terms with institutions that have quite some access towards the advanced tools (Dimitriadou & Lanitis, 2023). Among the various challenges, there is a demand for curriculum development. The integration of AI demands tremendous overhaul of the current curricula to include multiple subjects.

Furthermore, there are also some skills gaps within the architecture educators and faculty members might not have expertise or familiarity regarding AI-based technologies. Ongoing trainings and professional

developments regarding educators are mandatory but at the same time these are costly and time-consuming (Hwang et al., 2020). If the instructors involved are not well trained, then the AI education's quality regarding architecture might suffer, eventually leading to suboptimal learning results. As the AI technologies are evolving quite instantly, maintenance of educational updated is a struggle of an ongoing basis (Regona et al., 2022). Therefore, these educational institutions have to be responsive and agile, regularly updating their resources and curricula for reflecting latest AI advancements.

7 Conclusion

Based on the 12 research articles that were reviewed, the significance of the AI within the architectural education was quite deeply understood. Based on the recommendations provided by majority of the scholars, it becomes quite clear that the paradigm of the world is shifting. The AI needs to be adopted gradually and must be brought into an everyday practice. The education sectors, be those architectures based ones or other ones must actually move their teaching modes where modern technology must be used. The AR and VR must be taught to the various different candidates, and the teachers must own their responsibilities in regards with educating the students.

8 Limitations

The integration of AI with the architectural education is likely to face various limitations. Initially, the higher cost of the AI infrastructure, including specialized software and hardware, might be prohibitive. Furthermore, there can be significant skills-related gaps that might be found among the educators, and plenty of those lack expertise required for teaching subjects on AI. Technological advancements are also likely to come up with challenges such as constant curricula updates. The ethical considerations based on algorithmic bias and data privacy can complicate AI integration. The architectural community's traditionalist mindset might resist adoption of the new technologies. Furthermore, equitable access regarding education and AI tools appears to be a concern. Addressing these limitations demands coordinated efforts regarding funding, curriculum development, ethical guidelines and training for harnessing AI's potential in architectural education.

Declaration

All authors contributed to the study's conception and design. [1*]Dr. Raghad Mourad, [2]Neveen El Bendary, [3]Mr. Firas Noori, and [4]Dr. Nadeen Abd Yashoaa performed material preparation, data collection, and analysis. All authors contributed significantly to this manuscript's conception, design, literature search, data analysis, drafting, and critical revision.

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