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ORIGINAL

Environmental Design Teaching with the Integration of Traditional and Modern Techniques

Enseñanza del diseño ambiental con la integración de técnicas tradicionales y modernas

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ABSTRACT

Introduction: environmental management considers the architecture in design, planning, programming, or manufacturing. It intends to create places that recover the cultural, social, ecological, and physical architecture of certain locations. However, traditional teaching methods are indeed employed. Modern technologies serve as supplemental tools. The current method of instruction is a step toward contemporary technology.
Objective: examining environmental design training using conventional and contemporary techniques was the aim of the study.
Method: we collected survey data for this investigation. 400 students completed and submitted the questionnaire. Statistical Package for Social Sciences (SPSS) software was used to present the data. The research examines well-known visualization tools and traditional contemporary presentation techniques.
Results: according to the study, architecture students rated modern technologies more satisfactory than traditional methods, indicating higher quality facilities and services. Modern technology in Environmental Design Teaching enhances learning experiences by reducing time consumption (65 %), increasing efficiency (85 %), offering flexibility (65 %) and improved visualization (90 %), and facilitating better documentation (80 %), leading to higher student satisfaction (87 %).
Conclusions: integrating traditional and modern architectural design techniques enhances learning experiences and efficiency, resulting in more effective and innovative design solutions through advanced tools and methods.

Keywords: Environmental Design; Students; Traditional and Modern; Satisfaction Level.

RESUMEN

Introducción: la gestión ambiental considera la arquitectura en el diseño, planificación, programación o fabricación. Pretende crear lugares que rescaten la arquitectura cultural, social, ecológica y física de ciertos lugares. Sin embargo, se emplean métodos de enseñanza tradicionales. Las tecnologías modernas sirven como herramientas complementarias. El método actual de la instrucción es un paso hacia la tecnología contemporánea.
Objetivo: examinar la formación en diseño ambiental utilizando técnicas convencionales y contemporáneas fue el objetivo del estudio.
Método: se recolectaron los datos de la encuesta para esta investigación. 400 estudiantes completaron y presentaron el cuestionario. Para la presentación de los datos se utilizó el software Statistical Package for Social Sciences (SPSS). La investigación examina herramientas de visualización conocidas y técnicas de presentación tradicionales contemporáneas.

Resultados: según el estudio, los estudiantes de arquitectura calificaron las tecnologías modernas como más satisfactorias que los métodos tradicionales, indicando instalaciones y servicios de mayor calidad. La tecnología moderna en la enseñanza del diseño ambiental mejora las experiencias de aprendizaje al reducir el consumo de tiempo (65 %), aumentar la eficiencia (85 %), ofrecer flexibilidad (65 %) y mejorar la visualización (90 %), y facilitar una mejor documentación (80 %), lo que lleva a una mayor satisfacción del estudiante (87 %).
Conclusiones: la integración de técnicas de diseño arquitectónico tradicionales y modernas mejora las experiencias de aprendizaje y la eficiencia, resultando en soluciones de diseño más efectivas e innovadoras a través de herramientas y métodos avanzados.

Palabras clave: Diseño Ambiental; Estudiantes; Tradicional y Moderno; Nivel de Satisfacción.

INTRODUCTION

Creating and enhancing learning environments is the primary objective in educational design to support and improve teaching and learning. Environments that facilitate learning objectives, develop stakeholders responding to them, and encourage productive learning outcomes are all important.[1] The proper design of their physical spaces can have a significant impact on student participation, behavior, and academic success in educational institutions.[2] The benefits of aligning design goals with learning objectives, how to involve different stakeholders in the design process, and how these designs affect overall student learning will be discussed.

Educational designers, teachers, students, and other stakeholders are involved in many aspects of educational environmental design, each with their perspective when they are not so active; students' perspectives on how learning environments affect their experience are important.[3,4] By considering the perspectives of all these stakeholders, educational institutions can create an environment that supports diverse teaching styles and learning preferences.[5]

The unique educational objectives of the institution should be consistent with effective teaching practices and environmental management.[6] This means that, in the context of group projects, traditional lectures, or solo learning, the layout of classrooms and other learning spaces should represent and enhance the desired teaching styles.[7] Inclusive features such as rooms incorporating customizable materials, appropriate technology, and flexible design makes it possible to ensure that the physical environment supports education rather than hinders, it is also important to create an enabling learning environment that acquires and encourages related safety and accessibility.

Structured learning environments have a significant impact on student behavior, engagement, and academic achievement.[8] Studies show that well-planned environments with lots of natural light, comfortable seating, and well-organized layouts can improve students' motivation, attention, and teamwork abilities. Flexible learning spaces that accommodate various teaching methods and learning styles can enhance student interaction and support different educational needs. By creating environments that facilitate effective learning experiences, educational institutions can positively influence student outcomes and overall educational success.

Artificial Intelligence (AI) in architecture education to assist designers in better-comprehending design concepts. Study Architects' potential involvement in AI design raised concerns about how their creativity and architectural touch would be portrayed.[9] AI is changing design by merging Building Information Modelling (BIM) tools and enabling real-time analysis and optimization. They inspected students' experiences of new learning environments in secondary school and identified important issues for further longitudinal and the researchpresented previous showed features of teaching and learning environments can affect student learning and well-being, therefore, feedback can help achieve new learning environments.[10] With architecture playing a key role in tackling urgent environmental concerns, investigation looked to pave the road for a sustainable future.[11] Students enrolled in the first year of the Architectural Design Studio participated in an experimental investigation. The results of the study support the role that technology can play in enabling students to develop more innovative and sustainable solutions through integration into architectural education.

The use of e-learning in contemporary education at Afghan institutions with the objectives of addressing problems, finding best practices, and assessing trends were examined in the research.[12] For both quantitative and qualitative data, it employed a mixed-approaches technique that incorporates content analysis and questionnaires. There were 180 participants since a variety of faculties were guaranteed to be represented through the use of stratified random sampling. A highly automated method for generating recommendations for structural and ecological design: Large Language Model 4 (LLM4DESIGN). Study based only on on-site circumstances and design specifications, LLM4DESIGN used Retrieval Augmented Generation (RAG) ground designs in reality, Visual Language Models (VLM) synchronize all data, and Multi-Agent systems foster creativity.[13] The approach produced design schemes that were cohesive, multi-illustrated, and multi-textual. The integration of sustainable practices into

design education was examined, in the investigation with a focus on fine arts pedagogy.[14] Through an analysis of the relationship between sustainability and design education, the study pinpointed important approaches and techniques for integrating sustainable ideas into the curriculum. It explored the value of multidisciplinary cooperation, hands-on learning, and critical thinking in promoting sustainable design practices among students, drawing on viewpoints from the fine arts. Research developed the titration analysis was a classic and fundamental method in analytical chemistry that was used in many fields, including environmental research, industry, and medicine.[15] A full teaching laboratory course program that revolves around titration analysis and it played a critical role in these domains in assessing the purity and concentrations of various chemicals. To improve energy efficiency, green architecture used a variety of creative design and construction methods, which were all thoroughly determined. Umoh et al.[16] explored the incorporation of sustainable design concepts and highlighted the significance of reducing the environmental impact of buildings.

A range of techniques, including green roofs, passive architecture, and effective insulation systems, were investigated to build buildings that wisely use the resources available to them. With an emphasis on sustainable features in tropical climes, looked at Thai railway station design proposals from 1983 to 2022.[17] It looked for trends and places for improvement in architectural features such as development, roofing, style, form, and service areas. Gabled and curved roofs were typical, and then three-dimensional curved buildings. By showcasing local cultural traits at their main entrances, high-speed train stations improve passenger flow. To enhance agricultural productivity and practices, looked at how innovative training programs and extension services can help.[18] Because of their poor productivity and vulnerability to environmental changes, ancient agricultural techniques can fail to meet the demands of modern agriculture, even though they remain sustainable.

Problem statement: the gap between traditional teaching methodologies and modern architectural practices in environmental design education is a significant issue. Traditional methods often focus on foundational theories but fail to engage students with contemporary needs and technological advancements. This can limit students' ability to address complex design challenges. The integration of modern technologies, such as visualization tools and digital documentation, can enhance learning experiences but hinder overall educational effectiveness. This study aims to address this gap by identifying effective combinations of methodologies, fostering a more engaging learning environment, and equipping students with the necessary skills for environmental design.

METHOD

This research evaluates the architectural design training using traditional and modern methods, comparing effectiveness with digital methods, and assessing student performance across instructional formats to improve education quality. A study involving 400 computer users (86,75 %) surveyed preferences for architectural design software like AutoCAD, Photoshop, and Revit, comparing traditional and modern teaching methods. The study involved 20-28-year-olds in architectural design programs, with consistent computer usage backgrounds. Exclusion criteria removed non-relevant disciplines and inconsistent data. The research aimed to understand students' perceptions of modern versus traditional approaches, software preferences, and the impact of integrating modern technology in environmental design teaching on performance metrics.

Sample collection

Table 1. Architectural Designing Software and their classification

Types of Software	Description
AutoCAD	A software application for 2D and 3D design and drafting.
Photoshop	A graphic design and photo editing software.
Sketchup	A 3D modeling software used for architectural and design projects
Archicad	A BIM (Building Information Modeling) software for architecture
3ds Max	A 3D modeling, animation, and rendering software
Lumion	A real-time 3D visualization tool for architecture
Revit	BIM software for architectural design, MEP, and structural engineering.
Blender	An open-source 3D creation suite for modeling, animation, and rendering.
V-Ray	A rendering engine used with various 3D modeling software.
Cinema 4D	A program for 3D modeling, animation, and rendering.
Rhino	A 3D PC graphics and CAD application
InDesign	A desktop publishing and typesetting software.

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This research involved a data sample of 400 participants. The majority of students (86,75 %) are dedicated computer users who frequently use programs, while only 13,25 % use computers occasionally. The present research conducted a questionnaire survey based on the selection criteria. Figure 1 and table 1 present a list of software utilized in architectural design studies, their descriptions, and the number of students who preferred software, ranked by user count.

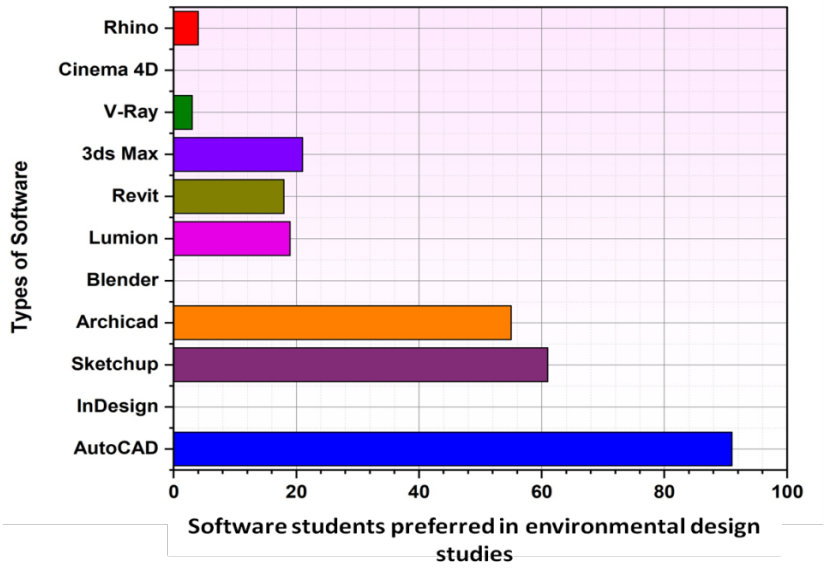

Figure 1. Total number of students who have a preference for specific software

Data analysis

To provide a consistent comparison, assessed two groups by providing both traditional and modern teaching and assessed with the identical drawing task. Based on time consumption, efficiency, flexibility, visualization, documentation, and satisfaction, performance was evaluated. The amount of time it took to do the work was recorded to gauge efficiency, as well as the quality and adaptability of the sketches was used to gauge flexibility and visualization. Clearness and completeness of the documentation were assessed, and a Likert scale was used to gauge satisfaction. The analysis focuses on various aspects of environmental design teaching to evaluate and compare different educational methods. Time consumption and efficiency examines students' time management and productivity, highlighting differences between groups. Flexibility and visualization assess students' adaptability and visualization skills, contrasting how different groups handle these aspects. Documentation and satisfaction explore the impact of thorough documentation on student satisfaction and effectiveness. Digital and traditional architectural education in environmental design studies compares digital versus traditional teaching methods, focusing on their respective strengths in technology and practical skills. The ANOVA test was used to consider the statistical consequence of variation in educational effect, with aessential p-value of 0,05 demonstrating significant differences between the two teaching methods.

Selection criteria

The selection criteria are an important task in this research. The selection criteria can be characterized into two types. The selection criteria types are inclusion and exclusion criteria, are described as follows:

Inclusion criteria

- Participants must be currently enrolled in architectural design programs, ensuring the relevance of their educational background to the study.
- Participants must be within the age range of 20-28 years, which aligns with the targeted demographic for the research.
- Participants' computer usage frequency must be categorized into specified frequencies, allowing for an accurate assessment of its impact on their field.
- Participants are required to provide complete demographic details, including age, gender, field of study, and course load, to facilitate a comprehensive analysis.

Exclusion criteria

- Individuals with inconsistent or irrelevant data regarding their field of study or course load are excluded to maintain the reliability of the findings.
- Participants who are not involved in fields such as computer science, mathematics, or English are excluded.

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Research questions

- How do students perceive the effectiveness of modern approaches compared to traditional methods in their studies? Which approach do they find more beneficial for their learning experience?
- Do frequent and infrequent computer users prefer different software tools for their architectural design work?
- Are there any significant differences in software use between students who frequently and rarely use computers?
- How does the integration of modern technology in environmental design teaching impact time consumption, flexibility, and student satisfaction?

RESULTS

Demographic profiles

Table 2 contrasts two groups of architectural design students: Group 1, consisting of 347 individuals, frequently uses computers, while group 2, with 53 members, engages with computers rarely. The contrast between these two groups highlights significant differences in their computer usage habits. Group 1 has a greater proportion of students aged 25-28 (56,8 %) than group 2 (62,3 %). Gender distribution reveals that group 1 includes more men (43,2 %) than group 2, whereas group 2 has a higher number of females (71,7 %) than group 1. In terms of architectural design studies, group 1 is more represented in Design Studio (23,1 %) and Interior Design (22,2 %), whereas group 2 has a significant presence in Interior Design (37,7 %). For course load, the majority of students in group 1 are full-time (86,4 %), but group 2 has a higher proportion of part-time students (24,5 %).

Table 2. Demographic Profiles

Category	Group 1 (N=347)	Group 2 (N=53)
Age Range		
20-24	150 (43,2 %)	20 (37,7 %)
25-28	197 (56,8 %)	33 (62,3 %)
Gender		
Male	150 (43,2 %)	15 (28,3 %)
Female	197 (56,8 %)	38 (71,7 %)
Types of Architectural Designing Students		
Design Studio	80 (23,1 %)	10 (18,9 %)
Field Studies and Site Visits	60 (17,3 %)	8 (15,1 %)
Interior Architecture	70 (20,2 %)	5 (9,4 %)
Exhibition Design	20 (5,8 %)	3 (5,7 %)
Architectural Graphics	40 (11,5 %)	7 (13,2 %)
Interior Design	77 (22,2 %)	20 (37,7 %)
Course Load		
Full-time	300 (86,4 %)	40 (75,5 %)
Part-time	47 (13,6 %)	13 (24,5 %)

Assessment of time consumption and efficiency

As Architecture College requires students to communicate coursework, presentations, and design projects, time management and efficiency are important abilities. Stress levels and job satisfaction can be greatly influenced by time management strategies. Efficiency can be increased by using methods and features that simplify the process, including digital imaging software. Time tracking software allows students to identify areas where they can improve their performance. Students who want to succeed in architecture programming must know how to manage their time and plan their projects effectively. The observed efficiency and time diagram are shown in figure 2. Group 1 has a lower time consumption (15 %) and higher efficiency (70 %) rate than group 2.

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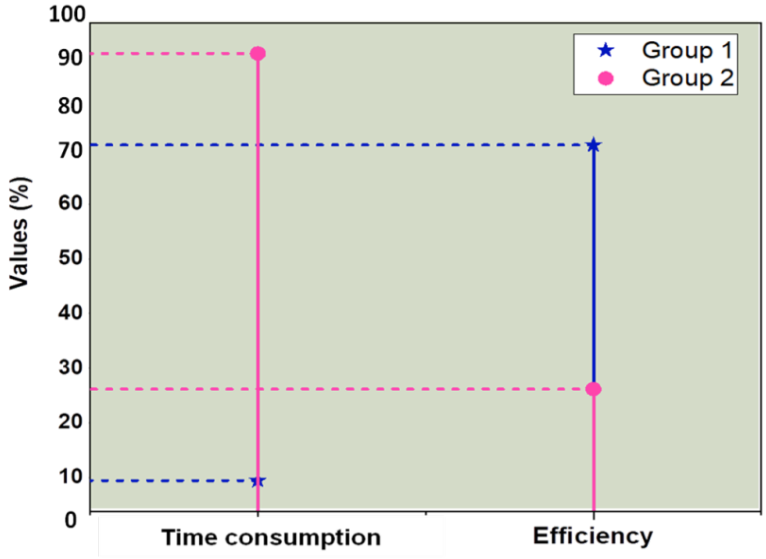

Figure 2. Outcomes of time consumption and efficiency

Assessment of flexibility and visualization

The ability to adapt to design constraints and learning conditions is called flexibility in architectural research. Allow students to understand the content so that they can form their opinions and share their ideas effectively. Using a variety of techniques from basic hand drawings to complex 3D modeling software provides flexibility and visual clarity. Students benefit from flexible learning methodologies that take into account various design styles and processes. Getting feedback from peers and teachers as well as frequent practice helps people strengthen their visualizing skills. Group 1 overcomes the flexibility (65 %) and visualization (90 %) scores of group 2. The graphical results of visualization and flexibility are shown in figure 3.

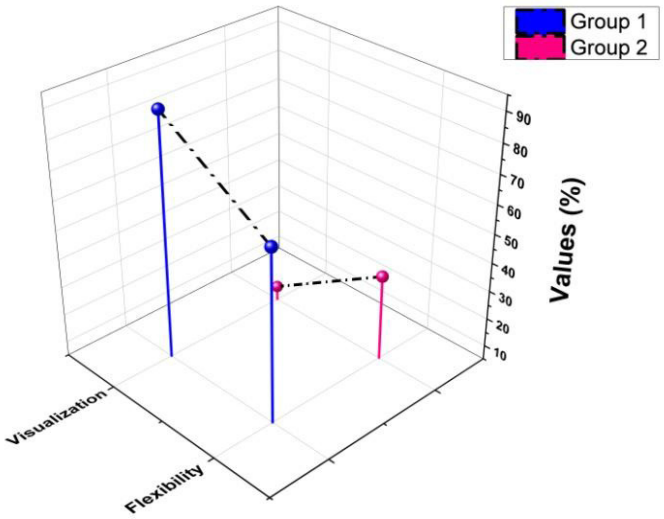

Figure 3. Outcomes of flexibility and visualization

Assessment of documentation and satisfaction

Documentation is essential in architecture education to track the development of designs and assess student learning. It includes creating portfolios, maintaining sketchbooks, and composing in-depth project reports. Good documentation greatly influences success in the workplace and the classroom by facilitating a clear statement of design targets. Students' degree of satisfaction is typically connected with their ability to adequately document and display their work. Good documentation procedures also help them get more constructive criticism and advance their design abilities over time. Figure 4 shows the graphical outcomes of documentation (80 %) and satisfaction (87 %). Group 1 surpasses group 2's satisfaction and documentation rates.

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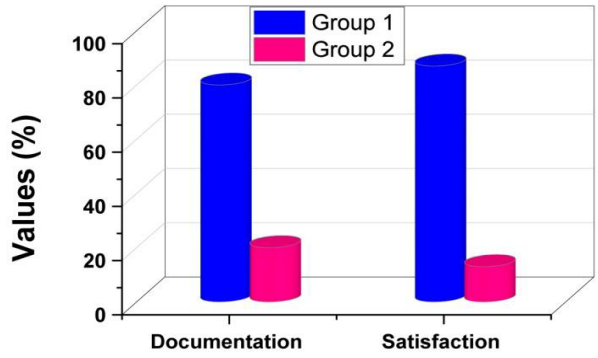

Figure 4. Outcomes of documentation and satisfaction

Digital and traditional architectural education in environmental design studies

A modern, data-driven approach to architecture is reflected in group 1's emphasis on digital and technology competencies in architectural design studies, with a particular focus on data analysis skills, precision tools, and virtual research. The second group, on the contrary, emphasizes traditional architectural education utilizing practical, real-world applications, site work skills, and understanding of constructional structures through hands-on experience and in-person activities. Group 2 puts direct, hands-on architectural practice and community participation first, whereas group 1 is focused on the integration of digital technologies and virtual learning. Figure 5 shows the variant factors between groups 1 and 2. Digital students excel in data analysis (30 %) and precision tools (25 %), with strengths in industry trends (20 %) and virtual engagement (10 %). Traditional students are stronger in fieldwork skills (30 %) and conventional practices (25 %), with a focus on local trends (20 %) and hands-on projects (15 %). Digital students are more proficient in technology, while traditional students have practical, hands-on experience.

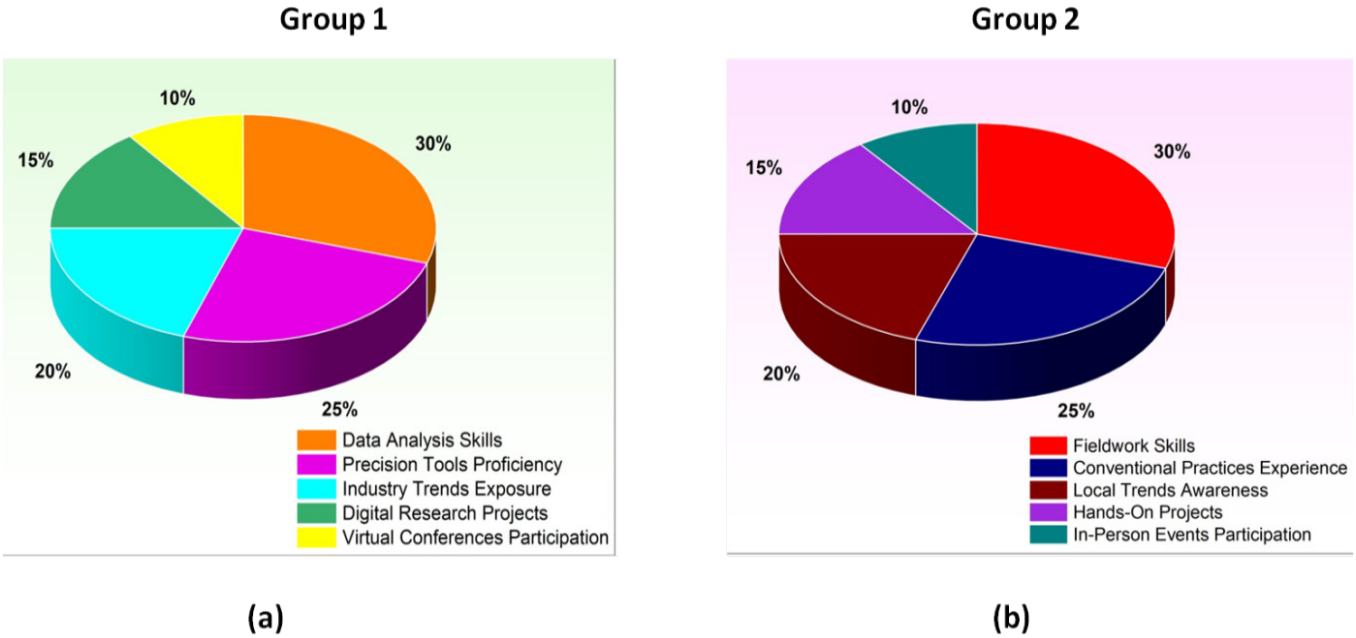

Figure 5. Outcomes of comparative analysis between (a) group 1 and (b) 2

ANOVA test

To ascertain if a single component significantly differs from the means of more independent groups, a statistical test known as a one-way ANOVA is conducted. It looks at whether changes in the dependent variable are more due to factor levels than chance. One-way ANOVA compares means and calculates F and p-values to determine if any observed differences are statistically significant. Table 3 marks the factor of educational outcomes as having a significant effect on the results. The highest F-value is 5,75 with a p-value of 0,02, associated with the educational outcomes metric.

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Table 3. Outcomes for ANOVA test

Criteria	df	SS	MS	p-value	F-Value
Educational Outcomes	3	1500	500	0,02	5,75
Efficiency and Productivity	2	800	300	0,05	4,00
Collaboration and Communication	2	600	400	0,10	3,00
Real-World Application	2	100	50	0,85	0. 50
Overall Satisfaction	2	100	-	-	-
Error	24	2400	-	-	-
Total	35	4000	-	-	-

DISCUSSION

AI can enhance architects' understanding of design concepts through the use of Building Information Modeling (BIM) tools[9] while also raising concerns about the potential loss of creativity and architectural touch in AI-generated designs. To explore the students' experiences in new learning environments, highlighted the significance of teaching methods on their learning and well-being, though it acknowledges the limitation of not fully addressing long-term impacts. The focus on architecture's role in tackling environmental challenges, supporting the notion that students can develop innovative solutions within the context of an Architectural Design Studio, but it have limited applicability outside that specific environment. The use of e-learning in Afghan institutions, emphasized the identification of best practices and trends, although its findings may not be generalizable due to cultural differences. The development of LLM4DESIGN, a tool for generating design recommendations based on specific conditions, but highlights the limitation of relying on accurate data inputs. Meanwhile, delved into integrating sustainability into design education, particularly from fine arts perspectives, suggesting that its findings are not universally apply to broader architectural contexts. The relevance of titration analysis in assessing chemical purity across various fields, but may not address modern, more efficient analytical techniques. The innovative green architecture methods to improve energy efficiency and reduce environmental impact, though it primarily addresses design techniques rather than all sustainability aspects. Thai railway station designs, highlighted significant architectural in the research with the components and possible growth areas; nevertheless, the research's is limited to certain historical and cultural contexts. An analysis of how extension services and training programs can enhance the agricultural production and the research cannot have included regional variations in agricultural methods. The performance analysis highlighted significant differences between architectural design students who use computers frequently (group 1) and those who use them infrequently (group 2). Group 1 shows higher efficiency and lower time management, consuming 85 % of the time compared to group 2's 15 %, and achieving a higher efficiency rate of 70 % versus 30 %. Flexibility and visualization skills are notably better in group 1, with 65 % demonstrating flexibility and 90 % showing strong visualization, compared to group 2's 35 % and 10 %, respectively. In documentation and satisfaction, group 1 leads with 80 % in documentation quality and 87 % in satisfaction, while group 2 records 20 % and 13 %, respectively. The one-way ANOVA results underscore the impact of educational outcomes with a significant F-value of 5,75 and a p-value of 0,02, indicating substantial differences in performance related to educational factors. This analysis reveals that group 1's proficiency in digital skills correlates with higher performance across all metrics, reflecting the benefits of integrating digital tools and methods in architectural design studies.

CONCLUSIONS

The combination of traditional and modern methods of teaching architectural management results in a comprehensive approach that maximizes the benefits of each. Traditional methods give a deeper understanding of the historical and cultural context, while modern methods offer advanced technology and innovative solutions integration enhances the learning outcomes and provides students with a broader range of abilities to consume current content addressing architectural issues. Teachers can use these strategies to encourage students to engage in flexible and innovative design thinking. Finally, this integration assures that future designers will be prepared to offer architecturally friendly and culturally sensitive solutions. Modern environmental design technology, by lowering time consumption (65 %), boosting efficiency (85 %), providing flexibility (65 %), improving visualization (90 %), and enabling better documentation (80 %), improves learning experiences and raises student satisfaction (87 %).

Integration can be difficult due to the different strategies used by traditional and modern methods. In the following generations, architectural policy curricula should place greater emphasis on developing scalable programs that encourage creativity and allow for flexibility.

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The authors declare that there is no conflict of interest.

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