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Article

The importance of figural and verbal sketches in creativity within the architectural design studio

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ABSTRACT

Architectural education has a significant history with Sketch, which has consistently held a prominent position in design. This study investigates the various types of sketches used in the design studio and their impact on architectural education. Sketches, including figural and verbal techniques, are essential for advancing students in design studios. Knowing sketches and their use in the design process can significantly increase students' creativity in the design studio. The research explores how figural and verbal sketches influenced creativity within the design studios. A sample of 107 students was selected from the 2022 Spring Semester and 2023 Fall Semester at Architecture Design 1 at Yildiz Technical University. The Torrance Tests of Creative Thinking and questionnaires were used in this methodology. The data was examined using SPSS version 26, and data analysis t-test, Pearson correlation, and Mann-Whitney U statistical tests were applied. Our research results demonstrate the effectiveness of figural (drawing, diagram, and modeling) and verbal (textual expression and dialogue) sketches in students' design process. These tools also affect students' creative thinking in various design stages. Furthermore, figural and verbal sketches are used in different project stages to develop innovative ideas and thinking and identify fresh solutions and problem-solving during the design problem.

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INTRODUCTION

Architecture education seeks to educate creative and informed people in this sector by cultivating inner skills and transferring architectural principles. Sketches in design education aid students in generating, documenting, and transmitting their creative ideas. Due to their ambiguity and multi-interpretation properties, they also foster creativity (Fish & Scrivener, 1990; Goel, 1995). Architecture students frequently utilize sketches throughout the ideation and information analysis stages to comprehend the subject. Sketches are also employed at later phases if urgent explanations and revisions are necessary (Lawson, 1990). Therefore, sketches are provided throughout the design process to show concepts.

Studio education encourages students to sketch creatively throughout the design process, and this study looks at various sketch methods during architecture education in

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which students communicate their ideas. Sketching gives students a distinctive viewpoint and allows designers to swiftly explore complex topics by articulating their ideas and enthusiasm via novel graphic representations. Sketch's ability to design enables the creation of unique mental images and innovative ideas, which may lead to confusion, enhance intellect, and facilitate creative thinking (Ferguson, 1977; Cross, 1999; Menezes, 2004). The significance of sketching in design thinking has been illuminated by numerous researchers. Goldschmidt (1991) proposed the concept of "seen as seen that", Schön and Wiggins (1992) introduced "seeing more seeing", and Geol (1995) discussed "lateral and vertical transformation". These methods not only serve as tools for design thinking but also as means of communicating with others (Lawson, 1990) and platforms for simultaneously perceiving and seeing a large amount of information (Laseau, 2001).

Research on the role of figural and verbal sketching in creativity within the architecture design studio needs to be conducted, which is the basis for this research. Assuming that the interaction between sketching and creativity is essential in the design process, this article addresses the following questions: In the design process, how do figural and verbal sketches influence creativity within architectural design approaches? Furthermore, which aspects of creativity are most influenced by using sketches in architectural design education? Subsequently, the significance of education and the connection with sketching have been deliberated. Once the influential factors were obtained, they were analyzed in the data. In the Figure 1 in the research process is shown:

Definition of Figural and Verbal Sketch

Sketching is a significant component of imaginative architectural design and a method for developing an architectural mindset. Additionally, it is crucial for architecture instruction since abstract concepts might have any number of unique features. Therefore, the initial stage in this investigation should be to define a sketch. The sketch forms personal thoughts in the design process and has different types in the transfer phase. The design process involved a variety of sketches, and the research on the subject supported it. Fish and Scrivener's (1990) study on the influence of figural and verbal sketches on architectural design highlights the cognitive processes involved. They argue that sketches translate descriptive propositional information into depictive forms, leading to the generation of new descriptive information and then back into sketches. This cyclical interaction highlights the dynamic role of sketching in fostering creativity. Sketching facilitates the continuous generation and refinement of ideas, supporting ideation and enabling the exploration of novel concepts in the architectural design process. Schön (1983) argues that figural and verbal sketching are two distinct methods of employing the language of design. Moreover, Lawson (1990) states that the establishment of creative design relies on the utilization of verbal and figural sketches. Thurlow (2019) asserts that sketch helps create mental images by using symbolic language, making it a creative communication tool that discovers a solution during the design process. Ferguson (1992) identifies three types of sketches: thinking, talking, and prescriptive. Thinking

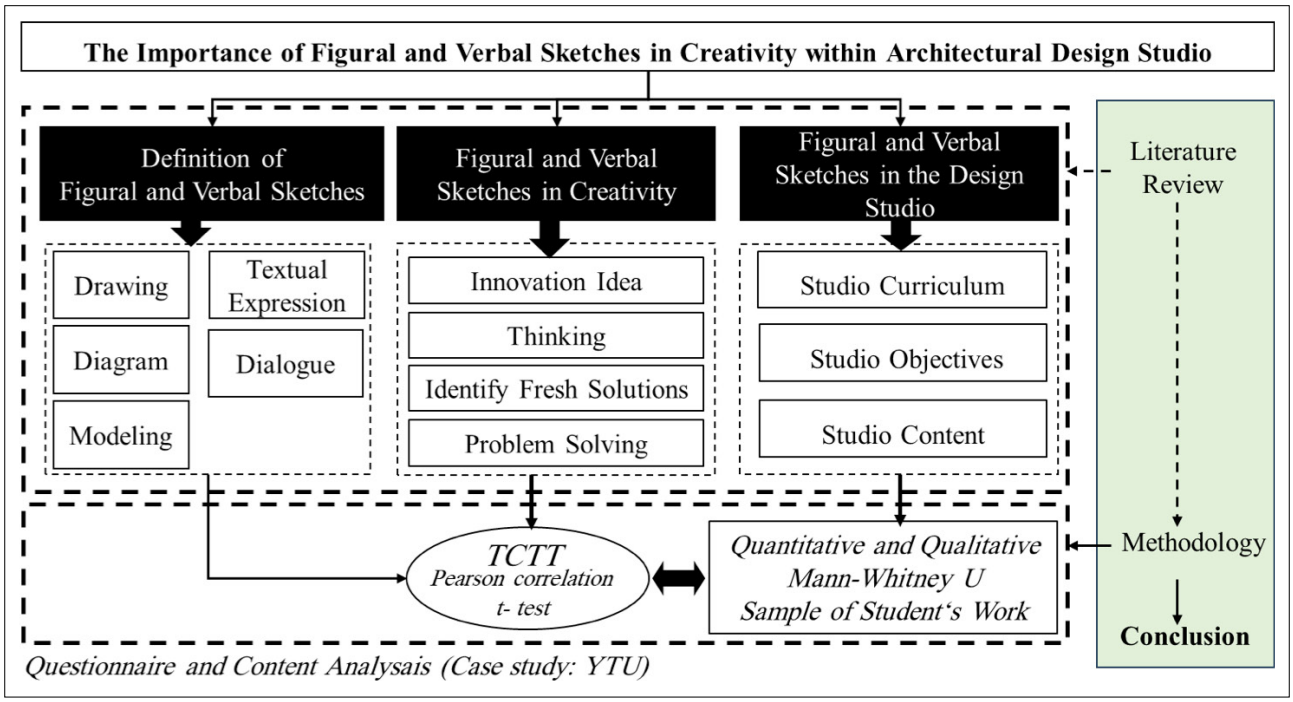


Figure 1. The research process.

sketches support individual thought processes while talking sketches facilitate group discussions. Prescriptive sketches communicate design decisions to outside parties, directing drafters to create a finished drawing. This study considers figural and verbal elements crucial for fostering creativity during the design process.

Figural Sketches: During the initial design phase, the design is documented using figural sketches, enabling the student to convey their mental representations to others. The shape sketch can become tangible and expressed in images, facilitating its gradual transformation into a more refined form as time progresses. Sketch, which plays a crucial role in the mind-hand-eye and mind connections, can be considered a means of "communicating with the individual" beyond providing a discussion tool as a communication tool (Lawson, 1990; Suwa & Tversky, 1996) and using the creative imagination (Zell, 2008). Figural sketches include Drawing, Diagram, and Modeling. Drawing and modeling are methods of abstraction of thought and are used to express a thought or concept in architecture. Diagrams are frequently used with conceptual sketches in the early design stages. Diagrams provide a better understanding of formal or conceptual attributes by simplifying and minimizing elements, discovering a way (Edwards, 2008), and helping to solve a design problem (Robbins, 1994). The designer contributes to the design process by reproducing the model. Models at different scales cause students to perceive form and proportion better in design education (Moon, 2005). Multiple tools bring the model design idea closer to its physical reality.

Verbal Sketches: Verbal sketches are also essential to express a particular idea in the design process (Lloyd et al., 1995). They define the structure of thinking and learning behaviors in the design process and question the communication and interaction process between the student designer and the project manager in architectural education (Lee et al., 2023; Potur, 2007). Initially, students learn through experience and education, then communicate their designs to professionals using handwriting. This helps them clearly express their ideas and engage with others in the design process. Verbal sketches are in two groups in the design process: Textual and Verbal Expression or Dialogue. Textual expression is a line language closely related to drawing, and much of designers' creative thinking is nonverbal, involving objects, pictures, or visual images in the mind (Ferguson, 1977). During the verbal sketch, students can understand, explain, and recognize other people's speech based on their prior experience because the verbal sketch has vague and ambiguous characters during the design process. Students need to explain the project in more detail to understand different things. Figural and verbal sketches are used together to provide more project details.

Figural and Verbal Sketch in Creativity

Creativity is a psychological phenomenon that generates unique, original, and practical ideas, insights, and solutions that are original and significant (Simonton & Ting, 2010). Creativity relate to educational experiences (Simonton, 2012). Creativity is a kind of thinking, reason-finding, association, and problem-solving activity (Aslan, 1990). Creating sketches facilitates transformative thinking and the reinterpretation of concepts in creative design. Initial investigations indicate the need to establish formalized shape rules for sketch interactions (Cross, 1997). Various types of figural and verbal sketches are associated with different stages of the design process, and the unstructured and ambiguous sketch is critical due to its connection with innovation and creativity. Sketches are initially fuzzy and uncertain, often only comprehensible to their creators. Their ambiguous and fuzzy nature of sketches is essential for fostering innovation and creativity in the design process, as they serve as critical tools for addressing ill-structured problems in the early design stages (Goel, 1995). Moreover, sketches remain imprecise and uncertain compared to refined designs, underscoring their role in iterative and creative exploration throughout the design process (Gürsoy, 2010).

Early design education students often need help using sketches for creativity, including a lack of skill, unfamiliarity with their purpose, and fear of failure (Leblanc, 2015). Sketches, particularly in their unstructured and ambiguous forms, facilitate reinterpretation and the generation of new design ideas. This iterative process supports creative exploration and problem-solving, enabling designers to externalize and refine their thoughts. It is especially beneficial for novice students in architectural education (Purcell & Gero, 1998), helping them assess and discard initial ideas, and most importantly, avoid random and unjustifiable concepts, thereby instilling confidence and developing more substantial and meaningful designs. Sketching also aids in generating new design ideas and transforming them into explanatory visual information (Fish & Scrivener, 1990), finding solutions and composing new ideas (Menezes, 2004), as well as fostering development, understanding, and problem-solving (Suwa & Tversky, 1996). Sketching encourages a reinterpreted cycle in idea generation, allowing for continuous evolution of creative concepts in both figural and verbal sketches.

Sketches in the Architectural Design Studio

The Design Studio is a crucial higher education architecture curriculum component, requiring weekly credit hours. It aids students through various phases and culminates in project submission. Flexibility programs develop creative thinking, problem-solving, and adaptability skills. The curriculum streamlines learning, focusing on multiple subjects. Factors influencing students' thinking and behavior include the

curriculum, education, relationships, and the studio's process. (Akin, 1987; Potur, 2007), The objective of the studio and space considerations in the educational content design studios of the class (Lawson, 1990; Nadimi et al., 2019). The studio's objective is to develop a deep understanding of the principles and processes of architectural design. This course fosters critical thinking, analyses complex problems, and proposes innovative solutions. The curriculum, objectives, and content of Design Studio are interconnected with the implementation of figural and verbal sketches and their impact on the design process. An architectural design studio process is comprised of stages: (A) Knowledge Acquisition, (B) Synthesis, (C) Analysis, and (D) Initial Design and Evaluation (Canbay Türkyılmaz & Polatoğlu, 2012). During this stage, figural and verbal sketches are used as the first step of the design for concept sketches, analysis sketches, processing sketches, and reinterpretation sketches.

Concept sketching is a deliberate technique for expressing design thinking in the initial design stage (Tovey et al., 2003). The conceptual stages of design are characterized by uncertain knowledge and evolving goals (McGown et al., 1998). Analysis sketches involve deeper investment in ideas discovered during the "Concept" stage, focusing on developing promising ideas(Do et al., 2000). Sketches are also widely acknowledged as a significant element in the design process (Ferguson, 1992; Goldschmidt, 1991). Process sketches are iterative figural and verbal sketches that track design progression. They are continuously refined through testing and feedback, allowing designers to improve their memory and thoughts. By improving the design process, it is possible to enhance exploration's fluidity (Brun et al., 2016). While reconstructing an idea, sketching supports analysis and reinterpretation during individual thinking (the "thinking" function) aids in understanding and reinterpreting others' drawings (the "talking" function), and provides access to earlier ideas (the "storing" function) (Brun et al., 2016; Van Der Lugt, 2005). Reinterpretation sketches enhance the creative process by offering new perspectives on a drawn representation and guiding idea generation (Purcell & Gero, 1998). Furthermore, this procedure is employed in an uninterrupted cycle throughout the studio's working process. During the design studio, using figural and verbal sketch techniques can enhance creativity, allowing students to tap into different brain parts, unlock new perspectives, serve as a visual representation of their imagination, and aid in explaining their concepts (Figure 2).

The rest of this paper is organized as follows: Section two discusses the methodology, including the objective of the research and survey method. Section three discusses the results in terms of analysis of figural and verbal sketch and creativity, analysis of education background and creativity, and analysis of the education, sketch, and TTCT. Section four evaluates the results and explores the relationship between sketching and creativity. Finally, section five concludes the paper, summarizing the essential findings and potential future research direction.

METHODOLOGY

The primary aim of this research was to investigate the impact of figural and verbal sketches during the design studio on student creativity. Building on previous studies, including the translation of the TTCT into Turkish (Aslan & Puccio, 2011) and its application in architectural education (Aridag & Aslan, 2012; Ayyıldız Potur & Barkul, 2009), this study introduces a new connection between TTCT and figural and verbal sketching in architecture education. The study was conducted with first-year architecture students at Yildiz Technical University (Istanbul, Turkey), Involving 107 students from the 2022 Spring (Group A) and 2023 Fall (Group B) Semesters. Group A participated in a hybrid format (one day online and one day face-to-face), while Group B attended face-to-face 2 lesson sessions in the

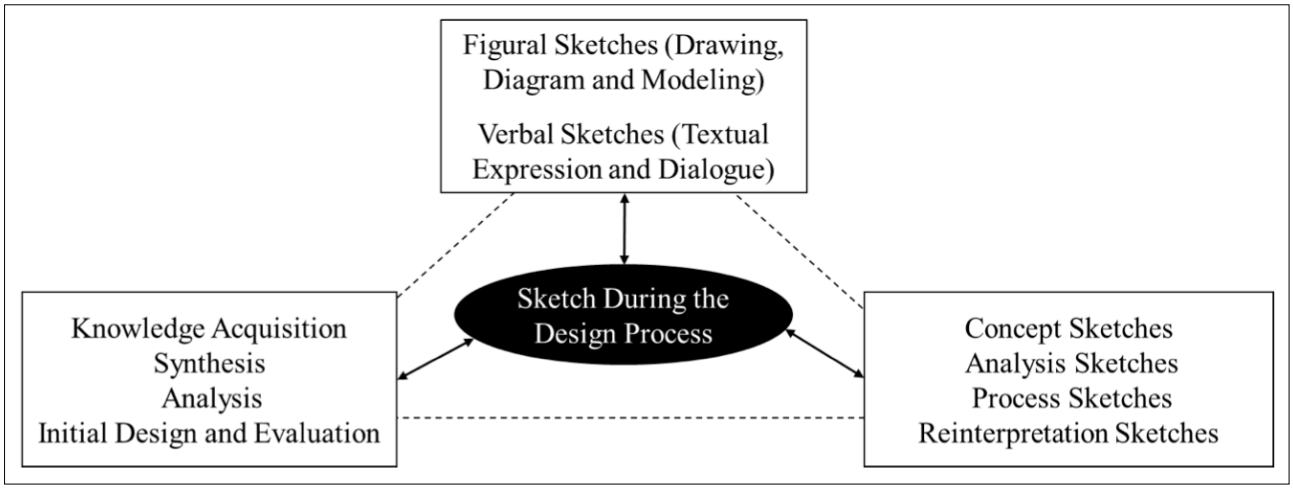


Figure 2. Using sketch in the design process.

studio during the week. These differences are intended to examine the impact of figural and verbal sketching on the design process and creativity in two distinct student groups.

This study employed quantitative and qualitative methods. The qualitative component involved a detailed analysis of the studio's curriculum, objectives, and sketches. This method was complemented by a quantitative approach, which involved administering the Torrance Tests of Creative Thinking (TTCT) alongside a specifically designed questionnaire. Whereas, the TTCT scoring method has limitations (Baer, 2011) in capturing the multifaceted nature of creativity in architectural design. To address these limitations, a specialized questionnaire on educational background and samples of students' work from Groups A and B were investigated to measure the creativity levels in the architectural studio and illustrate how figural and verbal sketching influence creativity. Also, the TTCT and a questionnaire were administered during weeks 6 and 7 of the semester. Data from the TTCT and the questionnaire were entered into SPSS software for analysis. The TTCT scoring guide, adapted to Turkish by Prof. Aslan, 1999, was used for evaluation. The questionnaires were analyzed to establish and validate the correlation between sketching and educational outcomes.

Statistically, the Mann-Whitney U test, t-test, and Pearson correlation were utilized to evaluate discrepancies in sketching factors as indicated by TTCT scores. Furthermore, descriptive and analytical approaches were adopted to scrutinize students' work. This combination of methods provided a robust framework for understanding the role of sketching in fostering creativity within architectural education (Table 1).

RESULTS

In the Architectural Design 1 (AD1) Studio, students employed diverse sketching styles to express their design ideas, integrating these techniques throughout the academic curriculum. The studio was conducted twice weekly, totaling 8 hours per week. Studio AD1 focused on developing students' abilities in spatial problem-solving and advanced architectural thinking. Students learned to conceptualize housing designs, address user requirements, and utilize various methods to convey their ideas. The curriculum emphasizes concept, analysis, process, and reconstruction sketches during the weekly studio sessions (Figure 3).

Analysis of Figural and Verbal Sketch and Creativity

The students in Group A used 91% drawing, 62.60% diagram, 81% modeling, 56.40 textual expressions, and 71.2% dialogue in Group B, 79.40% drawing, 64.60% diagram, 71% modeling, 76.60 textual expressions, and

Table 1. TTCT Methodology and associated qualitative analysis

	TTCT Test		Question	Qualitative Analysis (Education)
	TTCT Figural	**TTCT Verbal**		
Components	1. Fluency	1. Fluency	▪ Individual	▪ Studio curriculum
	2. Originality	2. Flexibility	▪ Family and educational background	▪ Objectives
	3. Abstractness of Titles	3. Originality	▪ Figural and verbal sketches	▪ Content significantly
	4. Elaboration			▪ Students sketch works
	5. Resistance to Premature Closure			
	6. Checklist of Creative Strengths			
Activities	1. Picture Construction	1. Asking	The questions are divided into two parts.	▪ Descriptive
	2. Picture Completion	2. Guessing Causes	The first part concerns individuals, families,	
	3. Lines (in Form A)/Circles	3. Guessing consequences	and educational backgrounds, while part two	
	(in Form B)	4. Product Improvement	concerns sketches.	
		5. Unusual Uses (Cardboard in Form A/Tin Cans in form B)		
		6. Just Suppose		
Time	30 min to finish all three activities	35 min to finish all six activities	10 min to finish	-

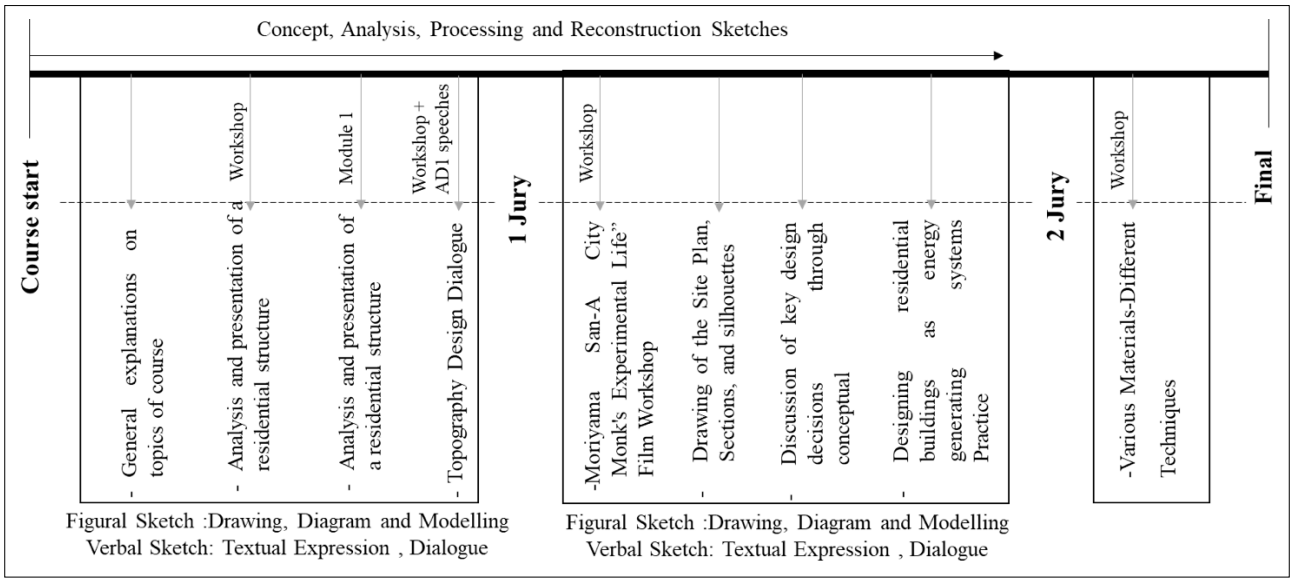


Figure 3. Architectural design studio 1 curriculum.

68.80% dialogue. Groups A and B of students' figural and verbal sketch works were considered at various stages of the design studio to investigate their use of various sketches during the design process.

Table 2 shows that students utilize figural and verbal sketches in various design processes to discover ideas, develop concepts, refine designs, analyze thoughts, and reconstruct. Group A emphasized figural sketches during the design process, relying significantly on drawing and modeling in design outputs. In contrast, Group B used figural and verbal sketches, drawings, diagrams, and textual expressions during the design process. Both groups, A and B, similarly utilized dialogue. Students use concepts and analysis sketches in their designs to create innovative ideas, think, identify fresh solutions, and problem-solve. As the process progresses, they employ process and reconstruction sketches to refine designs, solve project challenges, and explore fresh solutions. Sketches used to take on a more defined and structured form. Thus, sketches are crucial in the design process, driving creativity and development.

Analysis of Education Background and Creativity

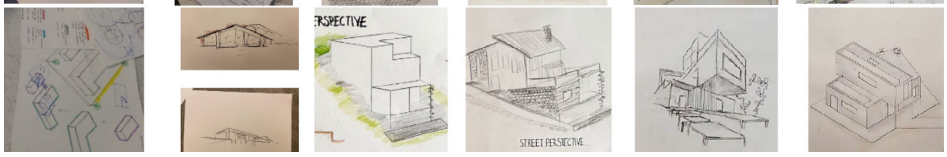
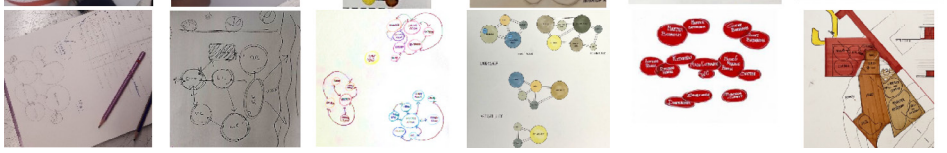
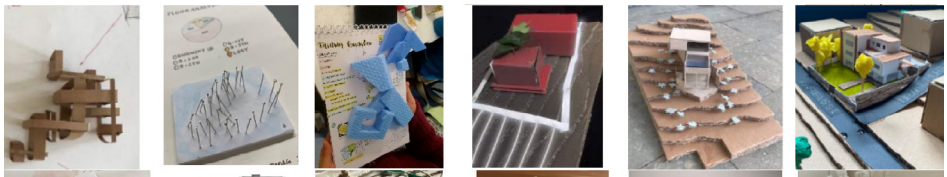
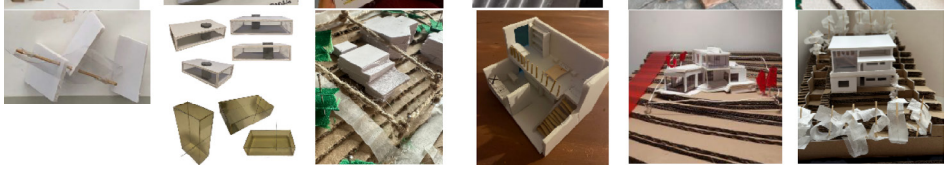
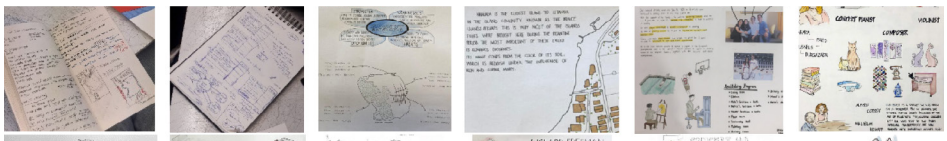
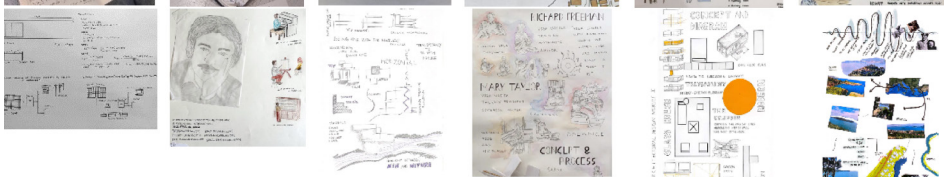
When examining students' characteristics, their grades are considered individual factors as well as a factor for measuring their creativity. Professors from various groups calculated the students' grades. In reviewing these grades, the grades of the design course of the previous semester are considered. They were, therefore, preoccupied with their tests and assignments. As a result, the researchers decided to use students' grades when designing projects to indicate their design creativity.

In Group A, a significant positive relationship exists between figural sketch, creativity, and "Introduction to Architectural Design (IAD)" score, as indicated by a correlation coefficient of 0.256 and a significance level of 0.027. This means that students in Group A who use more drawings, diagrams, and models in their design process tend to have higher creativity scores. However, in Group B, with a significance level of -0.74 and a significance level of 0.310, no significant relationship was found between figural sketching and creativity. Creativity and verbal sketching in Group A show an inverse significant relationship with a correlation coefficient of 0.449 and a significance level of 0.000. This indicates that students or individuals who are more involved in verbal sketching tend to be less involved in creativity, and this trend is supported by strong statistical evidence. In contrast, Group B shows no significant relationship between verbal sketching and creativity, with a significance level of -0.039 and a signification level of 0.397. The results are discussed in Table 3.

Analysis of the Education, Sketch, and TTCT

Group A, there is a correlation between the diagram with Resistance to Premature Closure ($Z=-2.128$) at $p<0.05$ level was noted. A significant difference was observed in the List of Forces scores at the $p<0.05$ level according to Storytelling Articulateness ($Z=-2.412$) and Richness of Imagination ($Z=-2.108$) and at the $p<0.005$ level according to Movement ($Z=-2.891$). Synthesis of Incomplete Figures ($Z=-2.223$) at the $p<0.05$ level was noted in modeling. The textual expression was significant at the $p<0.05$ level according to Verbal Fluency ($Z=-2.074$) and Verbal Originality ($Z=-2.429$) and at the $p<0.05$ level. According to Resistance to Premature Closure, the relationship between students' creativity and verbal expression or dialogue revealed a significant difference at $p<0.05$ level ($Z=-2.150$). Group B, there is a correlation between drawing at the $p<0.05$ level

Table 2. Analysis of the simple work of group A and B students

Sketch			**Group A And B Students Works During the Design Process**
Figural Sketch	Drawing	A	
		B	
	Diagram	A	
		B	
	Modeling	A	
		B	
Verbal Sketch	Textual	A	
		B	

with Verbal Fluency (Z=-2.169) and Verbal Flexibility (Z=-2.140) at p<0.05 level. The relationship between students' creativity and Textual Expressions with Synthesis of Lines (Z=-2.410) was noted at p<0.05. No significant difference was observed when examining how students' creativity connects to other factors (Table 4). The Torrance Creative Thinking Test mean scores from research groups A and B were compared using a t-test. At varying significance levels, group A received 21 points, and group B earned a score of 19. These numerical results show that students' verbal and figural creativity skill subcategories come into the figural and verbal flexibility dimensions. Elaboration explains that students make detailed embellishments to the thought product created. Resistance to Premature Closure shows student shapes using abstract topics, figurative meanings, and connections. Moreover, they can look at events and phenomena in more dimensions with verbal flexibility. A t-test was used to determine how the design exercise in this studio process affected the students in various semesters, and the results are discussed in Table 5.

Table 3. Correlation between the IAD course grades and creativity

Group	Analysis	Figural	Verbal
Group A	Pearson Correlation	0.256	0.449
	Sig. (1-tailed)	0.027	0.000
	N	58	57
Group B	Pearson Correlation	-0.074	-0.039
	Sig. (1-tailed)	0.310	0.397
	N	49	47

DISCUSSION

This study aimed to explore the relationship between sketching and creativity within the context of architectural design education. Quantitative and qualitative data, including an analysis of the TTCT, design studio, student education background, and a sample of figural and verbal sketches, were used to find this relationship.

Studio curriculum, course objectives, and course content affect students' work during the various steps and significantly enhance students' creativity due to their unique characteristics. The curriculum review, combined with students' questionnaire responses, indicates that students utilize both figural and verbal sketches in various ways to finalize and refine their designs. Each method is critical in nurturing creativity, emphasizing the need to incorporate various forms of expression in architectural design education.

The student work, highlights distinct differences in the design process. Students engage in various stages throughout the design studio, such as knowledge acquisition, synthesis, analysis, and initial design evaluation. In each step, they utilize figural and verbal sketches to develop innovative ideas and enhance their thinking process. Concept sketches often need to be more structured and transparent, fostering creativity by encouraging exploration. As students refine their ideas, they develop analysis sketches, which help them think more deeply, incorporate significant elements, and expand their concepts. During process sketches, students test their ideas, receive feedback, and refine their designs by adding detail, adjusting proportions, and enhancing spatial organization. In the final stages of reconstruction, they address functionality and aesthetic goals, ultimately achieving more refined and creative outcomes. This process continues throughout the design studio like a cycle.

Table 4. Relationship between the torrance tests of creative thinking with sketch

Group	Sketch		TTCT	N	Z	Sig.
A	Figural Sketch	Diagram	Resistance to Premature Closure	58	-2.128	0.033
			Storytelling Articulateness	58	-2.412	0.016
			Movement	58	-2.891	0.004
			Richness of Imagery	58	-2.108	0.035
		Modelling	Synthesis of Incomplete Figures	58	-2.223	0.026
	Verbal Sketch	Textual Expressions	Verbal Fluency	58	-2.074	0.038
			Verbal Originality	58	-2.429	0.015
		Dialog	Resistance to Premature Closure	58	-2.150	0.032
B	Figural Sketch	Drawing	Verbal Fluency	49	-2.169	0.030
			Verbal Flexibility	49	-2.140	0.032
	Verbal Sketch	Textual Expressions	Synthesis of Lines	49	-2.410	0.016

Table 5. T-Test analysis of the mean creativity test scores of groups A and B

TTCT	Year	Group	Test Value = 0					
			T	N	Sig.	Mean Difference	Std. Deviation	Std. Error Mean
Figural	Elaboration	A	28.077	57	0.000	11.362	11.36	3.082
		B	23.839	46	0.000	10.426	2.998	0.437
	Resistance to Premature Closure	A	10.562	53	0.000	4.315	4.31	3.002
		B	9.814	37	0.000	2.605	1.636	0.265
Verbal	Flexibility	A	21.294	57	0.000	20.328	20.33	7.270
		B	13.799	47	0.000	16.104	12.999	1.876

Test results show that Group A has a significant relationship between figural sketches and creativity. The students' sketch techniques are essential to their creative process. This group's extensive experience with figural sketches, which has significantly enhanced their creativity, is a key finding. Conversely, Group A was less able to use verbal tools to develop creative ideas due to their greater reliance on figural sketches, possibly due to a background primarily involving non-verbal sketches. In Group B, students have limited design skills, and experience may influence the relationship between drawing and creativity. Their ability to use figural and verbal sketches may need to be improved. These findings indicate that students' backgrounds influence how they use sketches during the design process and the results they obtain from these creative.

The Torrance test and questionnaire were used to establish the connection between sketches and education in Groups A and B. According to the Group A scores in the diagram, four parameters showed a significant difference. Resistance to Premature Closure, making an ability to resist premature closure allows for unique ideas and powerful and original thinking. Storytelling Articulateness is the subject's ability to effectively convey the message through context-relevant information. Movement, judges' perception of movement through titles, and speech. Richness of Imagery is the subject's ability to create solid and distinct images in the mind. In Modelling, the Synthesis of Incomplete Figures shows the student's ability to use flexibility under restrictions and identify links between varied things. Furthermore, drawing increases verbal flexibility scores and demonstrates students' capacity to generate ideas, shift approaches, and use techniques. High scores indicate a remarkable ability to adapt and develop multiple strategies. Fluency in drawing is caused by the ability to generate a high volume of relevant visual ideas or responses, demonstrating creativity and adaptability. In the textual expression, verbal originality demonstrates intellectual vitality and the capacity to develop novel ideas. Fluency causes the ability to generate many ideas through words. An incomplete Synthesis of Lines shows an individual with unique thinking, various relationships, and independence under limitations. Dialog and Resistance to Early Closure are linked, so students should be open-minded and consider every idea.

According to Kim et al. (2006), individuals who excel in fluency and originality subscales differ from those who perform better in elaboration and abstractness of titles subscales. Additionally, resistance to premature closure may influence either the innovative or adaptive style of creativity. This is based on Torrance's hypothesis that creative individuals keep their minds open to new ideas, while less creative individuals tend to reach conclusions prematurely. The two-factor models for Figural TTCT reflect this, with fluency and originality under the innovative factor and elaboration and abstractness of titles under the adaptive factor. The position of resistance to premature closure varies across these models, being associated with either the innovative factor, the adaptive factor, or both (Kim et al., 2006; Said-metal et al., 2018).

Educational background is an important factor to consider when assessing student creativity. The IAD score has a relationship with creativity, indicating that students who use figural and verbal sketches during design projects tend to be more creative and achieve higher grades. Specifically, students who utilize figural sketches demonstrate greater creativity.

CONCLUSION

The article hypothesizes that sketches play an important role in architecture education and increase students' creativity during the design process. Various figural and verbal sketching methods affect students' creativity during the design process. The Torrance test, the questionnaire, and students' sketch works were completed to check the importance of the curriculum, including the course period, the curriculum for the course, and the studio's objectives. The analysis focused on figural and verbal sketches, incorporating creativity and education (curriculum, such as the course period curriculum) into the design process. Based on the research findings, figural and verbal sketches are used at different project stages to develop innovative ideas and thinking and to identify fresh solutions and problem-solving during the design process.

They analyzed two consecutive semesters with equal curricula to determine the exact connection between these variables. The test results show an immediate connection between the creativity and education of Groups A and B. However, a different relationship between education and how students form their thoughts has been found using the figural and verbal sketching approach. According to the data, 9 out of 21 score types in group A and 2 out of 21 in group B provided results at various levels. Based on the analysis, both groups followed the same curriculum, used figural and verbal sketches during the studio, and utilized concept, analysis, processing, and reconstruction sketching. However, this method has different effects on the two groups' creativity.

According to the results of the TTCT test, the questionnaire, and the simple sketches, students were likelier to switch ideas and be creative when combining the figural and verbal sketches during the concept, analysis, process, and reconstruction sketches in the design process. This study found that Group A and B students who used figural sketches (drawing, diagram, and modeling) had unique ideas, powerful and original thinking, and the ability to create solid and distinct images in mind, shift approaches, adapt and develop multiple strategies, and generate a high

volume of relevant and responses, demonstrating creativity and adaptability. Verbal sketches (textual expressions and dialog) caused the development of novel ideas and generated many ideas through words, unique thinking, various relationships, independence, open-mindedness, and considering every idea.

The test results indicate a relationship between educational background and students' creativity. Group A exhibited greater creativity than Group B. Regarding Group A, where classes were conducted online and in person, students exhibited tremendous enthusiasm in conducting classes and communicating with their peers. Hence, within architecture studios, the verbal interaction between students and professors and among peers serves as a valuable catalyst for their creative process. However, Group B students in face-to-face courses show lower creativity levels than Group A. This shows that Group B students need further reinforcement because their educational background could be more substantial. Architectural studios need to consider solutions to increase students' creativity by sketching. Therefore, it is important to consider various aspects of the learning process. Due to this study's limitations, the focus was exclusively on sketching in the design process. Future research could investigate factors and various learning environments that influence students' creativity and examine additional factors impacting this creativity. These findings provide a foundation for future research endeavors.

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