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YARATICILIĞI TETİKLEYEN TASARIM STÜDYOSU STRATEJİLERİ

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ÖZET

Bu çalışma, karşılaştırmalı vaka analizi yoluyla mimarlık pedagojisine ve tasarım stüdyolarında keşfedici öğrenme ortamlarına katkıda bulunmayı amaçlamaktadır. Araştırma, yaratıcılığı teşvik etmek için kullanılan tasarım stüdyosu stratejileri hakkında örnek vaka çalışmasını içermektedir. Bu amaçla çalışmada önde gelen yaratıcılığa dayalı yürütücü stratejileri; spekülatif, çoklu spekülatif, malzeme odaklı, metaforik ve analojik yürütücü stratejisi olarak sınıflandırılmış ve analiz edilmiştir. Bu stratejilerin temel konseptleri ve bunların yaratıcılık ve tasarım bilişi açısından etkileri tespit edilmiştir. Metodolojik olarak, literatür araştırması yoluyla yaratıcılığı tetikleyen farklı kavramlar tanımlanmış, ilgili stratejiler belirlenmiş ve bunu uygulayan yürütücüler tespit edilmiştir. Daha sonra bu yürütücülerin yaklaşımları yarı yapılandırılmış görüşmeler ve basılı kaynaklara dayanarak analiz edilmiş ve buna göre her bir yürütücünün döngüsel tasarım sürecini bilişsel açıdan nasıl değiştirdiği irdelenmiştir. Sonuçlara göre döngüsel problem tanımlama ve çözüm üretme sürecini dönüştürmesi bakımından bu stratejiler benzerdir. Ancak, bu stratejiler sürecin farklı aşamalarında etkilidir. Bazıları başlangıçta ve sürecin ortasında problemin tanımlamasını etkilerken bazıları da olası çözümlere etki etmektedirler.

Anahtar Kelimeler: Analoji, Mimarlık, Yaratıcılık, Metafor, Spekülasyon.

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DESIGN STUDIO STRATEGIES FOR STIMULATING CREATIVITY

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ABSTRACT

This study aims to contribute to architecture design pedagogy and exploratory learning environments in design studios through cross-case analysis. It involves contextual sampling and collecting and analysing information from multiple sources about design studio strategies for stimulating creativity. Therefore, this study investigates the five leading creativity-based teaching strategies (i.e., speculative thinking, multispeculative thinking, material thinking, metaphorical thinking and analogical thinking as a teaching strategy) and identifies the main concepts and their impacts on the design process cognitively. The methodology of the study is to explore design studio practices by conducting document reviews about instructors and interviews with prominent international practitioners to collect in-depth information about their strategies. The paper identifies different stimulating concepts and demonstrates how an instructor cognitively influences the cyclical design process. According to the results deconstructing the iterative problem and solution process is typical for all these strategies. However, these strategies are effective in different phases of the process. They can affect problem identification at the beginning, redefining the design problem in the middle of the design process or possible solutions.

Keywords: Analogy, Architecture, Creativity, Metaphor, Speculation.

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1. INTRODUCTION

Today, the importance of process-oriented pedagogy is emphasized, and its antonym is extensively criticized in the literature (Oxman, 2001; Salama, 2005). Process-oriented pedagogy is defined as "an instructional model in which learners are taught to employ suitable learning and thinking activities to construct, change, and utilize their knowledge of a particular subject domain" (Vermunt and Verschaffel, 2000: 209). Further, product-oriented pedagogy, as the recent predominating design education, emphasizes the final product, skills, and knowledge rather than the knowing itself. Besides, the idea of "learning from failure" is considered in the process-oriented instructional model opposite to product-oriented pedagogy. Instead of teaching the knowledge, the instructor's responsibility in the process-oriented pedagogy is to create an ambiguous exploratory environment and guide students in the process of discovering this environment. This way, the instructor allows students to find a suitable way to discover that knowledge. This approach will require a shift from a teacher- to student-centred learning approach, which also allows taking advantage of students' unique characteristics and the divergence in an exploratory learning environment.

The student-centred learning approach focuses on concepts such as active involvement, communication, learning-by-doing, and social interaction. Divergent ideas can be generated in the studio and lead to valuable argumentations as outcomes of a student-centred environment. Design exploration is crucial in student-centred and process-oriented methodologies because learning via self-discoveries, instead of learning from an instructor, is an essential part of this process. The aim of a design studio is to foster creativity and innovation, thus creating unique solutions via straying from the normal path but being realistic at the same time. Therefore, instructors guide the process with a prevalent approach; they also use different strategies to enhance creativity or to deal with unexpected situations and resistance in the studio. This is accomplished by using discrete teaching strategies and orienting students to discover how to take their own approaches. Instructors orient and motivate the process by following a student's design steps in the process, guiding them to become creative designers with these strategies. This type of guidance takes a prevalent approach; on the other hand, students can use different strategies to enhance creativity or to deal with unexpected situations in the studio. The questions that arise here are what kind of strategies do they use? What are the differences and similarities between these strategies? How did they affect the generic design process? These are the questions we aim to answer.

Many different experimental design studio setups aim to stimulate creativity in a student-centred approach. Visual or textual stimuli could be used as an analogy, or conceptual associations could be used as a metaphor to make students stray from the normal path in these studios. On the other hand, some instructors could use speculative scenarios, or some choose independent formal or material exercises as a minor project to achieve that purpose. These strategies could change according to the instructor's specializations and current paradigms.

Most teaching strategies manipulate the generic design process, which is defined as a series of actions and reflections, a cyclic and open-ended conversation, an exploration through problem identification and solution in the literature (Clinton and Hokanson, 2012; Dorst and Cross, 2001; Maher, 2000; Schön, 1987) to enhance creativity. A designer deals not just with the problem given to them but also with the problems of the solutions that they suggest in

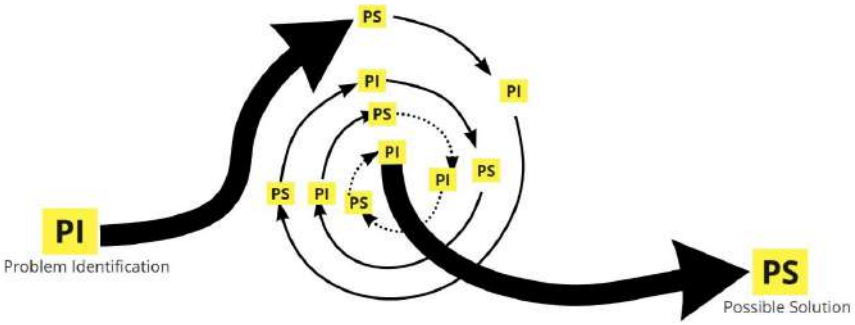

Figure 1. *Adapted From Maher's Design Problem Solving Process, 1996.*

each design move. All possible solutions include a problem, even the final solution suggested by the designer. Therefore, this internal conversation and design exploration as a co-evaluation of problem and solution continues holistically until the designer is satisfied. This process is graphically represented as a loop in Figure 1. Designers start with problem identification (PI) and then suggest a solution to this problem (PS). This solution generates other design problems that designers need to solve. This iterative process occurs until the designer ends it.

Basically, the divergence of mediums, student profiles, instructor perspectives, and challenges, e.g., the COVID-19 pandemic, lead to divergence in teaching strategies. In addition, the leading paradigms and developments of production technologies also affect these strategies. Researching the pioneering process-oriented teaching strategies and the way they enhance creativity is valuable in this context. Therefore, the following chapter argues for the use of creativity and problem-solving activities in design studios.

2. CREATIVITY AND PROBLEM-SOLVING

Creativity means being original and primitive in any field; specifically, it is defined as a power to form, invent, and explore ideas and develop abilities that are still hidden or already emerged (Mott, 1973). Creativity includes a sense of curiosity, being surprised, seeing something that nobody sees, and giving different responses. Maslow, (1958) using a child as an example, states that "Aristotelian classes do not exist for the young child. It is independent of control, taboos, discipline, inhibitions, delays, planning, and calculations of possibility or impossibility. It has nothing to do with time and space, or with sequence, causality, order, or the laws of the physical world." Therefore, we may generate a strategy to think and design freely then refine the idea through the obstacles and requirements that we have not considered, in order to achieve that purpose. Besides, creativity is mostly related to exceptions; therefore, we may use deviations from normal conditions as a strategy.

Goldschmidt and Sever, (2011) for example, showed that inspiration from unrelated texts leads to more creative design solutions than related texts. Here, we need to understand the components of creativity in addition to the design process to find a way to manipulate the generic process and translate it into a unique process. In order to derive this process from the literature and see that creativity is about the strategies, e.g., demolishing self-boundaries,

extraordinary, unconscious, cooperative, recreation, divergent thinking, discovery, re-representation, reintegration, straying from the normal path of conventional, intuition, ambiguity and deconstruction (Guilford, 1968; Pope, 2005). Jordanous, (2012) also attempts to identify the components of creativity by analysing many scientific texts. These are specified as active involvement, persistence, dealing with uncertainty, general intellectual ability, intention, emotional involvement, progression, development, spontaneity, subconscious processing, generation of results domain competence, independence, freedom, originality, social interaction, communication, thinking, evaluation, variety, divergence, and experimentation (Jordanous, 2012).

First, the intuition concept is equivalent to spontaneity and subconscious processing. The Cambridge dictionary describes it as "an ability to understand or know something immediately based on your feelings rather than facts." Intuition could also be described as experience-based unconscious solutions, dreams, or stories. Therefore, variating the experiences and interests could be intuitional references for an unconscious phase. Ward, Finke, and Smith, (1995) conceptualize intuition and insight as two distinct phases in the process of problem-solving, i.e., "an initial, intuitive phase, which involves a graded process of activating responses that are stimulated by, and increasingly appropriate to, the available pattern of clues, and an insight phase, which involves a conscious recognition, often quite sudden, that a particular response constitutes a potential solution to the problem." Another component of creativity is anarchy, which is associated with breaking the rules, independence, straying from the normal path, and demolishing self-imposed boundaries. Speculative arguments could be a strategy for creating an anarchical environment and triggering the process intuitively, which could encourage designers to focus on intellectuality and novelty. Ambiguity is also a vital component of creativity and is mostly associated with fluid expressions in a design studio; it could also be described as an opportunity for creativity in the design process. The instructor could use ambiguous expressions while describing design requirements in order to provide an independent design environment and trigger creativity. Therefore, students could explore and recreate knowledge/design problems.

Another crucial component is deconstruction, which originates from the term "Derrida." In literary theory, Derrida is associated with rediscovery, re-representation, re-explore, and re-integration to see an unknown and unseen reality in language; it is also translated to different fields with the same meanings. Richards, (2008) explains the definition of deconstruction as "the act of taking something apart can be the first step toward understanding something anew." Therefore, we believe that the contribution of re-exploring knowledge is to produce something novel. Here, integrating unfamiliar representation techniques that are not directly related to the issue/field and/or making speculations could be exemplified as a deconstructivist strategy. Finally, breaking the rules and exceeding the boundaries could be a powerful impetus for creating design problems. However, the balance between creativity and determinism is essential for architectural and industrial engineering fields as a difference from other artistic fields. A creative design product could fail in function; on the other hand, a functional design product could fail in creativity.

The design studio instructors, need appropriate strategies to educate designers for unpredictable future conditions and encourage them to be creative with the solution and also the design problem. In summary, we claim that the components of creativity are mostly used

as key concepts of the pioneer strategies. Therefore, this paper aims to understand pioneer strategies in terms of creativity components and formalize them in order to support our arguments. These components are associated with the origin of teaching strategies, which are related to manipulating the process by dividing or deconstructing it, intervening as a catalyst into it, and/or providing a speculative studio environment to discover a design problem instead of defining the problem. We explain and exemplify these strategies and their relation with creativity via pioneer teaching strategies in the next chapter.

3. METHODOLOGY

This study aims to enhance innovative pedagogies and contribute to exploratory learning environments in design studios through a cross-case analysis. It involves contextual sampling, along with collecting and analysing information from multiple sources about design studio strategies for stimulating creativity. Therefore, this study investigates the five leading creativity-based teaching strategies. The research started with a literature review of creativity concepts; then, we searched for possible cases related to these concepts. Andrew Kudless, Greg Lyn, Michele Giovanni Caja, Ir. F. R. Schnater and Frosso Pimenides were omitted. However, Delfina Bocca's studio, Yürekli and Falay's studio, Willian O'Brien's studio, Semra Aydınlı and Burçin Güngen's studio were examined in the research.

These cases were eliminated according to the interview eligibility, conceptual diversity and institutional diversity (Figure 2). The timeline analysis of the studios was done, and then these are categorised into five leading strategies as; speculative concepts, multispeculative concepts, material-based concepts, metaphorical reasoning and analogical reasoning as a teaching strategy. Firstly a timeline analysis of the studio was done to answer the research question; how did they affect the generic design process. Then the effects of the strategies were represented with manipulated design cycle diagrams.

We analysed how these main concepts affect the design process with timeline analysis and their impacts on design creativity by analysing their relationship with creativity concepts (Figure 3). The methodology of the study is to explore design studio practices through conducting document reviews about prominent international

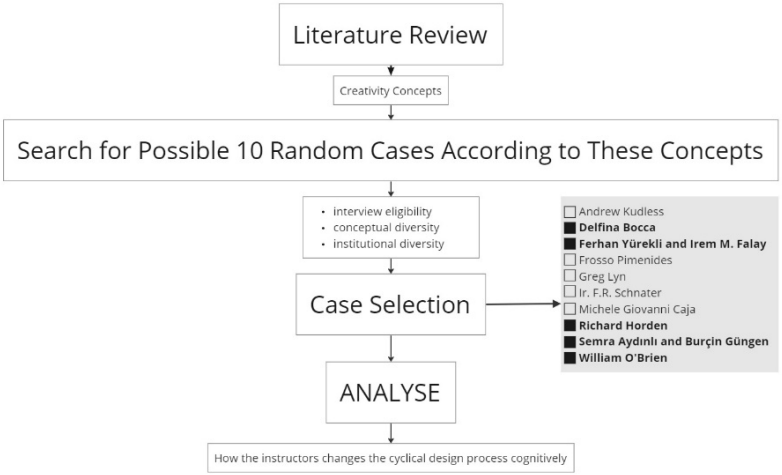

Figure 2. *Work Flow Chart and Selection Of The Cases.*

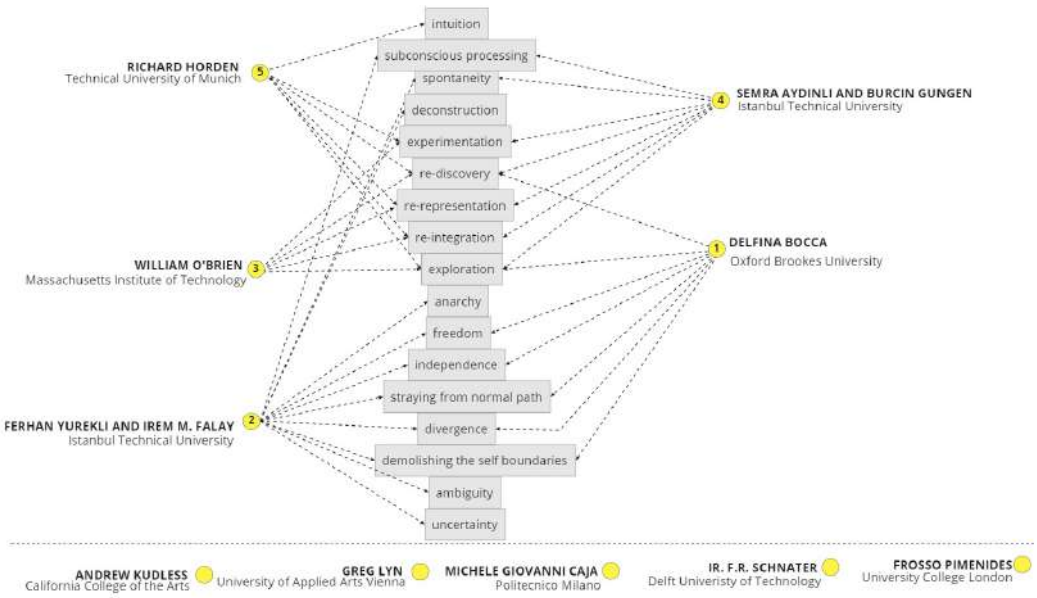

Figure 3. *Creativity-Based Concepts In The Literature and The Relationship Between Instructional Strategieses.*

practitioners and making interviews with them to collect in-depth information about their strategies. Different manipulations and stimulating concepts were identified and how an instructor translates this ordinary process into a unique process in detail was demonstrated in the paper with abstract diagrams of each strategy. These diagrams show how these strategies transform the design process and how these instructors create an ambiguous exploratory environment to stimulate creativity.

4. DESIGN STUDIO STRATEGIES

The literature presents many architectural models for teaching (Ledewitz, 1985; Salama, 2005) here, we aim to understand discrete creativity-based teaching strategies. Strategy is used as a method to foster creativity in design studios. For example; metaphorical reasoning is seen as a pedagogical tool for creativity in the literature (Casakin, 2011; Hey et al., 2008) and is described as being based on a conceptual transfer of relationships or mapping from a well-known source domain to a poorly known target domain, which could result in creative outcomes (Moser, 2000). Visual representations are crucial at this point. Donaldson, (2006) categorizes metaphorical concepts as "translating ideas into symbols, imagination and fantasy questions, record dreams and associate to the problems, scribbling, guided imagery scenario, and convert ideas into metaphorical representations.". Analogical reasoning is also another design strategy that is used for fostering creativity in the literature (Casakin, 2012; Horden, 2008). Speculative thinking, that uses speculative design hypotheses as a design context, is also a commonly used strategy in design studios (Author, 2020; Dong et al., 2021; Fricker, Kotnik and Piskorec, 2019; Yürekli and Falay, 2014). On the other hand, digital developments reverse the "form, structure, material" sequential process to the "material, structure, form" like a significant case, i.e., the Sydney Opera House (1957–73) (Oxman and Oxman, 2010). These, material strategies, are commonly used as a pedagogical tool to foster creativity in design studios nowadays (Kudless, 2016).

Five pioneer teaching strategies (i.e., speculative thinking, multispeculative thinking, material thinking, metaphorical thinking and analogical thinking as a teaching strategy) are chosen through their differences in terms of manipulation of the design process. The fact is that there is more than one strategy in all these design studios, and they intervene with each other. On the other hand, the scope of this paper is restricted, as it is focused on the discrete strategies to help our understanding of creativity and teaching strategies in design studios. Therefore, it is aimed to reveal how the strategies trigger creativity and affect the cyclic design process. Creativity is triggered by deconstructing the cyclical process by defining the problem, producing a possible solution, defining a new problem according to the previous possible solution and producing a solution again.

First, the key strategies and participants were identified through contextual literature review; then, the identified participants were analysed in detail (Table 1). Published sources and structured interviews were used to analyse the strategy's framework and the relationship with the creativity components in detail. Interviews with all of the instructors also had constraints; on the other hand, we collected pertinent information from the documentary analysis about their concepts, too. Therefore, these cases are also included in the paper. The interviews were semi structured and questions were prepared through the components of creativity related to "how." Two researchers worked collaboratively to make an inductive analysis to identify concepts through information. Diagrams were prepared for better understanding of the concepts and to make arguments about design education and design praxis. These schematic diagrams were iteratively reproduced to show the impact of teaching strategies on the design process. In conclusion, the first similarity between the pioneer design studios that were chosen for the paper is their approaches. These studios are all student-centred and process-oriented. Further, their aims are to obtain an exploratory learning environment, and, with analogical thinking as a teaching strategy, contribute to the process as being a shortcut to solve the design problem;

Table 1. *List of the Cases.*

No	Instructor	University	Strategy	Manipulation	Year	Data
1	Delfina Bocca	Oxford Brookes University	Speculative concepts	Speculating the problem identification (PI)	2020	Interview
2	Ferhan Yürekli & A. İrem Mollaahmetoğlu Falay	Istanbul Technical University	Multi-speculative concepts	Speculating & deconstructing the problem solving process	2010	Literature review & Observation*
3	Richard Horden	Technical University of Munich	Analogical reasoning	Stimulate solution phase (PS)	1996-2007	Literature review
4	Semra Aydınlı, Burçin Güngen	Istanbul Technical University	Metaphorical reasoning	Stimulate both problem identification (PI) and solution (PS)	2012	Literature review
5	William O'Brien Jr.	Massachusetts Institute of Technology	Material-based concepts	Dividing the problem solving process and speculating the problem identification (PI)	2018	Interview

*The author was one of the student participants in Yürekli and Falay's studio in 2010.

Figure 4. *Timeline Analysis of the Studio Process, 2020 According to the Interview With Bocca.*

moreover, other teaching strategies contribute to the process by expanding and speculating the problem identification and exploration phase to enhance creativity in different ways. We also need to emphasize that these strategies are not unique characteristics of a studio environment, as different instructors use these strategies in various ways. We aimed to discuss through specific and discrete examples here.

4.1. Speculative Concepts as a Teaching Strategy

Making speculation about the context or space, that stimulates creativity in the design studio, is a commonly used teaching strategy. Sometimes, students demand speculative design hypotheses; other times, instructors provide future and technology-based utopian or dystopian hypotheses to students at the beginning of the studio. Furthermore, instructors may start with utopian or dystopian readings to speculate on a design problem. For example, Author (2020) uses this strategy in his/her studio. The studio begins with dystopia novel readings as text stimuli. Students are then asked to speculate on a scenario associated with the texts and define its design problems in this studio. Bocca, (2020) also uses this strategy in her studio as an instructor. Students at Oxford University study Poconos' honeymoon resorts while speculating the myth of love and society in post-war America (http 1). The 'Digital Romanticism' studio starts with a case study and site investigation. A speculative scenario is used at the early stages of the studio to foster students' creativity at this studio (Bocca, 2020) (Figure 4).

Encouraging students to create speculative scenarios is a rule-breaking strategy, which is mainly associated with deconstruction, anarchy, and intuition in terms of creativity components. Speculative themes/scenarios, whatever their origin, affect the design problem in the beginning. They expand the problem exploration phase by reconsidering the design problems (Figure 6). This strategy helps students with novel design solutions and differentiates and characterizes their design process by enlarging the problem exploration space (Figure 5). It does not work as a shortcut, but it does affect the whole process and thus the solution indirectly. The problem identification and iterative solution process remain the same, but this strategy assists students in defining and discovering the potential

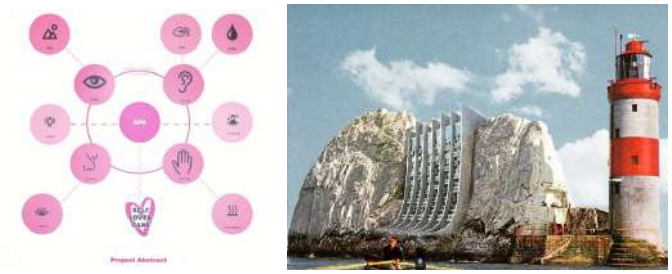

Figure 5. *Student Works from the Digital Romanticism Studio of Bocca, Source: Http 1.*

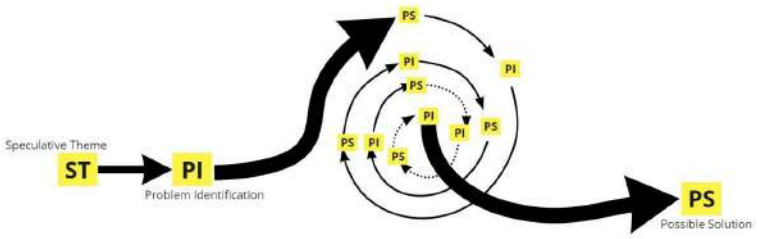

Figure 6. *The Impact of Speculative Concepts as a Teaching Strategy on the Design Process.*

and unique character of the design problem.

After identifying the hypothetic design problem in all aspects and speculative solutions, this hypothetic phase turns into a realistic phase in these studios. Here, the percentage of these phases is also a critical side of the issue. Freedom and independence for creativity are necessary as well as a need for more realistic requirements. Therefore, instructors implement experiments to obtain a balance between determinism and ambiguity in the studios. Bocca, (2020) states that they maintain the creative part of the process as long as possible; then, students are asked to design by using related materials and digital tools as a final step, which includes the site, material, and functionality discussions generally for the last three weeks in her studio.

4.2. Multispeculative Concepts as a Teaching Strategy

Designing the studio process with two or more different design problems is also used as an approach in design studios, which is notably common in freshmen or early design studios. Sometimes integration of these projects is desired, but sometimes these small-scale experiments are discontinuous. Yürekli and Falay, (2014) designed their studio with this approach. They use speculative thinking as an essential and powerful strategy; on the other hand, they do so with multiplication of the exercises, depending on various design problems, context, scale, and material. This studio differs from other speculative studio strategies with these short design experiments (Yürekli and Falay, 2014). Further, these scenarios and design outcomes intersect and integrate as a whole process. Many independent speculative scenarios are used, and the students generate independent solutions to them in Yürekli and Falay's studio (Figure 7). At the end of the studio, a speculative and unifying scenario is used to connect these different projects as one single project.

Speculations also propagate the design problems; however, their outcomes as a speculated solution also propagate the following design problem in the cycle (Figure 9). Therefore, a design solution turns into a component of another

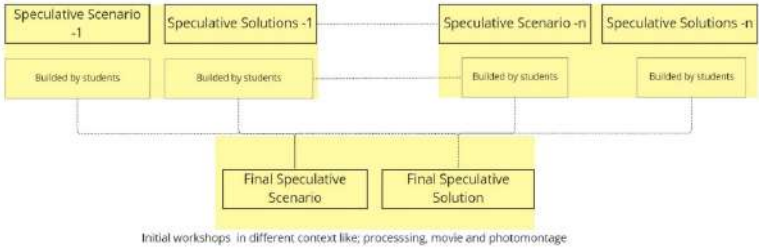

Figure 7. *Timeline Analysis of the 2010 Studio Process of Yürekli And Falay.*

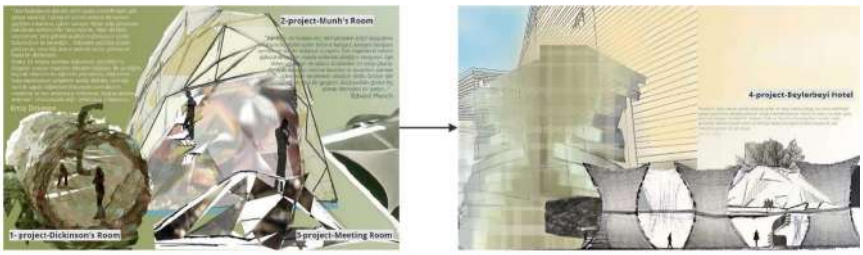

Figure 8. *Student Works From Yurekli and Falay's Studio, 2010, Source: Author's Archive.*

design process. For example, speculating about famous artists and designing a discrete room for each of them are used as separate projects at first. Then, the instructor asks students to integrate each special room by designing a meeting point for them (Figure 8). These micro-narratives orient students to design an undivided but heterogeneous outcome at the end. In addition to the argumentation on integration and intersection, enhancing creativity by these interrelated small-scale, short-term projects, and micro-narratives is also the strategy's primary aim. The problem identification and iterative solution process stay the same as speculative concepts as a teaching strategy. On the other hand, while the instructor uses different speculative themes to speculate and identify the design problems, he/she uses them to merge these iterative processes too.

The studio strategy is related to anarchy, which is described as real intellectual behaviour (Yürekli and Falay, 2014) as well as to ambiguity, intuition, and deconstruction in terms of creativity components. An instructor's ambiguous expressions are another issue that is especially emphasized by these prominent practitioners at Istanbul Technical University. The studio encourages hands-on design strategies but is also open to using new digital tools and strategies. Therefore, students are encouraged to use various design tools, materials, and mediums. In summary, deconstructing the design process by propagating design problems with various speculative themes is the characteristic of this strategy in which to foster creativity.

4.3. Material-Based Concepts as a Teaching Strategy

The developments in digital design tools and fabrication techniques have become possible and easy for designers to think and create more complex forms and realize intricate designs. This situation introduced new research into the agenda of the form and allows designers to break

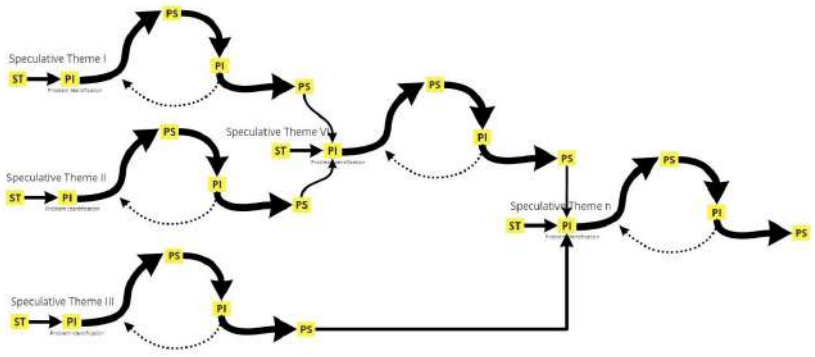

Figure 9. *The Impact Of Multi-Speculative Concepts as a Teaching Strategy on the Design Process.*

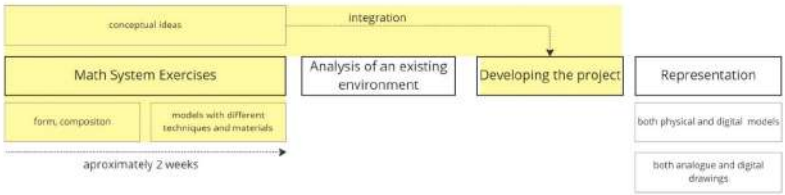

Figure 10. *Timeline Analysis of the 2018 Studio Process of O'Brien Studio.*

the rules and be creative, although it can still be difficult to generate a creative and innovative form experiment for architecture students who could resist acting upon uncertainty and remain on the side of the accepted knowledge, despite the related research. Here, an instructor requires a strategy to overcome this challenge. For example, O'Brien, (2020) uses a strategy to deal with talented and intelligent students who sometimes resist taking risks. He divides the studio into two parts, i.e., major and minor design exercises. He sets up a micro-design exercise to establish free thinking (O'Brien, 2020). This exercise, i.e., "Mat System," which originates from Alison Smithson' mat-building phenomenon (Smithson, 1974), takes two weeks (Figure 10). He uses the system

as a formal, compositional, hierarchical, and material exercise separately from contexts (e.g., site, economy, user needs, scale, function) (Figure 11). Then, he wants students to use these formal exercise findings and integrate them with major design exercises. O'Brien thus aims to foster creativity by encouraging students to take risks in this way.

This strategy divides and relocates design moves in simple terms. Materiality is considered in the beginning independently from the major design problem. Relocated design moves, which are related to the "deconstruction" and "straying the normal path of conventional" as components of creativity, are used as a strategy—not just to overcome resistance toward taking risks but to foster creativity at this point. The material-based concepts are used in a preliminary/minor project, and the possible solutions of the first design process are used in the secondary/major project. The solution of the minor project (PS) is included in the major project as a creative indicator (Figure 12).

Kudless, (2016) uses digital fabrication as a material thinking strategy with the same concerns in his studio. He starts the studio exercises with thinking and learning about the power and potential of material, which is also a form-finding exercise; then, students are asked to design with this knowledge on a specific site and context (Kudless, 2016). He states about the studio: "Placing material as a primary design

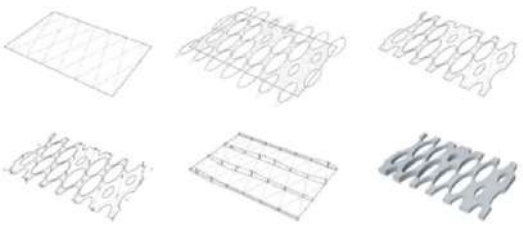

Figure 11. *Student Works From O'Brien's Studio 2018, Source: William O'Brien's Archive.*

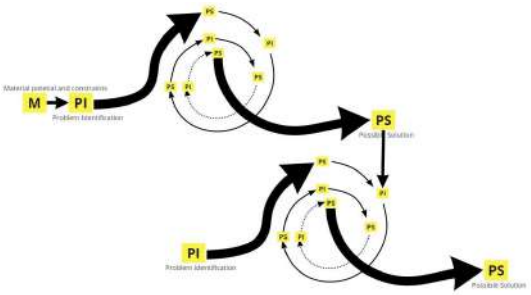

Figure 12. *The Impact of Material-Based Concepts as a Teaching Strategy on the Design Process.*

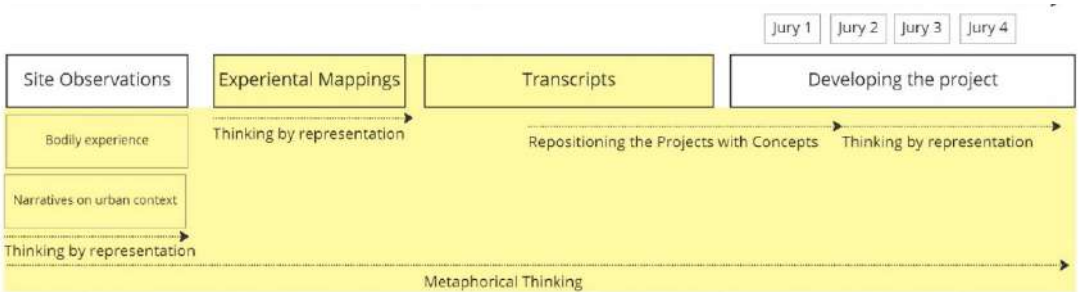

Figure 13. *Timeline Analysis of the 2012 Parallax Studio Process of Aydinli and Kürtüncü.*

move then site and program as a secondary move enables the students to develop much more innovative designs" (Kudless, 2016). In summary, it can be said that this is a commonly used strategy because of the triggered technological developments and paradigm shift.

4.4. Metaphorical Reasoning as a Teaching Strategy

Metaphorical reasoning is generally used in architectural design studios to encourage students to realize the unseen relationships through different lenses, e.g., threshold, boundary, and publicity. Students are further asked to associate these concepts with their site and reconstruct them into a metaphorical context, which would help them to construct a design concept accordingly. The studio starts with bodily experience and urban context narratives as site observations. The instructors encourage students to use representations to think with associations of concepts in different stages of the process. Different experimental interventions are also used as workshops in the Parallax Studio (Aydınlı and Kürtüncü, 2018) (Figure 13).

Aydınlı and Kürtüncü, (2014) uses metaphorical concepts as a reasoning strategy in The Parallax Studio. Parallax, which originated from Steven Holl, could be defined as discovering relationships between unrelated issues. Metaphorical reasoning and re-representation strategies are used to make that kind of discovery in the studio. The authors have adapted Tschumi's transcripts as a thinking tool. These transcripts (i.e., sequencing the experiential knowledge with an image) help students to transform fluid and experiential ideas to spatial concepts as catalysts of the process (Figure 14). Metaphorical reasoning strategy is supported with the power of representations, which are the main instruments of the studio (Aydınlı and Kürtüncü, 2018).

The studio process is flexible and changeable depending on the mediums, opportunities, and students. Therefore, it is not a fixed rule for their studio; it is also not just used as a strategy, as it helps in rediscovery.Metaphorical reasoning is different from analogical reasoning in many ways; on the other hand, structural embodiment of the studio is quite similar. Both of them intervene in the design moves; however, metaphorical

Figure 14. *Student Works From 2012 Aydinli and Kürtüncü's Studio, Source: (Aydinli & Kürtüncü, 2018).*

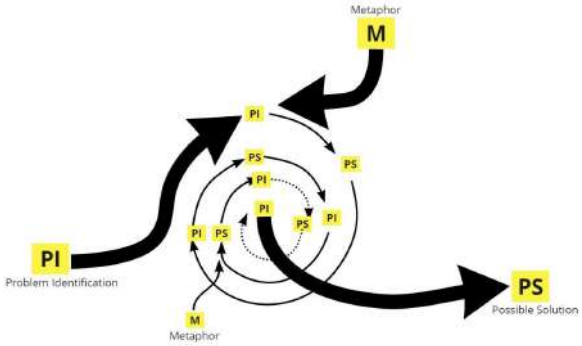

Figure 15. *The Impact of Metaphorical Reasoning as a Teaching Strategy on the Design Process.*

reasoning is not a shortcut for the solution as is analogical thinking. The metaphorical concepts intervene in the process and expand problem identifications and possible solutions in the cycle (Figure 15). This strategy helps to foster creativity with expanding coevaluation between the problem and solution. Metaphors work for customizing the iterative problem and solution process.

4.5. Analogical Reasoning as a Teaching Strategy

Analogical reasoning plays a key role in design education because it can stimulate the problem and solution coevolutionary process by leaping over exploration steps. This strategy helps novice designers to develop their relational thinking skills and find a novel idea via discovery of a solution to an analogous problem. Analogical thinking strategy intervenes in the design process as does the metaphorical thinking strategy, but it also accelerates the process. Here, for example, Horden, (2008) encourages his students to use analogical reasoning as a strategy at the Micro Architecture Studio. He chooses extreme environments such as space, desert, and mountains and starts the studio with formal exercises on two different levels. Platonic solid and natural form investigations are done to choose a primary form. The students develop the project with functional needs and site restrictions (Horden, 2008) (Figure 16).

As an example of a student project, it was designed through the functionality of a lizard's back and standing style (Figure 17). The student learns from its sensitive part of the body (the stomach) and how it keeps calm. In this way, the students experiment with learning from the unique features of nature to enhance creativity and generate unique outcomes. Analogical references affect the possible solution (PS) and differentiate this iterative process with this methodology (Figure 18).

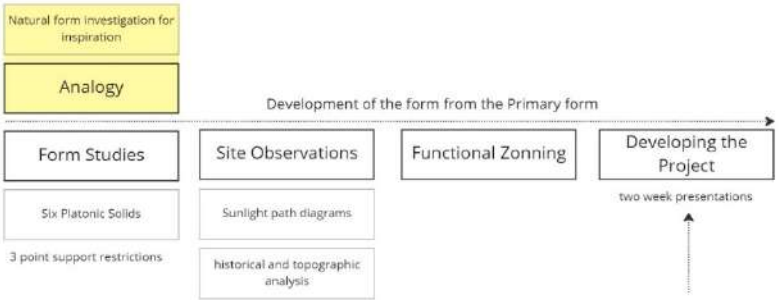

Figure 16. *Timeline analysis of the Horden's Micro Architecture Studio process.*

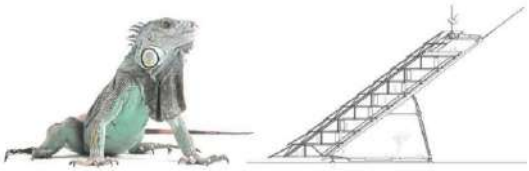

Figure 17. *Student works from 1996-2007 Horden' s Micro Architecture studio, source: (Horden, 2008).*

Analogical reasoning is useful and easy to conduct for students and professionals. Goldschmidt and Casakin, (1999) show that analogy has potential to improve the quality of design; further, identifying the analogue solution from the novice designer is not an impenetrable issue. The authors indicate that students do not need to be taught how to use analogy but need to encourage (Casakin and Goldschmidt, 1999). Therefore, instructors should aim to strengthen students' analogical reasoning skills and enhance creativity by encouraging them with this strategy, as does Horden (2008). Knowledge transfer between the analogue solution and design problem is crucial at this point. An analogue solution should be deconstructed to foster understanding; the information between these semantic concepts can be used to create a novel idea. Furthermore, the impacts of "the distance of the semantic layers" (Zhu, 2020) and "the type of the stimuli" (Goldschmidt and Sever, 2011) on design creativity are also essential at this point.

CONCLUSION

The design studio strategies and their role in the design process are explored in this study. The cross-case analysis methodology is used to acquire information from document analysis and interviews for specific cases. The paper is not just accumulating knowledge of the strategies but also determines the role of this differentiated iterative design process on the design process from the design cognition perspective.

The aim of a design studio to foster creativity and innovation is to create unique solutions via straying from the normal path but remaining realistic. Therefore, instructors typically guide the process using a prevalent approach; on the other hand, they use different strategies to enhance creativity or to deal with unexpected situations and resistance in the studio. They do this by using discrete teaching strategies and orienting students to help them discover their own approaches. These teaching strategies vary the design process to develop students' understanding of the design cycle and that such development enhances their creativity. Therefore, this paper focuses on five discrete strategies and how to manipulate the design cycle.

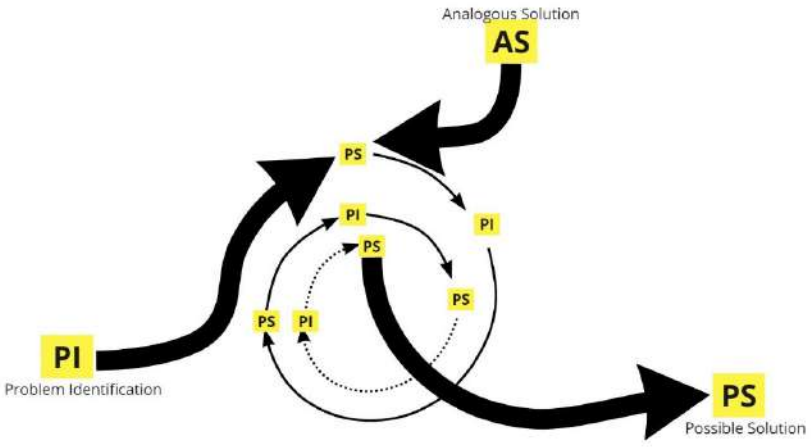

Figure 18. *The impact of analogical reasoning as a teaching strategy on the design process.*

Table 2. *The cognitive effects of the design studio strategies.*

	Problem Identification -1st	Problem Identification - 2nd 3rd 4th ...	Possible Solutions
Speculative theme	+		
Multi-speculative theme	+	+	
Material-based concept	+	+	
Metaphorical reasoning		+	+
Analogical reasoning			+

The generic design process was defined as steps, including defining the problem and finding possible solutions and then exploring the problems of the possible solutions themself to refine the solution as an open-ended process in the paper. Then, how an instructor translates this ordinary process into a unique process in detail was demonstrated. First, the stimulating concepts were identified according to the timeline analysis of the studios. These are speculative concepts, multispeculative concepts, material-based concepts, analogical reasoning and metaphorical reasoning strategies. Then the manipulations in the design process were identified and explained with the design cycle diagrams. As is understood from the cases, some strategies expand upon the problem of exploration space, and some expand on solutions through representation techniques and metaphorical reasoning. Analogical reasoning strategy affects solutions intuitively; speculative concept strategy and multispeculative theme are based on liberating the studio with speculative themes. Multispeculative concepts strategy differs from speculative concepts strategy by repeating the speculative design process. Deconstructing the iterative problem and solution process is typical for all these strategies. However, these strategies are effective in different phases of the process. While speculative theme affects problem identification at the beginning, multispeculative theme and material-based concepts affect multiple phases by redefining the design problem during the design process. Metaphorical reasoning is separated from the first design problem but causes to redefine it by metaphorical concepts in the process. Lastly, the analogical reasoning strategy does not affect the problem identification, and it affects just the possible solutions (Table 2). These strategies transform the generic design process into a unique design process by manipulating it in these ways.

In summary, all of these cases, which are used by different design studio instructors, help us to understand the strategies of manipulating the process. This research as an exploratory case study may be useful for subsequent studies that aim to suggest a model or strategy to enhance creativity in design studios. It also has the potential to create further awareness of instructors who might adopt these strategies into their studios.

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Figure 8. Author's archive, student work from Yürekli and Falay's architectural design studio, 2010.

Figure 11. William O'Brien's archive

Figure 14. Aydinli, S., and Kürtüncü, B. (2018). Paradigm shift in studio culture. A/Z ITU Journal of the Faculty of Architecture, 15(3), 91–108. https://doi.org/10.5505/itujfa.2018.20053

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