GRID ARCHITECTURE, PLANNING AND DESIGN JOURNAL
GRİD MİMARLIK, PLANLAMA VE TASARIM DERGİSİ

Vol. 3, No. 2, 2020 / Cilt 3, Sayı 2, 2020, DOI: 10.37246/grid.727805

From Sketch to Architectural Production/Design Process: A Studio Experience

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Keywords

Sketch; Architectural Design; Perception; Creativity; Architectural Studio

Abstract

The purpose of this text is to determine how the architectural sketches produced by the educator-architect can be transformed by architecture students into an architectural composition and how coherent relationships are established in achieving a holistic outcome product. The method, which is a part of the architectural studio education, starts with the sketches made by the educator-architect instantly for each student separately. The expectation in the design process is a holistic outcome product development that defines a coherent network of relationships from the initial idea sketch. As a result, two groups of orientations were identified as "the ones interpreting the sketch with contextual-formal elements" and "those who created separate situations from the linear character of the sketch" but despite similar orientations, it was found that similar analogy tools were used in the meaning-perception-comprehension phase of the idea sketch. Through this study, the group of students who previously used the sketch process in their design studios with their own practices or experimented with the transition to the third dimension with models by using the sketch process, handled the linear-contextual-formal pattern of the sketch produced by the educator-architect and discovered different orientations of architectural production at this point.

Article Information

Received: 27.04.2020
Accepted: 08.07.2020
Available Online: 29.07.2020

Article Classification: Research Article

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Eskizden Mimari Üretime/Tasarım Süreci: Deneysel Bir Stüdyo Pratiği

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Anahtar Sözcükler

Eskiz; Mimari Tasarım; Algı; Yaratıcılık; Mimari Stüdyo

Öz

Bu metnin amacı, eğitimci-mimar tarafından üretilen fikir eskizlerinin mimarlık öğrencileri tarafından mimari bir kompozisyona ne denli dönüştürülebildiği ve bütüncül bir sonuç ürünü elde etmede tutarlı ilişkilerin nasıl kurulduğunun saptanmasıdır. Yöntemden önce metin kurgusu, mimari eskiz ve biçimlerin algılanması üzerine kısa bir literatür açılımı gerçekleştirmiştir. Mimari stüdyo eğitiminin bir parçası olan yöntem, eğitimci-mimar tarafından anlık olarak her bir öğrenci için ayrı ayrı yapılan eskizlerle başlamaktadır. Tasarım sürecindeki beklenti, başlangıçtaki fikir eskizinden tutarlı bir ilişkiler ağını tanımlayan bütüncül bir sonuç ürün geliştirmeleridir. Verili tasarım bilgisinin sonuç ürüne ulaştırılması amacıyla protokol grubuna 6 saatlik süre verilmiş ve son aşama olarak, 6 saatlik deneyimini kayıt altına alan yazılı bir rapor hazırlamaları istenmiştir. Sonuçta, "eskizi bağlamsal-biçimsel öğeleriyle yorumlayanlar" ve "eskizin çizgisel karakterinden ayrıksı durumlar ortaya çıkaranlar" olarak iki yönelim grubu saptanmıştır ve fakat iki farklı yönelime rağmen fikir eskizini anlamlandırma-algılama-kavrama aşamasında benzer analojik araçlardan yararlanıldığı ortaya çıkmıştır. Bu çalışma aracılığıyla daha öncesinde tasarım stüdyolarında eskiz sürecini kendi pratikleriyle kullanan ya da etüt sürecinde yine üçüncü boyuta geçişi maketlerle deneyleyen öğrenci grubu, eğitimci-mimar tarafından üretilen eskizin çizgisel-bağlamsal-biçimsel örgüsünü çeşitli mekânsal çakışımlarla ele almış ve bu noktada mimari üretimin farklı yönelimlerini keşfetmiştir.

Makale Bilgileri

Alındı: 27.04.2020
Kabul edildi: 08.07.2020
Erişilebilir: 29.07.2020

Makale Kategorisi: Özgün Araştırma Makalesi

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Vol. 3, No. 2, 2020 / Cilt 3, Sayı 2, 2020, DOI: 10.37246/grid.727805

INTRODUCTION

In its traditional definition, the architectural studio, although accepted as an environment that provides solutions to a defined design problem, actually consists of processes that enable design research and contribute to the production of design knowledge. There are many ways of acquiring design knowledge, and there also are many different methods of designing through the act of designing, and even tools developed from individual experiences. Different thinking tools such as making models, drawing or developing the design in a computer-aided environment are effective design mechanisms of the process that transforms the design act into an architectural product. Sketching is the most well-known and most well-known of these tools in the design of architecture.

The sketch is a freehand drawing (Kavakli et.al., 1998, p. 485). Edwards (2008, p. 1) states that architects use sketches to explain a design idea, to analyze the existing built environment and to mark how their designs will look in this environment, to analyze building typology, and emphasizes that the main point in sketching as a freehand drawing technique is a design tool and a method expressing thought. Therefore, architectural sketching is, among other things, the initial stage of the act of designing. A sketch can be said to be the preliminary idea of architectural production which is sought in response to a design problem that has been put forward no matter how it is defined. Architectural sketch not only includes design knowledge but also includes the experience of the sketcher in architectural culture and worldview, in other words, visual memory and perceptual skill capacity. As noted by Makowska (2015, p. 20), drawing is realized as a unique, independent and holistic record based on individual experience by allowing one to look inside. At some point, sketching is one aspect of the discovery and testing of reality that supports the development of imagination and opens up communication channels consisting of dialogue and spatial-visual activity (Makowska, 2015, p. 18). Therefore, as a design tool, sketching is the ability of a mechanism that passes through the cognitive process to be transferred to paper in hand-mind coordination. The resulting sketch contains a design idea and contains perceptual-formal values related to the cognitive process of the sketcher. A sketch made by a single person can be perceived as a multiple-character design input by different specific individuals, and different sketches made by a single person can be grasped differently by individuals with different specific experiences. As Dinç Kalaycı (2016, p. 18) states, the most important criterion of understanding and evaluating any application in the studio is how the application serves to understand the phenomenon of architecture. Therefore, also the main area of interest of this text in a short-term studio work developed on the architectural sketch is thus the preliminary idea of a design by architecture

students with different specific experiences from different sketches made by the educator-architect and how the architectural solution is developed at the spatial level based on the sketch.

In the general literature, some studies reveal the differences between professional architects-architecture students and beginner-advanced students over the understanding of architectural sketch, the manner of construction and the resulting product. This text, unlike them, deals with how multiple sketches made by the educator-architect are perceived by the students of architecture with different specific experiences as a prior design idea and the ability to design it like an organized composition through the language of architectural shaping. At this point, the main purpose of this text is to study how the sketch is the subject of perceptual experience as a prior idea of design. There are also some handicaps in this practice form. For example, the group of senior students in which studio practice was applied consisted of 52 people and only 34 students achieved the expected result from the method. Also, subjecting only advanced students to the methodology shows shrinkage in comparison. Similarly, the sketches given to the advanced group of students to conclude were made by the educator-architect for each student separately. In other words, the educator-architect and students who have been together in all architectural studios for 4 years know each other closely, and the educator-architect has diversified the sketch that each student has made by being aware of the capacity and capabilities of each student. Of course, in this architectural education process, it does not mean to sketch the students progressing with low-graders, or more clearly, sketching the low-to-mid student with easier sketches or sketching the successful students as a problem with more complex. He states that only the educator-architect develops sketches that are appropriate to the perception and capacity of the student. Overcoming these handicaps will be manipulated by explaining similar methods to studio practice. Another handicap is the production time of the sketches made by the educator-architect for each student separately. To be clear, independent sketches were made in the studio at that moment in an instant to study the student. In other words, the sketches are produced in series in an instant and this is suitable for the nature of the architectural studio. So much so that the studios are the places where research is done on the spot (Dinç Kalaycı, 2016, p. 3).

This study was carried out as a quiz within the 4th-grade diploma project group in the 2018-2019 academic year and the method was designed entirely by the executives. If there is a parenthesis on the preference of sketching as a method, it will be useful to look at today's diversified communication network and design environment. Despite all the increasing design possibilities, sketching as a design tool is still an important mechanism in architectural education. However, according to Ayıran (2007, p. 53), in the current education system, students are reluctant to use sketches and tend to explain their projects orally and through other visual environments instead of sketches. For this reason, it is important to reawake the sketch as a design tool. According to Ayıran (2007, p. 57-58), a designer can turn the visual images in his mind into sketches and thus making sketches directs the designer to his goal; sketch is the activity of continuous change in the process of reaching the final result of a designer and also contributes to both identifying and solving the problem by helping us understand them while transforming the images in our minds into concrete expressions. Within the scope of this text, firstly, a theoretical framework will be drawn on sketching, and findings will be presented after sharing the method.

ARCHITECTURAL SKETCH AS A COMMUNICATION TOOL

Nigel Cross and Gabriela Goldschmidt are two important figures who have studied the position of the sketch in architectural and design education. For example, Cross (1999, p. 31-32) states that in the lines where he discusses the necessity of drawing for designers, one of the reasons for the necessity is that a drawing is needed that reveals a model of the object at the end of the design process, and the design process leading to the end product is progressively obtained through drawings called sketches. Therefore, design sketches for Cross (1999, p. 35-36) help to construct the problem through analysis attempts and allow to explore of the revealed features and qualities of the solution concept.

Goldschmidt deals with the sketch from highly diversified points of view. According to Goldschmidt (1991, p. 123), sketching is a habit that architects resort to in the early stages of a subject they deal with; sketches done on a transparent paper are usually made very quickly and sometimes so specific that only the sketcher can grasp his sketch. This method, which is used in the early stage of architectural design, that is, sketching, thus enables the production of data to support the design research. In the context of design research, the sketch is inherent in the creative process and new artifacts are created through sketch (Goldschmidt, 1991, p. 124). On the way to the product, the sketch is conceived as an important design tool. In another study, Goldschmidt (1992, p. 212) underlines that the transparency of the sketched paper allows the addition, deletion, modification, and conversion of the first draft to other images without losing the first draft. In addition to this feature of sketch, which helps to produce preliminary design ideas, in another study, Goldschmidt (1994, p. 161-162) underlines that an efficient sketch activity is to record and represent existing thoughts in the mind; emphasizes that sketches are used by architects to help produce an idea and that such a sketch reflects visual thinking. The person who sketches provides a quick and direct recycle with the freehand sketch, representing the possible forms and shapes, parts, features and the relationship between them (Goldschmidt, 2003, p. 81). Besides, according to Goldschmidt (2003, p. 81), the sketching ability consists of two independent components; the first is fluency and requires the sketcher to focus on the production process, and the second component is based on the ability to see third-dimensional relationships and requires a good vertical projection system. In a recent study, Goldschmidt (2017, p. 110) states that sketching is the embodiment of the first representation of forms and shapes as an exploratory activity.

We learn from Goldschmidt that the sketch is drawn on a transparent sheet of paper and, thanks to this feature, the image in the mind is reconsidered repeatedly and transformed over and over. Thus, the solutions to the architectural design problem begin to be produced on a slippery floor that is open to change in the first stage. As ideas in thought become embodied on paper, the design problem is redefined and new design insights are developed accordingly. This means that data can be generated in design research through sketching, which is also inherent to the creative aspect of design. According to Aydınlı (2014, p. 63), sketch design contributes to the development of a creative mind and provides clues to information that cannot be expressed. Besides, sketch design helps the act of drawing existing images in the mind by hand-mind coordination in the sense of studying prior ideas. As stated in a study, sketch data made during the first stage of the design process are the draft data and do not represent excellence but rather function as a language among

individuals (Özker & Makaklı, 2017, p. 74). Therefore, the aspect of the sketch that makes it a prior idea of a design product is closely related to its mechanism that contributes to the design process. In this case, how does the sketch manage the shaping of the design?

The idea sketches that play an important role in the creative process emerge in the early stage of the design (Verstijnen et.al., 1998, p. 520). A priori, as the primary idea of a solution to any design problem; sketch constructs a sequence of images with the relationship mechanisms it defines. In other words, sketching constitutes the first stage of the design process as the most appropriate method for the expression and manipulation of rough ideas; such that the sketch as the only concrete trace of the thinking process, embodies the thoughts of the designer creates the visible basis of the design process (Juchmes et.al., 2005, p. 905). In this respect, sketch offers a conceptual study. Fast-generated design ideas are used not only to frame the initial ideas of the designer but also to better understand the problem (Rodgers et.al., 2000, p. 452). Thus, the first conceptual study of the prior ideas of the design can also be called idea sketches. Reflections on these prior ideas or idea sketches that emerged in the initial stage of the design act reproduce design information many times in the process leading to solutions through reinterpretations and transformations. Each production stage creates new components with different feedbacks and makes the process dynamic. It is precisely this stage that the designer requires perceptual sensors to be open and allows an effective dialogue with the drawings on paper. As noted by Goldschmidt (1992, p. 193), the sketch talks back to the designer, and as the dialogue progresses, the sketch continues until a satisfactory concept reaches sufficient consistency. In this process, every new product that emerges on paper represents ideas and new ideas that are not planned or expected before sketching; such that reinterpretations also mark the ability to transform, develop and produce new images in the mind when sketching (Menezes & Lawson, 2006, p. 572). Each production process contributes to the shaping of the final product by providing new clues to the design. Each stage is like a kind of control mechanism, helping to develop ideas by providing control on the way to the product. Because as long as the sketches are controlled, surprising relationships and features are discovered that reveal ways to refine and revise ideas (Suwa & Tversky, 1997, p. 386). Thus, the shaping of the design is reduced to a gradual process through sketch, leading to the existence of a multiple creation environment and the multiple relationships defined in a specific relationship. Because the architect/architect candidates become a conscious observer of reality through sketching and experience the processes of interpreting and analyzing by their individual experience; learns how to select and combine different image elements within the spatial whole, perceived and drawn reality becomes increasingly personal experience, and as a result, sketch emerges as a unique and original document (Makowska, 2015, p. 20). The ultimate aim of the design process is the production of a visual representation of an entity designed with sufficient integrity and consistency, allowing the construction of a visual simulation of the final product, either physically or mentally (Goldschmidt, 1991, p. 125). Design, therefore, includes reproductions, transformations, and refinements for non-existent artifacts; interpretations are important for testing the idea in the mind and opening communication channels through representation in design.

As stated by Goldschmidt (2003, p. 78), there are only vague and crude ideas in the mind when sketching begins. As the sketch progresses, new relationships are produced and clues are drawn from them in the early stages of the design process. To obtain design clues, it is necessary to capture

the consecutively generated ideas on paper. In "Sketches of Thought", Goel divides this into the lateral and vertical transformations, namely the operational state of the process between successive sketches in the early design phase. In lateral transformation, movement develops from one idea to a slightly different idea; movement in a vertical transformation is from an idea to a more detailed and rigorous version of the same idea (Rodgers et.al., 2000, p. 453). In other words, by expressing the idea of design through sketching, learning the clues of design information by the way of sketching is realized with lateral and vertical transformations. While lateral transformations make it possible to switch from one idea to another; vertical transformations involve the elaboration of the same idea. A similar transformation mechanism is examined in this text. The scope of the studio practice consists of lateral and vertical transformations, how the idea sketch made by the educator-architect can be transformed by the advanced architectural student and visualization of a holistic result product formed by consistent relations. Ultimately, idea sketches help to free-form and develop a concept that mediates between imagination and the embodiment of ideas; it teaches abstract and artificial thinking, reveals the essence and structure of form, and activates a deeper level of perception that goes beyond ordinary visual observation (Makowska, 2015, p. 21). This means that in the design process of architectural design, sketches of ideas also trigger a mental mechanism based on perceptual performance. In other words, depending on the level of perception of formal images, it is discussed to capture clues and construct new relations.

METHODOLOGY: A TYPE OF STUDIO PRACTICE ON DESIGN PERFORMANCE

As aforementioned, the main area of interest of this text was the determination of how the sketches of ideas individually made by the educator-architect can be transformed by advanced architecture students and how to establish consistent relations in obtaining a holistic result product. The basic elements framing such a field of study is the concept of idea sketching. In this study, there is a one-time design task. The main element that initiates the execution of the design task is the sketch, which is also the basic element that framed the method. The main reason for choosing sketch as a design tool is related to its contribution to learning. Bilda et.al (2006, p. 609) found that design education needed intensive learning through drawing, so it was important to learn how to think with a sketch, and they learned how to develop students' ideas through the sketch. Briefly, a studio practice based on the sketch is the source of the method that enables the development of design thinking or designing ability. Moreover, the ambiguity of sketches as a means of creating and solving problems is not a negative feature; on the contrary, with its ambiguity, sketching helps us to see new opportunities and changes the formations created by images accumulated in our minds and from the retina (Ayıran, 2014, p. 61). In other words, inevitably, sketching is a potential tool for developing reasoning in design (Goldschmidt, 2003, p. 83).

Since the studio practice consists of a series of actions applied to carry out a design task, the initial task of this study is the sketches made by the educator-architect for each student individually. Sketches made individually and at the time for each architectural student with different specific experiences are presented to the advanced architectural student as a design knowledge. The second task is thus to give the given design information to the final product. In the 2018-2019 academic year, the studio group, which was applied as a final exam after the final jury of the diploma project

group, consists of 52 people. For 52 specific and architects, 52 different ideas sketches are given as a final task for the students to test their knowledge and ability. The design task expects to develop a holistic result product that defines a coherent network of relationships from the initial idea sketch; In addition to the initial idea sketch as design information, there is no imposition of function, program or location description. At this stage, the studio group was given 6 hours, and at the end of the period, as the third phase, they were asked to prepare a written report that recorded their 6-hour experience.

Before proceeding to the studio practice, the handicaps faced by the study will also be discussed. First of all, the point that should be expressed is the sensitivity of the sketches made for each student in the production stage. The fact that the educator-architect and students who have been together in all architectural studios for four years are familiar with each other in terms of design capability and capacity has led the educator-architect to develop sketches appropriate to the perception and capacity of the student. This increased the operability of the resulting product-oriented practice. Another issue is the contraction of the comparative possibility. The studio group consisting of 52 people who submitted their diploma projects and consisted of students who were candidates for being architects; however, a comparison could be made within the group where the design task was applied. On the other hand, studies involving similar analyzes bring about the results of different comparison possibilities. For example, Goldschmidt (1992, p. 200), in a study of consecutive sketches in architectural design, by stating that sequential processes are the step that gradually reduces the unsolvability of the problem, states that the series describes the course of the solution and that the potential of the series does not depend on the succession of the individual movement. In this study, Goldschmidt examines the transformations and potentials between the architects named Tim and Gilbert and the sketches produced by Alvar Alto and Mario Botta for library designs. He concludes that sequential sketches are a problem-solving heuristic procedure that improves the visual recycle mechanism; each image in the series is a reaction to the previous image, so the person who sketches takes advantage of the chain of recyclable images that approve the design sketch or show its inaccuracy, and success in this method depends on the ability to read the appropriate information of each new image adequately to direct the next movement (Goldschmidt, 1992, p. 215).

Suwa and Tversky (1997, p. 400), who conducted a study on how architects and students perceive sketches, found that architects were better acquainted with visual qualities that produce design thinking than students, paid more attention to elements such as form/angle or size, and were better at reading non-visual functional subjects or abstract features from sketching in the process of discovering consecutively related ideas. Similarly, Casakin and Goldschmidt (1999, p. 156) conducted a study to discover what degree that is helping to improve the use of visual analogies also solve the design problems between beginner and expert designers. As a result of the experiment, which was conducted through sketches, it was found that using an efficient strategy such as visual analogy improved the performance of even beginner designers (Casakin, & Goldschmidt, 1999, p. 174). The hypothesis of another study that focuses on novice and expert designers is that the reason for the imbalance in cognitive activity between the novice and expert designers in the design process is the proportion of information processing carried out by experience in drawing production and defining sketches (Kavakli, & Gero, 2001, p. 347). This

study, where sketching is a design tool, determines that although the attention given to the features is high in beginners, the attention given to relations in the design studies of the experts is more (Kavakli, & Gero, 2001, p. 358-359). The result of these studies is that in the context of the aim to be achieved, different contents may be encountered between the beginner-expert designer, the architect-architecture student or the group of beginner-advanced students when the sketch is used as a design tool. Therefore, it seems possible that unrestricted diversified results will emerge within the studio in which this method is applied. The last case study with a similar approach where the sketch is placed on the main axis is made on how visual stimuli affect the design performance. The hypothesis of the study is based on whether different visuals are equally effective in developing the design in all problem types (Goldschmidt, & Smolkov, 2006, p. 553). According to the obtained results, design problems with different features in terms of visual stimuli in terms of increasing performance is sensitive to different environmental conditions (Goldschmidt, & Smolkov, 2006, p. 567). In the context of this text, when the method is matched with such a result, it would be appropriate to state that there is no visual stimulus in the studio environment where the studio practice is performed. This brief overview of similar studies provided clues as to what criteria the studio would be evaluated in terms of content within the 6 hours.

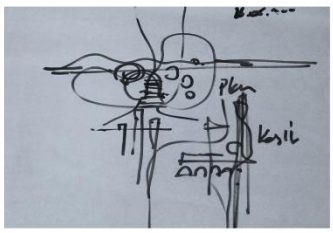
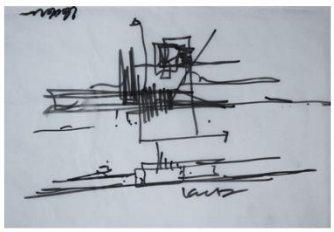
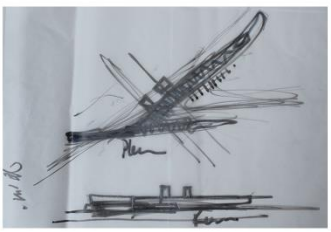
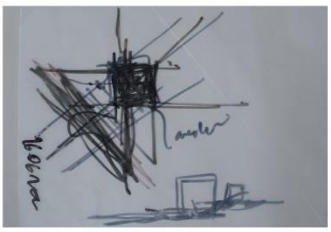
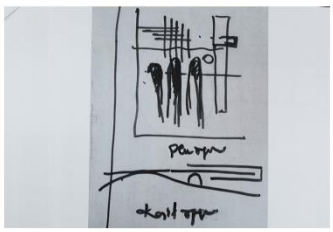
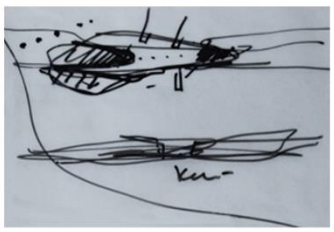
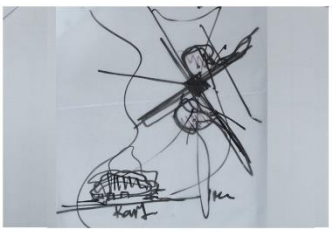
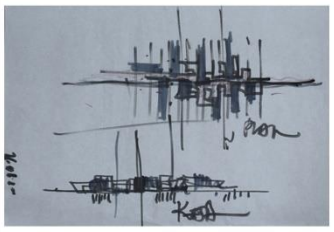
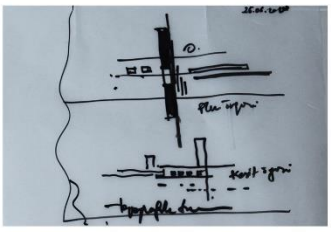
According to Cross (1999, p. 28), the design does not mean producing the most appropriate solution, but rather heuristic; the creative designer interprets the design task as a fragmented map of the unknown region and sets out for exploration. Forming the relationships between the visual images in the idea sketch, defining new relationships, adding and subtracting to cope with formal-functional situations, constitute the flexible content of the method. The studio group was expected to produce meanings such as formal organization, functional organization, spatial relations, orientation, abstract relations, and symbolic values from the hidden clues in the sketch. The studio group was left in a creative process in the architectural studio through sketching. The creative process is a whole in which ideas that affect and are influenced through subsequent developments (Akin, 2008, p. 4). Creative design, on the other hand, is a subject that develops and refines the formulation of both the problem and the ideas for a solution with the continuous repetition of analysis, synthesis and evaluation processes between the problem and the solution (Dorst, & Cross, 2001, p. 434). Therefore, creativity needs to be enabled to produce design information from the images on the sketch, and framing the problem and solution together and producing successive sketches (lateral-vertical) accordingly are other issues expected from the method.

FINDINGS AND RESULTS

The trainer-architect produced 52 different idea sketches for the studio group consisting of 52 people. Each idea sketch has clues showing plan and cross-sectional relationships (Table 1). Thus, not only the explicit or implicit meanings of the second dimension but also the clues related to the third dimension about the formal organization were invited to sketch ideas. As stated by Arnheim (2009, p. 63), although the plan stores information about the superstructure, it describes how the structure infiltrates the surrounding world, describes how it has been entered, passed, used, and shows its location, proximity, and distance from its neighbors in a certain environment. In contrast to this function of the plan, the section does not have the same integrity and has a built-in/structural distinction between up-down-side surfaces (Arnheim, 2009, p. 63). For this reason,

while the images related to the plan were drawn in the idea sketch, short images of the third dimension were also conveyed by the cross-section. At the end of the studio practice, the student is expected to make the initial sketch visible through drawing tools such as plan-section-view and model.

Table 1. Initial idea sketches

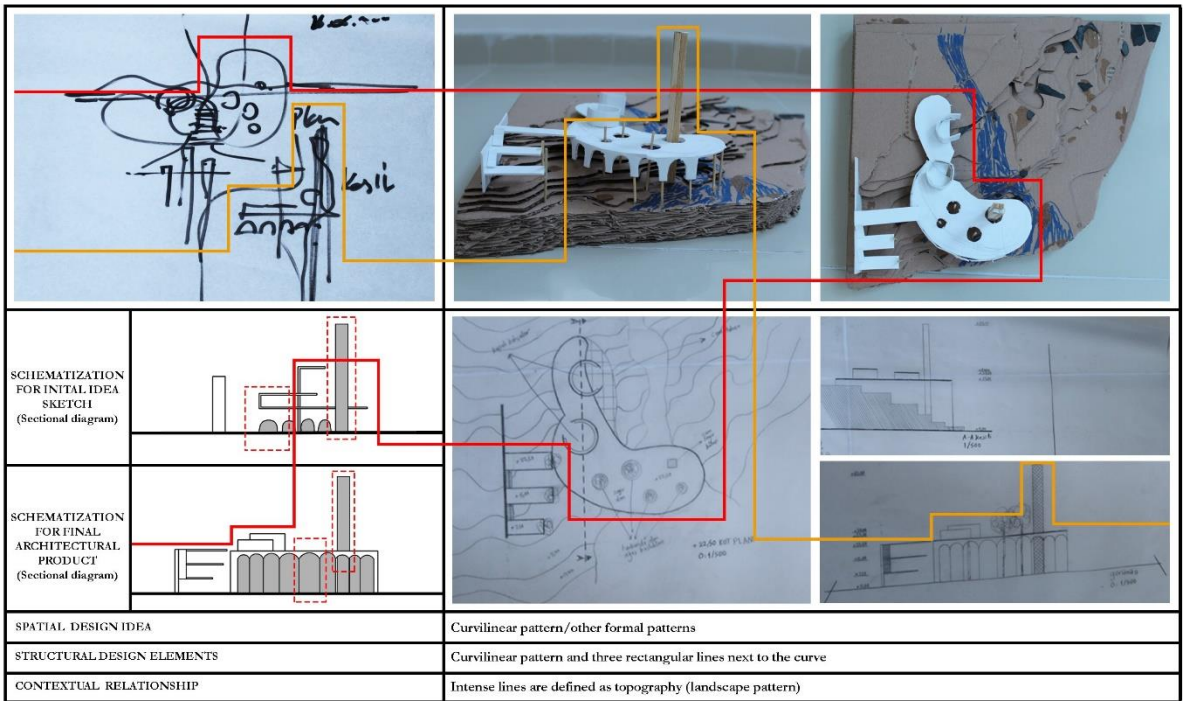
		
sketch model 1	sketch model 2	sketch model 3
		
sketch model 4	sketch model 5	sketch model 6
		
sketch model 7	sketch model 8	sketch model 9
		
sketch model 10	sketch model 11	sketch model 12

On the other hand, the use of the lateral and vertical transformation mechanism introduced by Goel during sequential sketches will help to understand the outputs of the studio. Again, while lateral transformations transform one idea into another, in vertical transformations an idea is developed over the same kinds of ideas. According to Prats et. al. (2009, p. 506), Goel's research reveals that designers do not produce independent ideas, but rather produce a single idea or several

related ideas developed from that single idea. Also, Rodgers et.al (2000, p. 461) states that Goel defines a third possible transformation model called duplication, which is a movement from one drawing to another drawing of the identical type. When we consider these lateral and vertical transformations approaches in a corner of our mind and evaluate the results of the studio applied on the sketch, two basic orientations emerge. The first is "those who interpret the sketch with contextual-formal elements" and the second is "those who create situations that differ from the linear character of the sketch". If we go through Goel, we can argue that the first orientation marks the vertical transformation and the second orientation marks the lateral transformation. However, the result of the studio application is that in the interpretation of linear readings that perform vertical and lateral transformations in products, new relationship mechanisms that define the principles of simulation have also been identified. For example, vertical and lateral transformations performed different cognitive operations based on perceptual skills, in the research process leading to the product, not only those who consider the mass mechanism but also those who interpret the images on the sketch together with the layer of the ground, those who see only as spatial design, those who see as the production of linear composition, who make more pictorial readings, those who make linear deformation or a completely different formal mechanism emerge.

At this stage of the study, the results will be shared from the group of "interpreters of the sketch with contextual-formal elements" (vertical transformation) and from the group of "those creating different situations from the linear character of the sketch" (lateral transformation). The images placed in the table are left-to-right sketches made by the educator-architect, the model of the final product developed by the student and the drawings consisting of plan-section-views. In table 2, the idea sketch was interpreted together with the ground layer and the language of formation was designed according to the original composition without any linear deformation. Accordingly, the main circular pattern on the sketch was conceived as a raised terrace from the ground, while the remaining other formal objects were solved as small functional units serving this terrace. In the written report of the student studying this idea sketch, the most striking element on the sketch is the curved lines in the plan and cross-sectional plane, and it is stated that this architectural language is effective in establishing functional relations. Other interpretations were made depending on the first sketch on the way to the product resulting from the botanical garden and the viewing terrace. According to the written report, the axle passing through the middle of the sketch was envisioned as a waterfall on the edge of the cliff, although there were no signs indicating the topography.

Table 2. "Interpreters of the sketch with contextual-formal elements" (vertical transformation) example

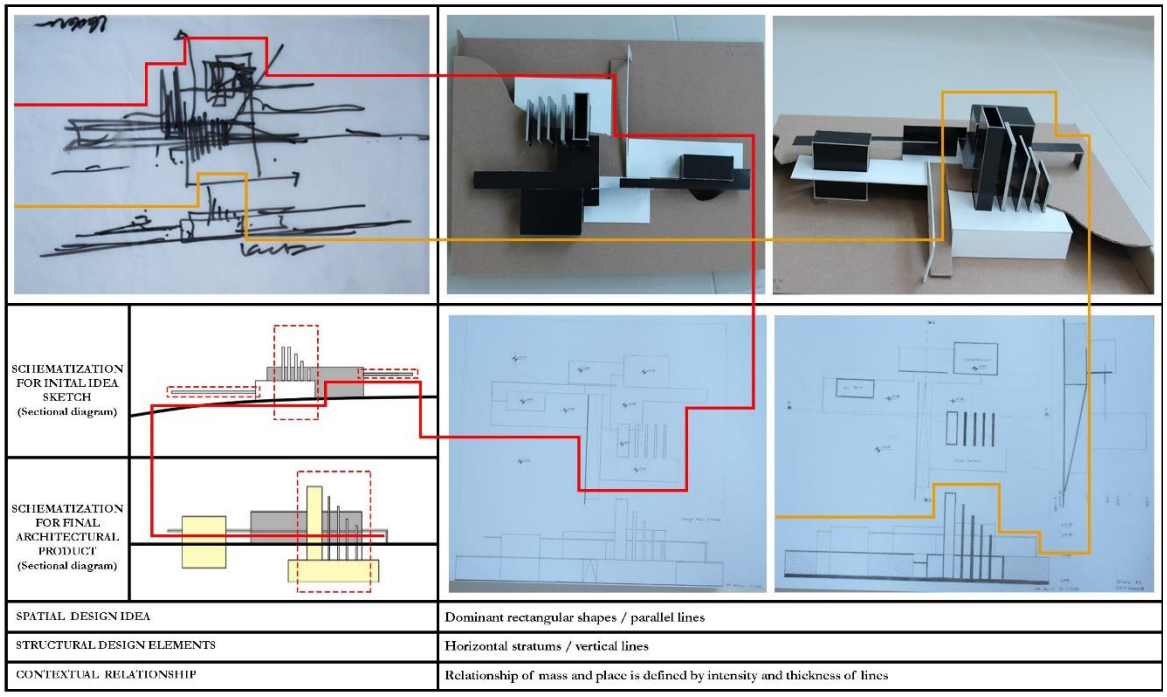


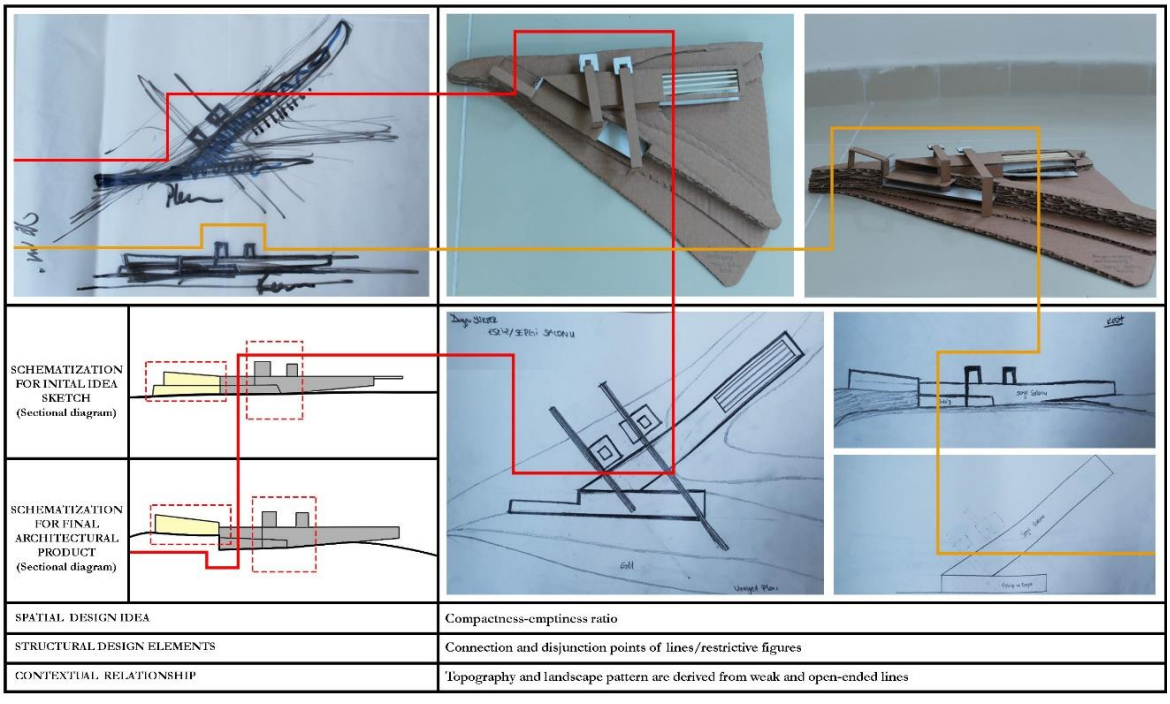
In table 3, the idea sketch was interpreted with its contextual-formal features and mass expression was taken into consideration in this expression. According to the written report, the dominant elements in the lower right and upper corners were turned into closed spaces, the parallel lines were massed and a hierarchical order was taken as a basis in the sectional plane. In addition, the horizontal extension on the left side was turned into a platform and the path was reinforced by adding a new mass. In this conception, while all the formal elements in the initial idea sketch were transformed into closed spaces that were left in their current places, mobility was tried to be formed with different elevation arrangements in the vertical line. The additions to the initial sketch are the continuation of the linear traces on the sketch, where it is emphasized that care is taken to adapt to the initial sketch. In the establishment of functional relations, the dominant formal elements on the sketch were set out, but according to the written report, in obtaining the resulting product, which is intended to be used as a museum, it was found that spatial analysis could not be made through the images on the sketch; on the contrary, it is stated that the most appropriate function is chosen for the mass form. Finally, it was stated in the written report that the thickness and density of the lines in the initial sketch were read and the verticality was dominated in the regions where the linear density increased.

In the second example of the table 3, the mass arrangement is again taken into account. According to the written report, the formal figures in the initial sketch created a closed area effect. It is envisaged that there is a water attachment as a limiting element on the sketch. The ground layer could be read by means of open-ended lines. In the transformation of the initial idea sketch into the final product, the delimiting formal elements, which were drawn in a distinct and darker manner, were objectified, and the mechanism included a water element, a green space, and a ramp

attachment. In this formal transformation, attention was paid to the connection and breaking points of the lines, closed and bounding areas, and to the open-ended lines, which only felt that some of them existed in the drawing. In the functionalization of the form, it was emphasized that a plan and cross-section were examined, a solution was made, and an exhibition hall was analyzed based on the relations between the massed forms.

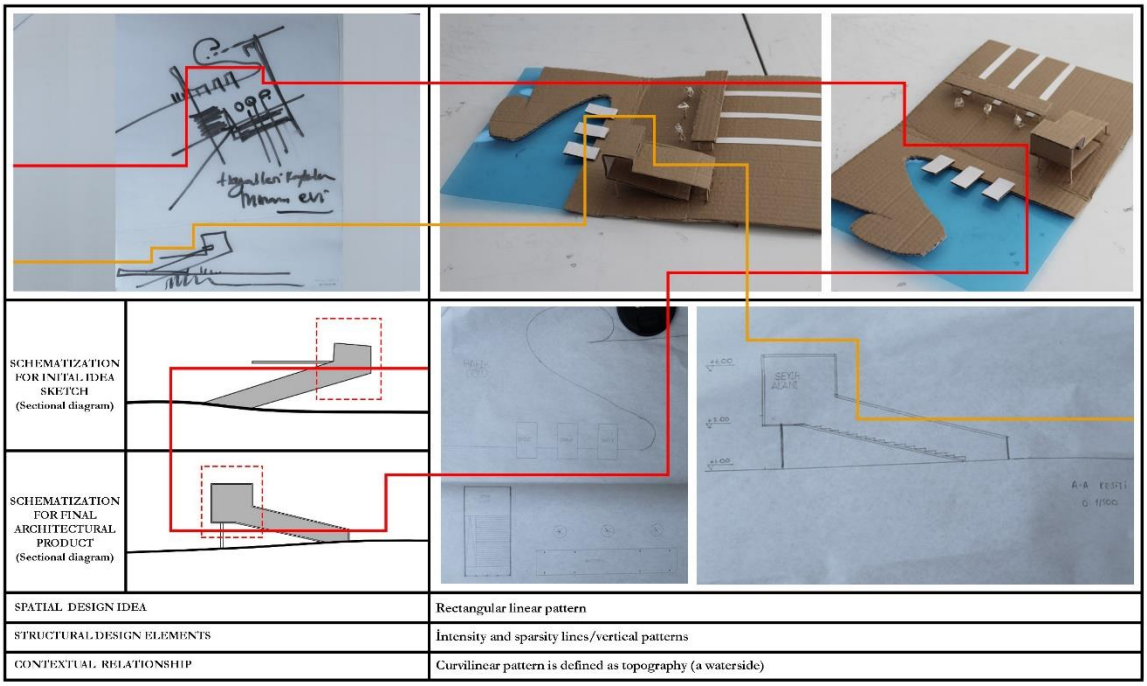
Table 3. "Interpreters of the sketch with contextual-formal elements" (vertical transformation) examples





In table 4, there are more powerful examples that deform the initial idea sketch from the group of "interpreters of a sketch with contextual-formal elements". According to the written report of table 4, the idea sketch was first studied through the cross-section and the rectangular linear pattern as the dominant element was conceived as the main spatial unit. The curved surface is constructed as a ground layer and all the lines on the sketch are assumed to be located by a lake. The orientation of the rational lines in terms of spatial organization's approach to the waterfront was read. The main rectangular mass, where the linear density increases, was used as a viewing tower, and all other linear elements were designed as service units directing to open and semi-open spaces.

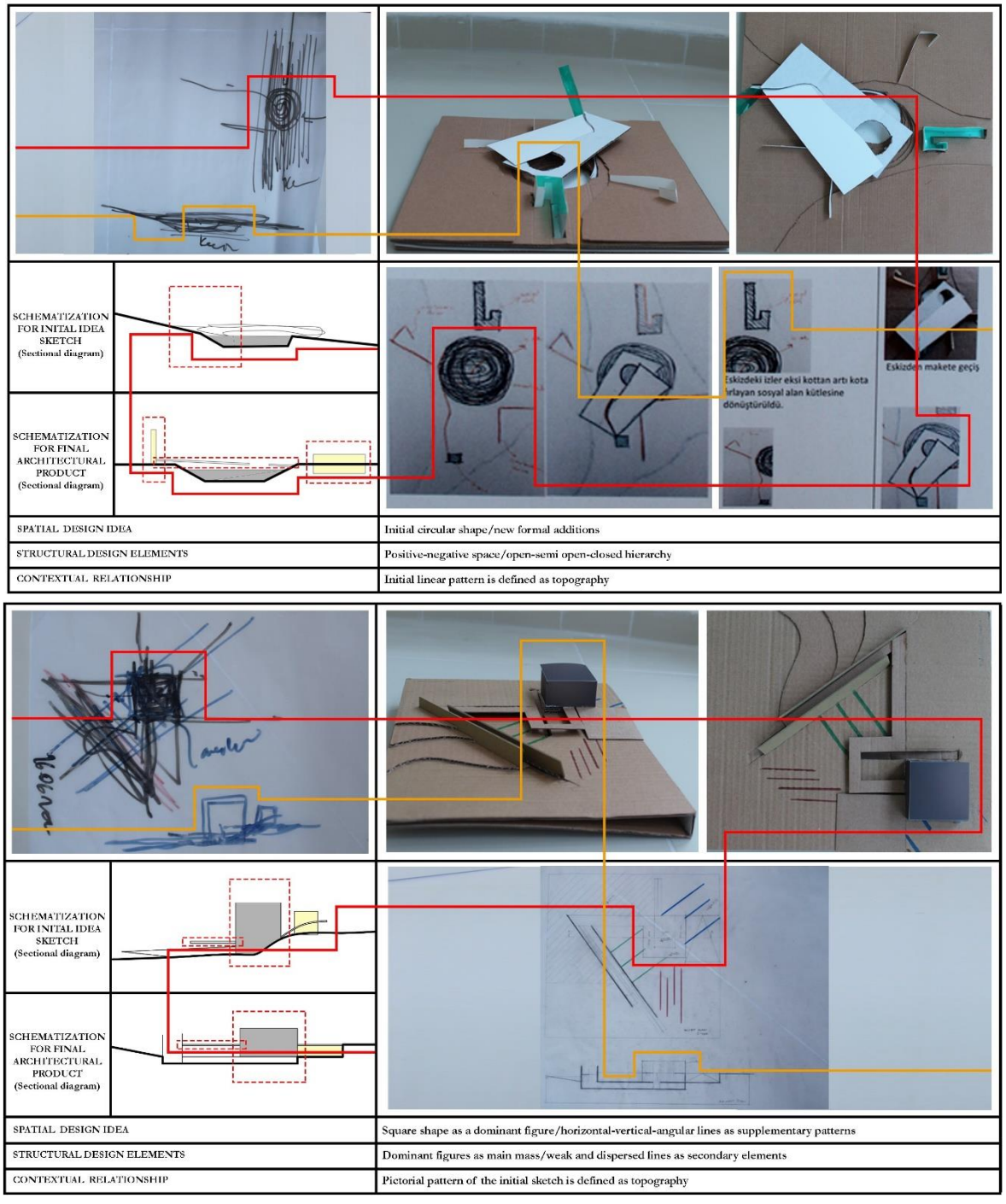
Table 4. "Interpreters of the sketch with contextual-formal elements" (vertical transformation) example



In table 5, a strong linear deformation was performed. The linear deformation is enriched with new formal additions without considering the initial idea sketch, considering the ground layer. According to the written report, the stains on the first sketch were subjected to a serious imagination filter, and the forms on the sketch were studied through the plan and cross-section, and it was discovered how the relations between the stains in their closed/open/semi-open space constructions and the guiding elements and landscape elements contributed to the massification. For example, in the design of the ground layer; position, dominance, orientation, and harmony were observed. The mass apparatus, which functions as an underground art museum, is thus designed over the positive-negative space relationship. To accomplish this, some of the stains in the sketch were solved as a monument, which was attached to the mass ejected from the topography and attached to the guiding wall, forming a slit starting from the open underground.

In the second example of table 5, while interpreting the ground layer, a linear composition was produced with more pictorial readings. The topographic situation read over the section dominated the whole design, sketch lines with different colors are defined as landscape tracks. The pattern with a high line density in the square form was accepted as the dominant form, and all other horizontal-vertical-angled lines directed to this form were conceived as auxiliary elements. Thus, the walls and eaves that define the boundaries are designed in the mass organization.

Table 5. "Interpreters of the sketch with contextual-formal elements" (vertical transformation) examples

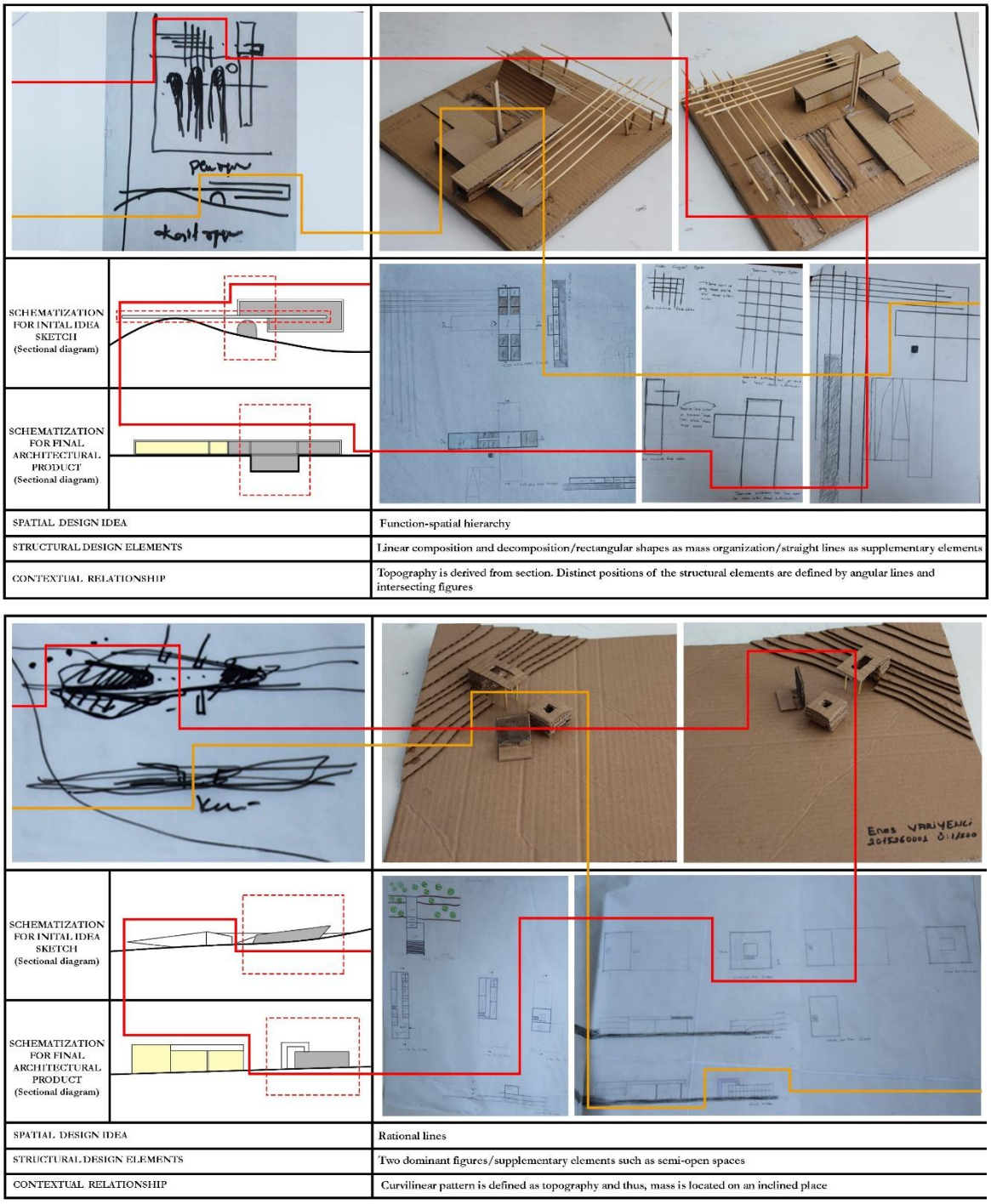


If an evaluation is made based on the examples presented so far, it is found that the dominant elements are sought in the lines on the idea sketch. This predominant element was identified from the plan and cross-sectional readings, sometimes shaped as a mass apparatus and sometimes as a topographic situation. Linear characters, which are not fully understood on the sketch, are used as secondary design elements and left as secondary spaces serving the main formal unit in the spatial organization without any additions or substitutions. Generally, the initial sketch was seen as purely spatial design, and even in cases where linear deformation was strong, visual cues were not adequately processed in the mind. These studies, which derive from the vertical transformation mentioned by Goel, do not contain consecutive sketches that were reconstructed to grasp the initial sketch and formal situation, on the contrary, the analyzes made to impose a function on the idea sketch and to obtain a spatial composition.

On the other hand, the resulting products constructed based on lateral transformation are classified as "those who create eccentric situations from the linear character of the sketch". In table 6 prioritized the function-space organization of the resulting product, and the initial idea sketch was transformed to provide the planimetric organization. According to the written report, the lines on the sketch were subjected to thought in terms of functional relations, and the formal organization followed this. While forming the shape, the ground layer was also observed and the initial lines were deformed by addition and subtraction. The linear elements in the idea sketch were included as a complementary component in the new design. Thus, in this example, the initial idea sketch was transformed through linear composition production. In this example, it is understood that the function is first determined in the mind, various transformations are performed to adapt to the specified function, the lines on the sketch are perceived as auxiliary-complementary clues and then a new mass organization is realized. In fact, according to the written report, it was stated that the cross-sectional diagram in the idea sketch could not be understood and it was emphasized that the scaling of the initial idea, that is, a concrete analysis attempt from an abstract design fiction, played a role in the transformation of the existing lines on the sketch.

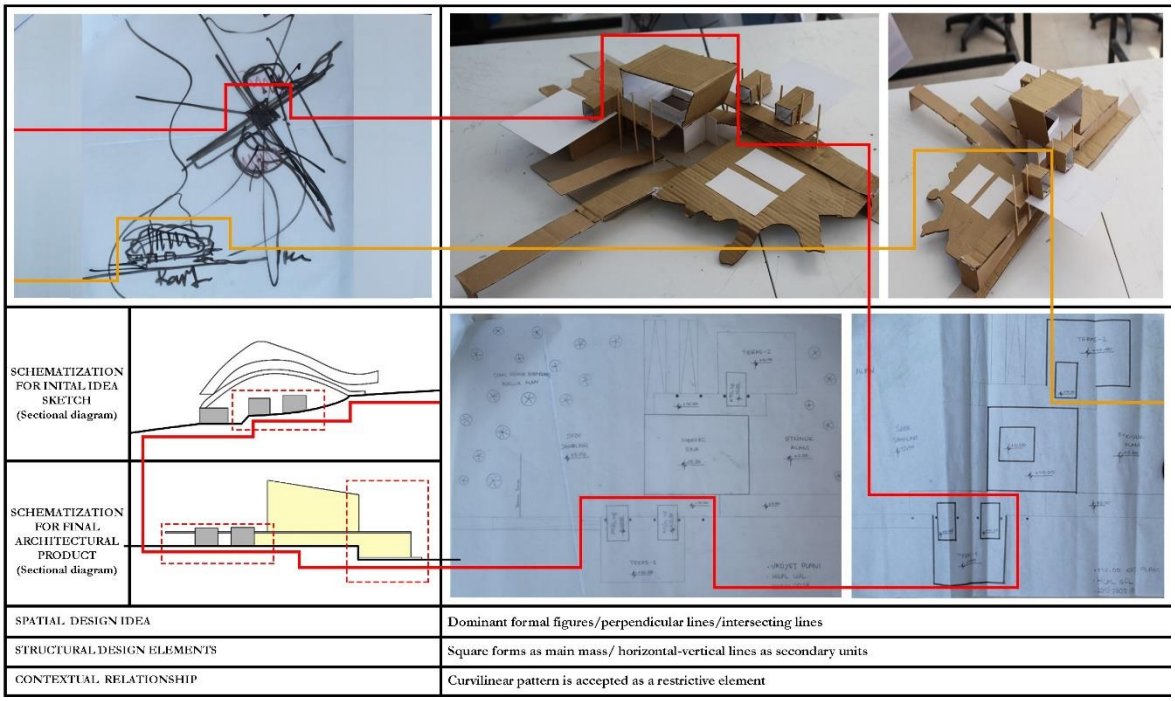
In the second example of table 6, the lines on the sketch are interpreted together with the ground layer and all curved lines are reduced to the rational line arrangement. From the sketch, the presence of two separate masses as the dominant element was read and they were reduced to a single mass connected by eaves. According to the written report, the linear organization on the sketch revealed that the mass organization was located in a sloping area and it was determined that this structure could be a library from the correlation between plan and section. The resulting product, evolved from an idea sketch to a different formal set-up, stands more as a reflection of the relationships from the specific experiences of the student of architecture.

Table 6. "Those who create situations different from the linear character of the sketch" (lateral transformation) examples



Example of table 7 is the one that remains most dependent on the initial idea of sketching different situations from the linear character of the sketch. Because the lines having horizontal-vertical extension outside the dominant formal elements are designed as guiding axles and platform arrangement for pedestrians in the final product. According to the written report, circular and square components emerged as dominant elements, a dynamic effect was read from other lines of different angles and orientations, and accordingly, it was considered appropriate to function as a youth center of mass organization.

Table 7. "Those who create situations different from the linear character of the sketch" (lateral transformation) example

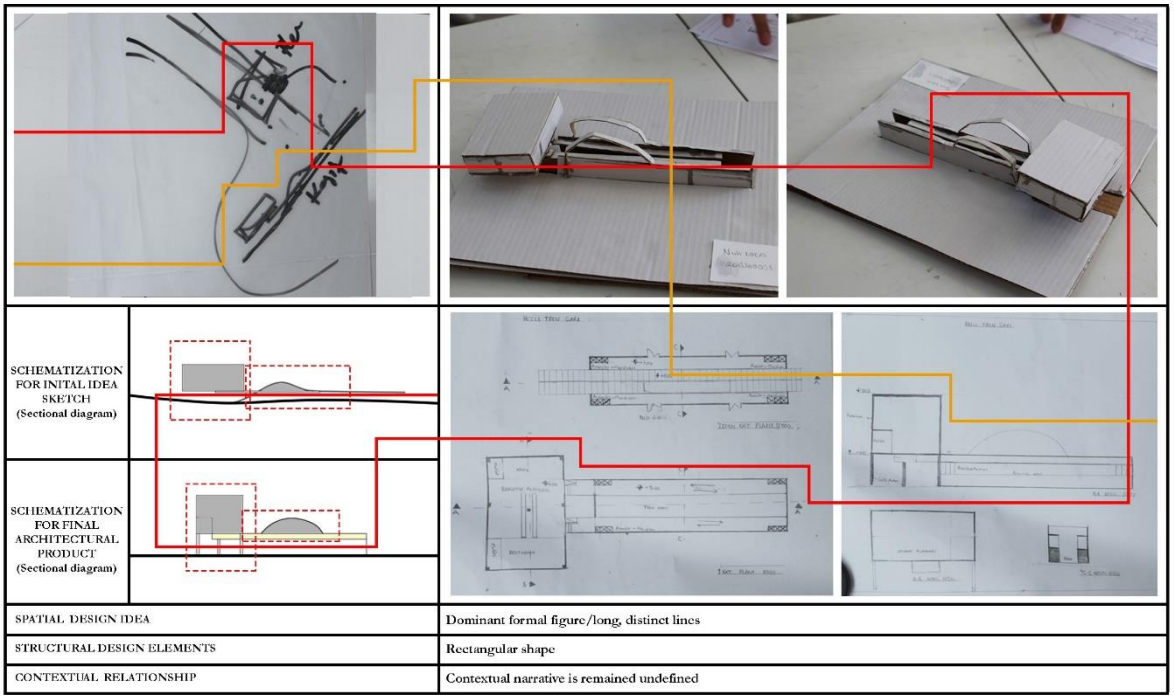


In table 8, there are examples of transformations that make it difficult to read the linear elements in the initial idea sketch from the group of "those who create situations different from the linear character of the sketch". In the first example of table 8, the rectangular shape was chosen as the dominant element, and all other spatial constructions were performed around it. The resultant product is mostly discussed through the cross-sectional relations in the idea sketch, and the initial linear relations in the planimetric plane are faded. In this example, the form language is created through a pictorial reading.

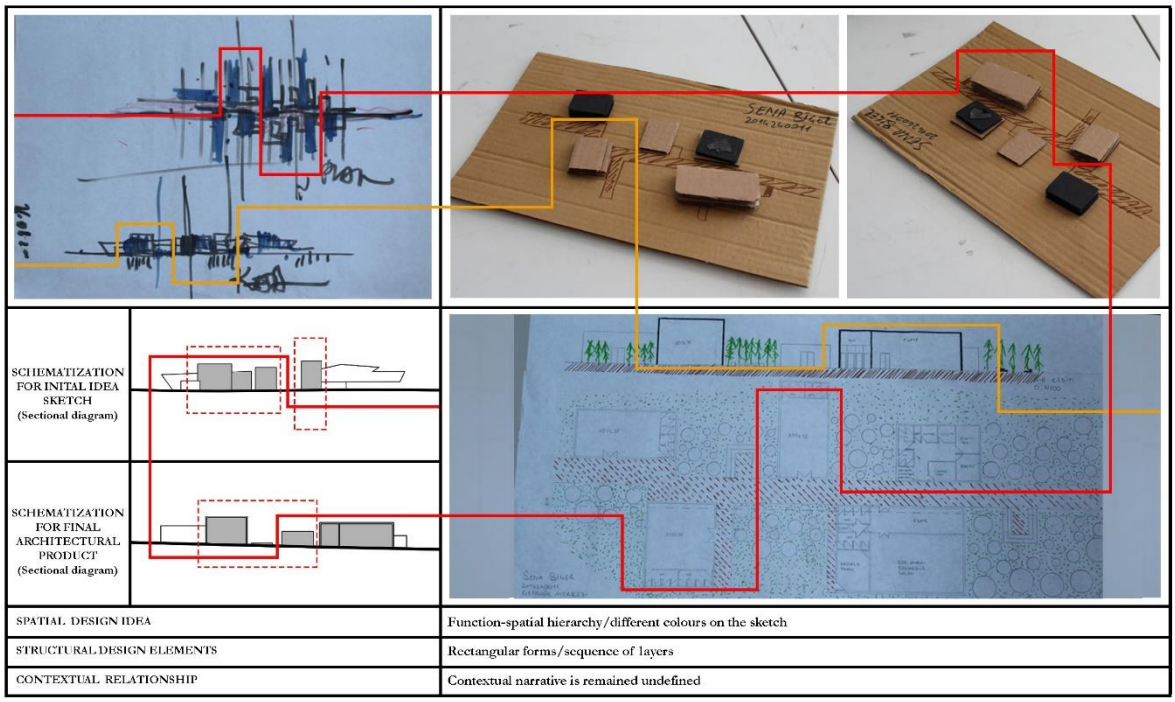
Second example of table 8 is the attempt to analyze the farthest from the initial idea sketch, given the drawing and model of the resulting product. According to the written report, no additions and subtractions were made, the ground layer was not included in the design in any way and the form language was formed directly through a function such as youth center. Instead of selecting the dominant element or relations on the sketch; The sketch left by the pencils of different colors used

in making sketches was highlighted. Therefore, the jumps created by the color differences in the idea sketch managed the open-semi-open-closed space relationship of the mass system.

Table 8. "Those who create situations different from the linear character of the sketch" (lateral transformation) examples



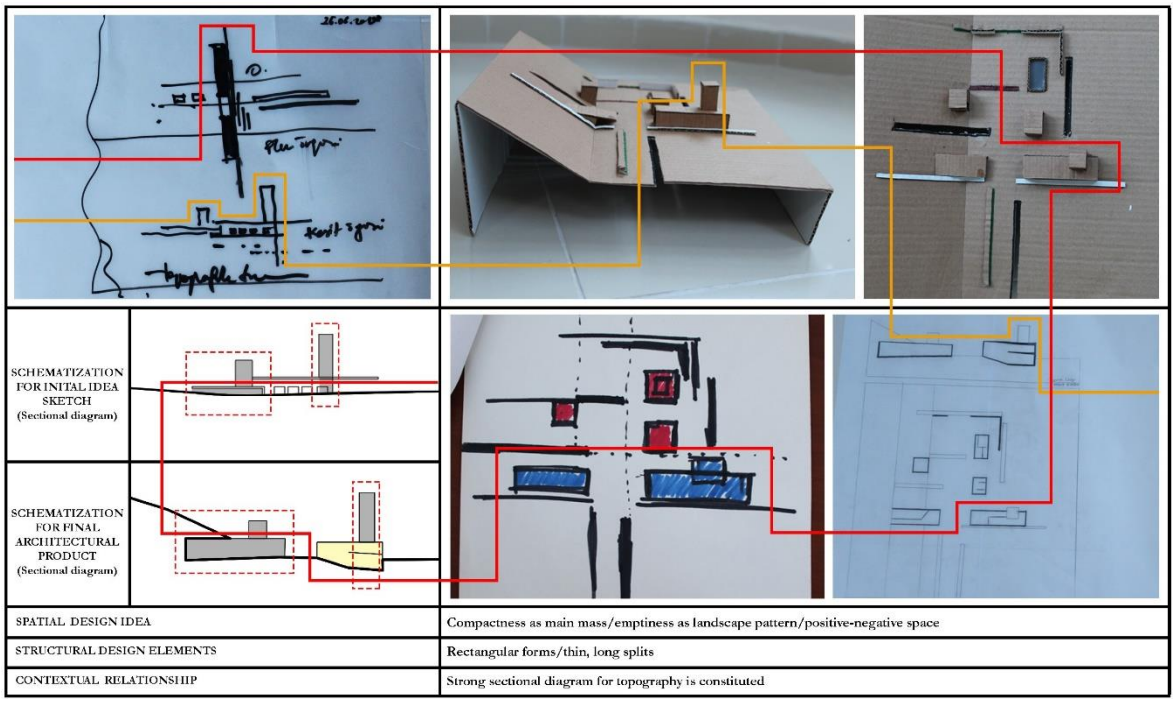
SPATIAL DESIGN IDEA	Dominant formal figure/long, distinct lines
STRUCTURAL DESIGN ELEMENTS	Rectangular shape
CONTEXTUAL RELATIONSHIP	Contextual narrative is remained undefined



SPATIAL DESIGN IDEA	Function-spatial hierarchy/different colours on the sketch
STRUCTURAL DESIGN ELEMENTS	Rectangular forms/sequence of layers
CONTEXTUAL RELATIONSHIP	Contextual narrative is remained undefined

In table 9, the ground layer was handled with force, and the solid patterns on the sketch were chosen as the dominant spatial element. Other linear elements are designed as a complementary structure around this main space. According to the written report, it was determined that the relationship between plan and section in the idea sketch should be interpreted together and positive-negative space relations should be established. There is no need to create any correlation between the linear components standing apart on the sketch, except for the functional relationship, and each is placed in the mass mechanism.

Table 9. "Those who create situations different from the linear character of the sketch" (lateral transformation) example



If an evaluation is made based on the examples presented so far, it is seen that the lines on the idea sketch are not used as the dominant element of the formal setup. The process from the initial sketch to the result was not realized by deformations such as addition and subtraction, but through specific form dictionaries from pictorial reading or individual experiences. These studies, which derive from the lateral transformation mentioned by Goel, do not contain consecutive sketches that were reconstructed to grasp the initial sketch and the formal situation; on the contrary, there are solutions made to achieve a direct result product. While individual experiences are strengthened in these analyzes; perceptual performance, which increases understanding of the sketch, has weakened.

CONCLUSION

As a conclusion, the result products, which are examined with the process and content effectiveness as well as their perceptual-functional-semantic expansions, are classified according to the way they are produced from the initial idea sketch. Accordingly, two orientation groups were identified as "interpreters of the sketch with contextual-formal elements" and "those who created situations that differed from the linear character of the sketch". If Goel's lateral and vertical transformation mechanisms are remembered, the first orientation marks the vertical transformation and the second orientation marks the lateral transformation. However, although there are different orientations, the studio practice in the study revealed similar reading mechanisms between these two approaches. In other words, the process starting from the idea sketch to the architectural product is manipulated with similar tools in the meaning-perception-comprehension stage, regardless of lateral or vertical. These tools, which are developed on perceptual and comprehension skills, are used to take into account the mass mechanism, to interpret the images on the sketch together with the ground layer, to read as a spatial design, to produce linear composition, to make pictorial readings, to make linear deformations and to reveal another mechanism. Briefly, the processes of perception selectivity and cognitive capacity place the images on the sketch into a category of information. The visual clues captured by choosing the dominant one among the objects, making deformations such as addition and subtraction, and deciding the elements that would form the spatial-functional composition, came together with the specific experiences of the advanced architecture students and formed the descriptive elements that constitute the final product.

This studio experience is, above all, a product of inquiry related to the different orientations of the act of designing with the form of inquiry that transforms from sketch to architectural production. The group of students who previously used the sketch process in their design studios or experimented with the transition to the third dimension with models by using the sketch process with their practices dealt with the linear-contextual-formal structure of the sketch produced by the educator-architect with various spatial overlaps and discovered different orientations of architectural production at this point. It should be stated that design process of the students has been changed and transformed through perception of the images on the sketches. This process is implemented by activating operational visual thinking and reasoning. For this purpose, a design task is given to the architecture students. By analyzing design task through lateral and vertical transformations of initial design idea on the sketch, architecture students discovered new design ways. Moreover, architecture students invented new visual habits by using this method. Benefits obtained from the study are various in terms of design process. For example, by using this method, students experienced a case-study in a limited time in comparison with traditional architectural studio. Also, interfaces of design process were grasped by an interactive way. Design process was transformed into a thinking and doing exercise. Thus, architecture students were experienced a tangible and graspable design task instead of intangible, abstract or notional design process. Consequently, while architecture students grasped design interface, he/she discovered how his/her own design thinking was operating during design process.

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