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Initial Practices for Abstraction of Body and Space in Design Education

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ABSTRACT
The relationship between space and human occurs through the actions performed with the body. The abstraction study as an exploration of the body is one of the significant practices for first-year design students. However, there are not enough investigations for design students regarding body, space and basic design principles. This paper aims to explore the potentiality and limitations of the body-abstraction process by comparing the impact of two different educational models on students' perception and improvement. The applied methodology includes comparing two design processes of the basic design course depending on parameters: Given example, source of the video, type of movement, the number of the selected-used scenes, mode of sketching, the method for production, requested outcome, the scale of the study, the material of models and critique of the video. The results present that the activation of the body through mental practice, drawing and modelling stages is critical to understand its abstract and spatial capabilities. The realisation of the potentials in the relationship between body and abstraction in spatial perception would enable us to create an advanced design process addressing more original concepts.
Keywords: Body, Abstraction, Basic Design, Design Process, Design Education

1. INTRODUCTION

A brief overview on the history of architecture reveals the fact that many parameters are used in the design process depending on the diverse needs of people. One of the most critical parameters is the state of the body in space. People communicate with space through their bodies with physical and perceptual limitations. Thus, the body plays an active role throughout the design process with its rigid physical properties, perceptual reality and movement capabilities. At the same time, the properties of space shape the body as well. Designers should pay attention to all the parameters of space-body interaction to carry out an efficient design process.

Abstraction is one of the methods used in order to understand space-body interaction. The aim of the abstraction is to comprehend the essence of a thing or situation by acquiring generalised concepts. In this sense, abstraction is a method that people use in daily life while making decisions and producing an idea. While perceiving the world, the brain creates its own reality by eliminating some information and focusing on some. The abstraction process, therefore, takes place in all kinds of human actions and perceptual processes.

Different forms of abstraction are used in the field of philosophy and science. While scientists make objective measurements of a natural event and present a model, they abstract nature's mechanisms. Similarly, in philosophy, generalised inferences are made by the abstraction of different ideas, comprehensions and perceptions. Since there are endless parameters that affect the issues discussed in philosophy, it is not possible to make

a general evaluation without leaving some of these parameters in the background. In architecture, abstraction is used in several ways depending on the understanding of the design's nature and needs. Some cases of using abstraction in architecture are as follows: initial sketches of the design process, imitating natural process or forms, transforming formal or symbolic features of things, and the like. In this respect, abstraction is considered as a method that can be used in every stage of architectural design.

Students of architecture encounter the abstraction method for the first time in the basic design course that they meet the design discipline's basic concepts and methods. In this course, students are expected to develop their creativity and abstract thinking skills. In this context, it is considered that teaching the relationship between the human body and space through the abstraction method is of great importance for understanding the design process. This paper compares and evaluates the outcomes of two different basic design practices where the body-abstraction method is used. Thus, it opens the discussion of the body-space relationship in architectural design through abstraction technique.

2. THEORETICAL FRAMEWORK

2.1. Experience of the Body and Space of the Experience

What produces life in space is human activity. Space is perceived by the lived body, and it refers to the relation of space with the body (Morris, 1997). Being body refers to being linked with a certain world, and our body is not necessarily in space but made from it (Merleau-Ponty, 2005). Moreover, the world revealed by the body is a lively, inhabited space (Frampton, 2001, p. 11). In this sense, body and space are inseparable elements as a variable phenomenon in which the interaction is always maintained. Tschumi (1994, p. 110) highlights the phenomenological approach of the body:

> "The Cartesian body-as-object has been opposed to the phenomenological body-as-subject, and the materiality and logic of the body have been opposed to the materiality and logic of spaces. From the space of the body to the body-in space-the passage is intricate".

Apart from being an anatomical being, the body is a phenomenon that affects its environment and vice versa. While the body shapes itself by its movements, every perception and experience of the body reproduces the space (Spuybroek, 2008). The concept of the body indicates and produces spatiality, and the body itself has spatial features and determinations (Grosz, 2001; Tschumi, 1994). Accordingly, if space, which allows possibilities of the body's movement, is understood outside the body, every movement of the body can reveal various possibilities in space and so creates the space (Spuybroek, 2008). Today, as Erkenez and Ciravoğlu (2020) mentioned, both the body and the space are capable of metamorphosis and have a performative structure that carries new potentials according to the situation. Since space contains the body, soul and mind, architecture pays attention to people, life and experience (Huang, 1991). In this sense, the body is a phenomenon that effectively shapes the architectural design from beginning to end.

The body is defined as both the starting and arrival point of architecture (Tschumi, 1994). Further, the bodily reaction is defined as "an inseparable aspect of the experience of architecture" (Pallasmaa, 2012, p. 67). In this regard, it is essential to explore the details of the body phenomenon in order to perceive the relationship of the body with space. Considering all, the use of the abstraction of the body in the thinking process emerges as a method of design practice.

2.2. Abstraction and Architecture

Etymologically, the word of *abstraction* derived from Late Latin *abstractionem* which means "to drag away, detach, pull away, divert" and Old French *abstraction* meaning "a withdrawal from worldly affairs, asceticism" (Online Etymology Dictionary, n.d.). The dictionary defines

it as "the process of formulating generalised ideas or concepts by extracting common qualities from specific examples" (Collins Dictionary, n.d.). Abstraction expresses separating in mind what is inseparable in reality to fully comprehend the concrete as a whole by considering the relations of the parts. It is a process that handles any one of the properties of an object or any of the relationships between its properties. Without the acquisition of abstract concepts, one cannot attain any phenomenon's essence and reality (Hançerlioğlu, 2000).

In a general sense, abstraction is used by people in daily life when trying to deal with the reality of the world. Considering the concept of abstraction as an evaluation of a specific feature of a situation while leaving other properties in the background, then every idea or belief can be considered as different kinds of abstraction (Locke and Woolhouse, 2004). Similarly, scientists create a natural phenomenon model by abstracting the complexity of natural mechanisms (Russell, 1930). In this sense, abstraction involves exclusion without untruth (Jones, 2005; Godfrey-Smith, 2009) and implies imperfection (Levy, 2018).

In architecture, based on different types of environmental perception of human beings, abstraction models can be examined in three forms; formal, functional and semantic abstraction. "Expressing the concrete form through pure expression language or reducing the form into geometrical characteristic" is called as formal abstraction. Functional abstraction is "related to relationships between human's action and the environment through pictorial representations or schematic display". Semantic abstraction is about "expressions generated by association, that defines the subjective, changing object related to the perceiver's sensual and cognitive responses with expressions such as metaphors and symbols that include the cultural meaning" (Gencosmanoglu and Nezor, 2010, p. 1338).

In the light of the definitions and explanations, the abstraction process unveils powerful connections between body and space (Cregan, 2006). Since the abstraction method always is part of the design process, it is emphasised in architectural education. The basic design course is the first stage where architecture students start abstraction studies. In this context, the basic design studio is of great importance in terms of discussing the role of body-space relations in the design process through the abstraction method.

2.3. Basic Design, Dance and Body Abstraction

Basic design course enables first-year students to perform exercises that increase their perception capabilities, stimulate their mental processes, strengthen their creativity, and provide coordination of thinking and handicraft. This course teaches the basic principles and techniques of design and gives the students the ability of abstract thinking, using materials and expressing their ideas. Therefore, students become competent in the field of design through processes such as perception, analysis, discovering details, interpreting and revealing abstract or concrete original solutions. In this sense, beyond focusing on theoretical contents basic design proceeds by students' curiosity and experiences (Boucharenc, 2006, p. 1).

Historically, the basic design course is an ongoing extension of the Modern Architecture and Bauhaus School (Sarıoğlu Erdoğdu, 2016). The basic art education at the Bauhaus school that lasted for six months was a start-up course that was considered the basis of study programs. Students were experiencing the materials exactly in the workshops where the artist and the craftsman train together (Bulat, et al., 2014). This education model, which contains the search for a geometric balance, the discovery of the essence of aesthetics and simplicity, still maintains its importance in contemporary design education. Discussions in Bauhaus - the human body and its relation to space, the practice of abstraction, the possibilities that the body creates in space - are still guiding in today's space-body discourses.

Artists like Schlemmer and Kandinsky tried to explore the human figure's formal essence and thought about the possibilities that occurred in space due to the movement of the form. Schlemmer was interested in the transformation of the human figure and expressed the body in organic forms and geometric shapes. In the age of mechanisation dominated by reduction, Schlemmer abstracted the body and integrated it into the rules of colour and forms. Furthermore, he blended it into the cubic, abstract and machine features of the stage. He also considered bodies as architectural objects and tried to find the space that carries bodily features and revives with the movements of the bodies (Dervişoğlu, 2008). According to Schlemmer (1987, p. 25) "cubical-abstract space is only the horizontal and vertical framework for the body's movement flow. These movements are determined organically and emotionally." The samples from Schlemmer's works, the possibilities of Man as Dancer, transformed through costume and moving in space is shown in Figure 1.

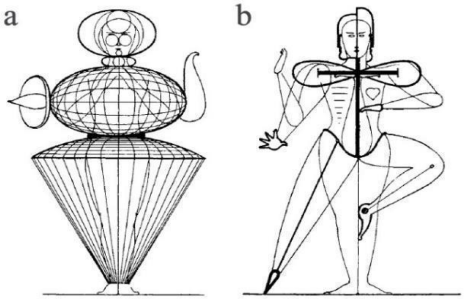


Figure 1. (a) The laws of motion of the human body in space; (b) The metaphysical forms of expression symbolising various members of the human body (Schlemmer, 1987: p. 27).

The two abstraction drawings, produced by Kandinsky (see, Figure 2) from photographs of a dancer, also serve as an example of the discussion of Bauhaus's reductionist approach to body-space relations. Dance Curves' work is a product based on Kandinsky's theories of point, line, form, and colour (Kandinsky, 1926). He reflected the concepts of simplicity and essence of the form by the lines of dance abstraction.

According to Salazar Sutil (2014, p. 29), "Kandinsky (1926, p. 521) argued in his accompanying essay that an instantaneous photographic capture of dance movement could be translated into diagrammatic form, in order to understand better how the dance, which is essentially a temporal art form, is in fact made up of cut-off forms or still shapes in space… The moving human body is reduced to lines and joint angles, allowing a sense of movement to emerge from the sequencing of still-photographic geometric images". It is seen that Schlemmer and Kandinsky deal with the body-space relationship through the abstraction of the body and explore the possibilities of movement in space.

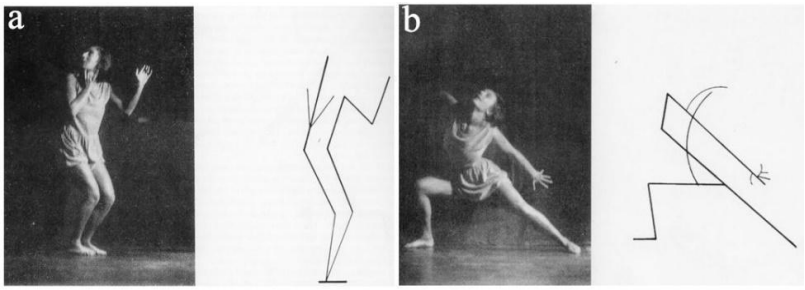


Figure 2. Dance curves (Kandinsky, 1926, pp. 118-119).

Body, especially with its movements, is part of the constitution of inhabited space. As a practice of embodied experience, dance presents some clues for the role of the body in space. Laban (1966) defines place as the locality of spatial change, and it is not just an empty container separated from movement. Movement in the place delineates the

atmosphere of space. Since space is a concealed property of movement that is a visible aspect of space, movement and place become intertwined as one another's intrinsic qualities. "Kinesphere" is used to define space of movement. It indicates the sphere around the body or the extension of the body created by movements of arms, legs, gestures and postures (Laban, 1966, p. 10). It means that the body and its extensions shape a living volume in space. Schiller (2008, pp. 432-433) developed a "kinesfield", following Laban's kinesphere, to understand movement and the "dynamic transactions that take place between the body and the environment". It is not just a sphere of the body but also the Spatio-temporal conditions of the environment, such as socio-cultural events and atmosphere. While "kinesfield" is a textured place revolving around the body in particular contexts, "kinesphere" could surround anybody moving in any kind of space.

The condition of the body in space relating to choreography highlights the movement sequences of the physical body performing the dance. American dancer and choreographer William Forsythe considers choreography as the potential direction of action without a single path. It organises bodies linked with other bodies and environments (Spier, 2011). When the dance and choreography synchronise, choreography serves as a medium in which bodily experience occurs (Forsythe, 2011). In this stage, Forsythe evaluates ballet as an abstraction that can only be performed by failing to provide the perfect ideal (Siegmund, 2011). This Platonic understanding demonstrates that the experience of dance itself can be considered as the abstraction process. In short, these divergent paradigms for dance provide an exhaustive insight for body-space-abstraction relations from volumetric aspects to socio-cultural conditions.

Considering all, the first-year students of architecture can experience the relations of body-space with body-abstraction exercises. As Ersoy (2011, p.125) claims that "dance can be a resource of phenomenology and a practical tool for embodied learning". Following the growing interest for Bauhaus (Binder et al. 2008; Cross, 1983; Dearstyne, 2014; Droste, 2002; Ehn, 1998), many discussions have been developed regarding dance, body and abstraction (Funkenstein, 2007; Huxley, 2017; Sutil, 2014; Ersoy, 2011). Although some body-abstraction methods are known in practice, there is not much empirical investigation to guide us for improving design students' perception regarding body, space and basic principles of design. This research aims to explore the relations between abstraction practices and the reflection of students. In light of the purpose of the study, research questions are listed below.

- What are the critical and creative limits of different body-abstraction processes?

- What are the effects of given examples (with design task), different type of movements, number of body references and various sketching techniques on students' design outcomes and perception of the body?

- What are the differences between watching dance and performing with their own bodies on students' volumetric perception?

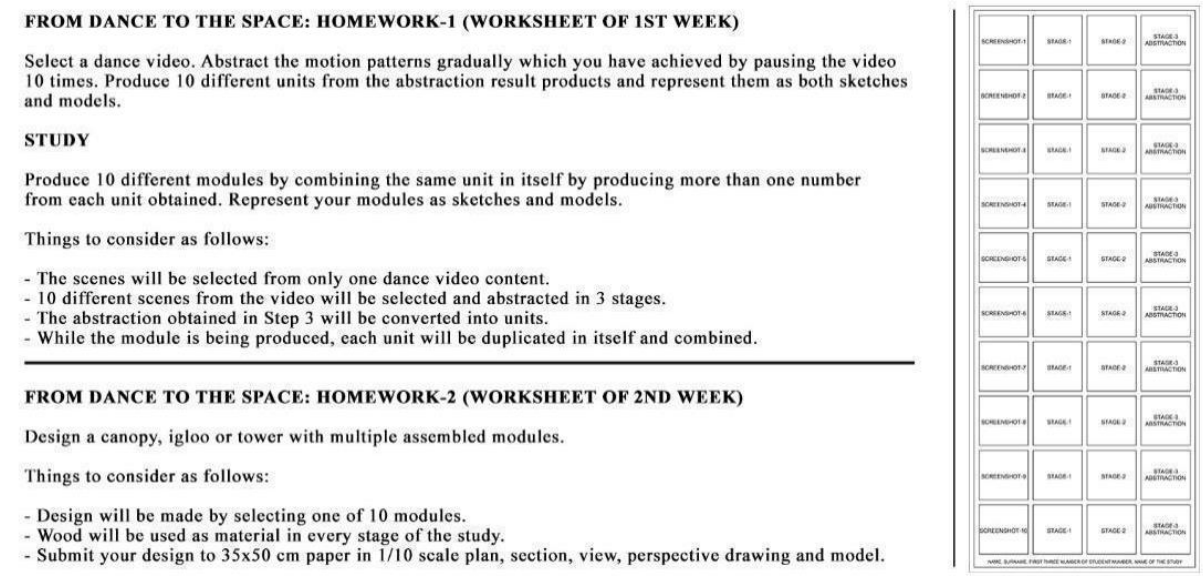
- How divergent model production methods, materials and scales shapes the relationship between final model and body abstraction process?

- What are the reflections of demanding architectural space or abstract models as design outcomes on the arrangement of the final structure?

3. RESEARCH DESIGN

In this research, two studies were examined to understand the influence of different abstraction methods on the designs of students. In order to achieve this purpose, researchers compared the results of two studies with determined parameters, discussed

the results and developed recommendations. These studies based on the body abstraction technique have been carried out in the basic design courses at the Department of Architecture, Eskişehir Technical University. They were held in 2015 and 2019. Given studies were named as "From Dance to Space" (2015) and "Body-Movement-Space" (2019), which refer to Study 1 and Study 2, respectively. Both studies were executed in the second semester of first-year education. Thus, students had some experiences to relate key components of the problem by previous exercises regarding basic design principles. The design tasks of the two studies are shown in Figure 3 and 4.



FROM DANCE TO THE SPACE: HOMEWORK-1 (WORKSHEET OF 1ST WEEK)

Select a dance video. Abstract the motion patterns gradually which you have achieved by pausing the video 10 times. Produce 10 different units from the abstraction result products and represent them as both sketches and models.

STUDY

Produce 10 different modules by combining the same unit in itself by producing more than one number from each unit obtained. Represent your modules as sketches and models.

Things to consider as follows:

- The scenes will be selected from only one dance video content.
- 10 different scenes from the video will be selected and abstracted in 3 stages.
- The abstraction obtained in Step 3 will be converted into units.
- While the module is being produced, each unit will be duplicated in itself and combined.

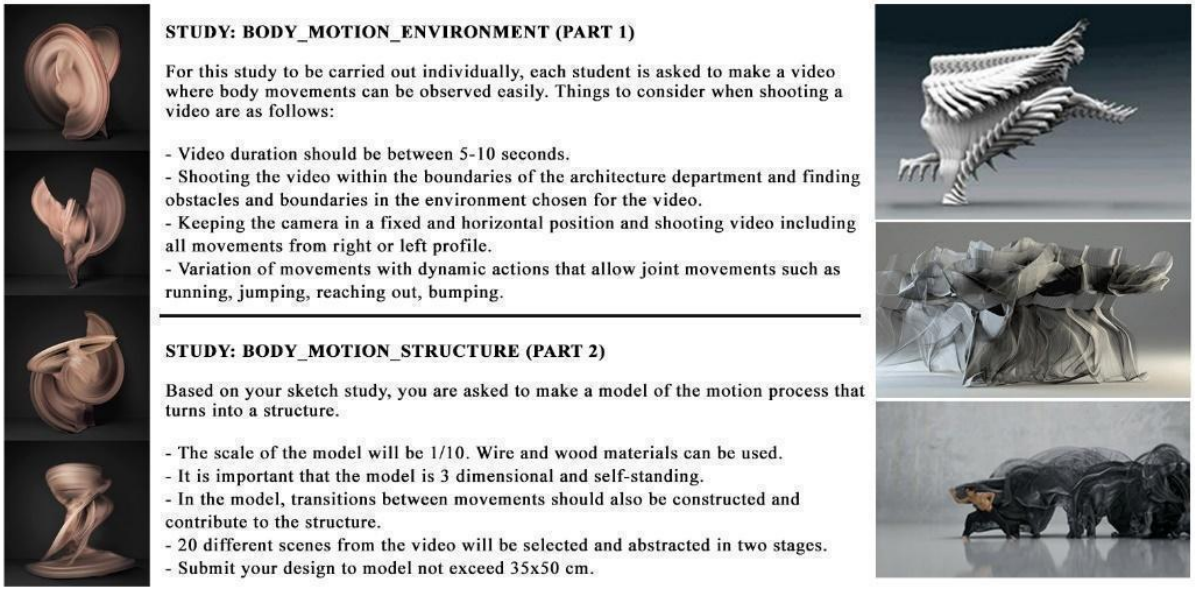
FROM DANCE TO THE SPACE: HOMEWORK-2 (WORKSHEET OF 2ND WEEK)

Design a canopy, igloo or tower with multiple assembled modules.

Things to consider as follows:

- Design will be made by selecting one of 10 modules.
- Wood will be used as material in every stage of the study.
- Submit your design to 35x50 cm paper in 1/10 scale plan, section, view, perspective drawing and model.

Figure 3. Design task of Study 1 (Adapted by the Authors)



STUDY: BODY_MOTION_ENVIRONMENT (PART 1)

For this study to be carried out individually, each student is asked to make a video where body movements can be observed easily. Things to consider when shooting a video are as follows:

- Video duration should be between 5-10 seconds.
- Shooting the video within the boundaries of the architecture department and finding obstacles and boundaries in the environment chosen for the video.
- Keeping the camera in a fixed and horizontal position and shooting video including all movements from right or left profile.
- Variation of movements with dynamic actions that allow joint movements such as running, jumping, reaching out, bumping.

STUDY: BODY_MOTION_STRUCTURE (PART 2)

Based on your sketch study, you are asked to make a model of the motion process that turns into a structure.

- The scale of the model will be 1/10. Wire and wood materials can be used.
- It is important that the model is 3 dimensional and self-standing.
- In the model, transitions between movements should also be constructed and contribute to the structure.
- 20 different scenes from the video will be selected and abstracted in two stages.
- Submit your design to model not exceed 35x50 cm.

Figure 4. Design task of Study 2 (Adapted by the Authors)

During Study 1, students were asked to select a dance video and ten scenes in it by analysing the movements. The selected movements were abstracted in three phases, and in the third phase, students explored the units which will be the parts of the spatial structure later. The process continued with the development of the modules by duplicating each unit within itself. In this stage, students had design practices by duplicating each module itself and then selected one of the modules according to its design potential. After sketch and model practices, the design outcome has become a spatial structure. The model of Study 1 is shown in Figure 5.

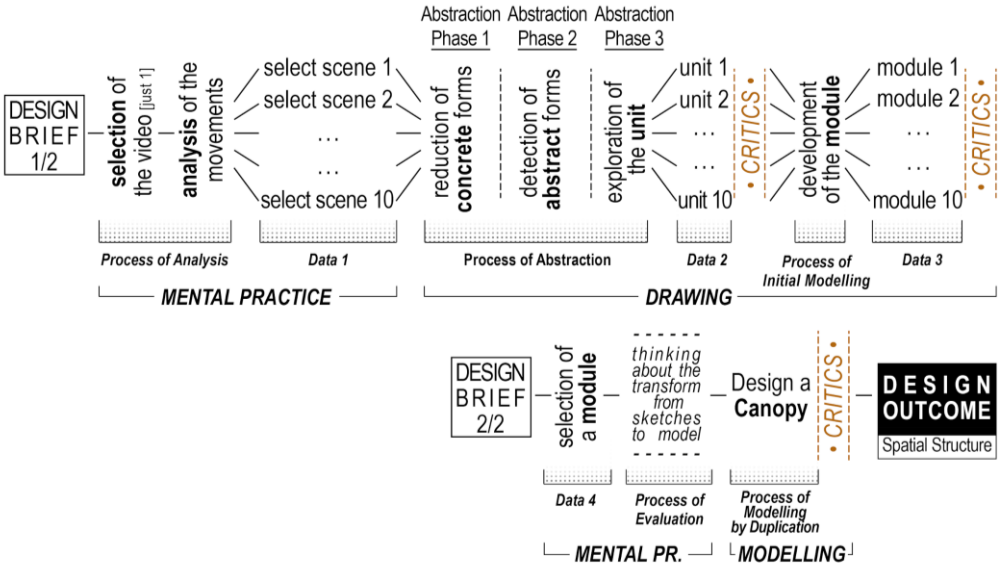


Figure 5. Design model of Study 1

During Study 2, students were asked to record a video that contains different types of movements in the environment with obstacles and boundaries. Variation of the movements (e.g., running, jumping, bumping) was emphasised. They were needed to select twenty scenes from their video. These scenes were converged and abstracted. They produced the sketches as a final phase of abstraction. Following that, it was required to think about the transformation from abstract sketches to a model. Finally, they modelled a motion structure in consecutive composition. The model of Study 2 is shown in Figure 6.

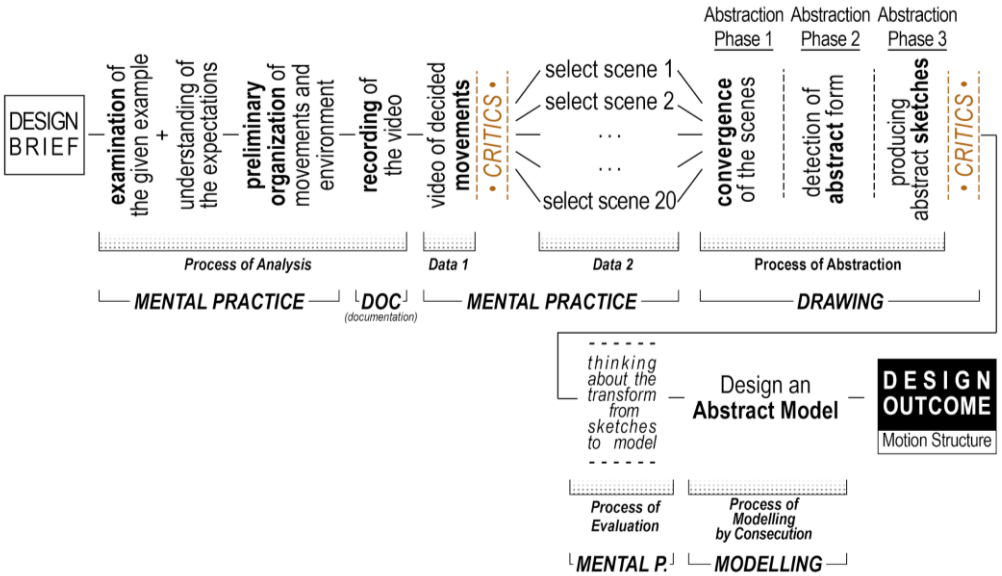


Figure 6. Design model of Study 2

3.1. Participants

Two studies involved the participation of first-year architecture students. 67 students of basic design course participated in "From Dance to Space", and 41 students participated in "Body-Movement-Space". Two samples for each study were selected randomly from designs that had the highest scores. Two abstraction models were examined in detail so as to find out fundamental distinctions in different stages and design outcomes.

3.2. Method

Within the scope of the paper, the data of the studies were presented through the process of each study. After that, differences between the two studies were revealed by various parameters to find out productivity and limitations for the body-abstraction. These parameters were specified as follows: given example, source of the video, type of movement, the number of the selected-used scenes, mode of sketching, the method for production, requested outcome, the scale of the study, the material of models and critique of the video. Discussion and suggestions were developed based on these parameters.

4. RESULTS

Within four years, abstraction studies for novice students have been conducted annually. We made minor changes each year and followed the acquisitions of students from these practices. At the end of four years, the change of the practices has become major (see, Table 1). Hence, we had the opportunity to analyse the student reaction to the change from Study 1 in 2015 to Study 2 in 2019. Two studies are analysed depending on determined parameters in detail to understand the distinctions between the design processes.

Table 1. Summary of Study 1 and 2

		STUDY 1 (2015 Spring)	**STUDY 2 (2019 Spring)**
STAGE 1	**Given Image**	None	Long Exposured Footage of Dance Figures Some Footage for Expected Outcome
	Requirements	Selecting a Video of *Dance* Performance	Recording the Video of Movement
		Drawing Abstract Sketches Referencing Selected *Dance* Video Producing of Units Referencing the Sketches	Drawing an Abstract Sketch Referencing the Recorded Video
		Producing of Modules Referencing the Units	
	Limitations	Number of Selected Video: *Only one video should be selected* Number of Scene: *10 varied scenes*	Video Format: *The camera should be stabilised in landscape pose* Number of Scene: *20 varied scenes*
		Movement: *Just Dance*	Movement: *Running, jumping, lying down, bump*
		Duration of Video: *No limitation*	Duration of Video: *5-10 sec*
		Number of Abstraction Phases: *3 phased abstraction* Transition to the Unit from the Abstract Sketch: *- Third stage* Transition to the Module from the Unit: *- Duplication of the same unit within a module*	Number of Abstraction Phases: *2 phased abstraction* Environment for Recording: *- A place which has obstructions and boundaries* The scale of abstract sketches: *- 1/10*
STAGE 2	**Requirements**	Modeling a Structure (Canopy / Tower / Igloo), Referencing Selected Module	Modeling a Movement Referencing Abstract Sketches
	Limitations	The Scale of Model: *1/10*	The Scale of Model: *1/10*
		Material: *Wood*	Material: *Metal / Wood*
		Selection of Module: *Canopy should be created by duplicating only one module*	

Both studies were a two-stage process. In the first stage of Study 1, there was no image as a reference for the design task's final design. Students were asked to select a dance

performance video and draw the ten scenes from the selected videos. Other performances except dance were not allowed to select for abstraction. The template for the drawings was given to them (see, Figure 3). According to the template, each scene needed to be abstracted three times. Figure 7 is shown the two selected sample of abstract drawings.

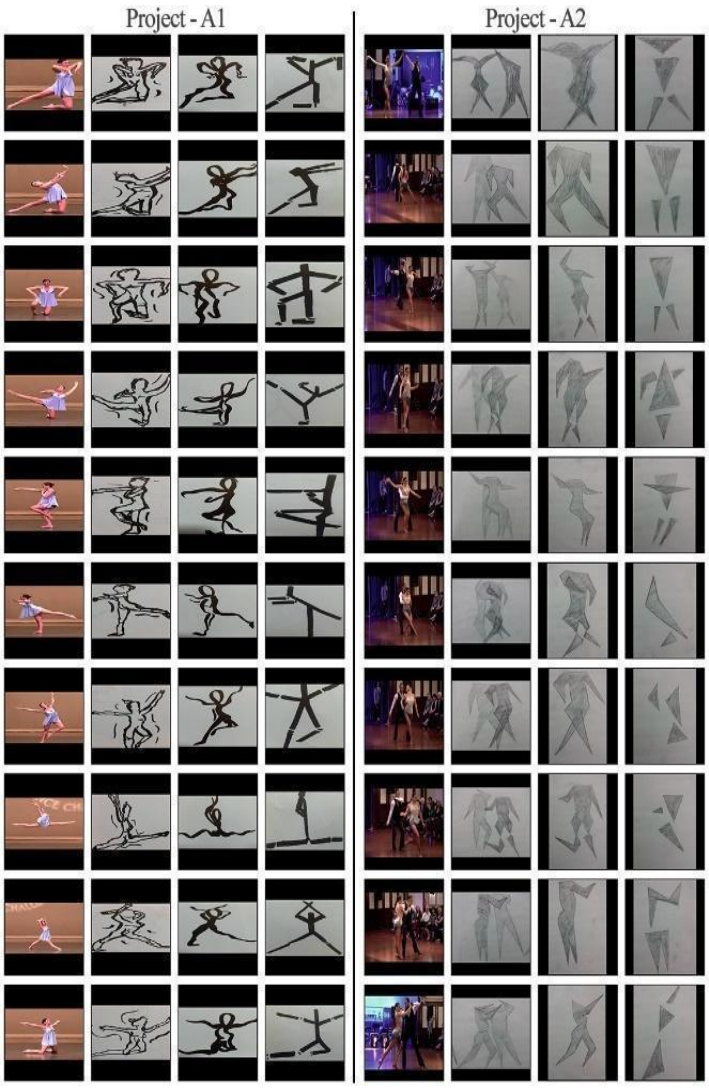


Figure 7. Abstract drawings of Study 1

Through first and second abstraction, drawings were refined gradually to find out the essence of body structure. Finally, they should achieve a unit for each scene at the end of the third abstraction. This provides the exploration of units. Each unit has served to develop a module. These modules should be created via the duplication method. It should be noted that students were blind to the instructor's expectation for the final design. We have concealed the aim of the study to avoid the restriction of their free-thinking process. In the second stage of Study 1, students were asked to model a structure on the scale of 1:10. This structure might be a canopy, a tower or an igloo. First, one of the alternative modules should be selected. Then, the selected module should be duplicated to model one of the required structures. Only wood is allowed as a material of the model. Figure 8 is shown in the selected sample of models.

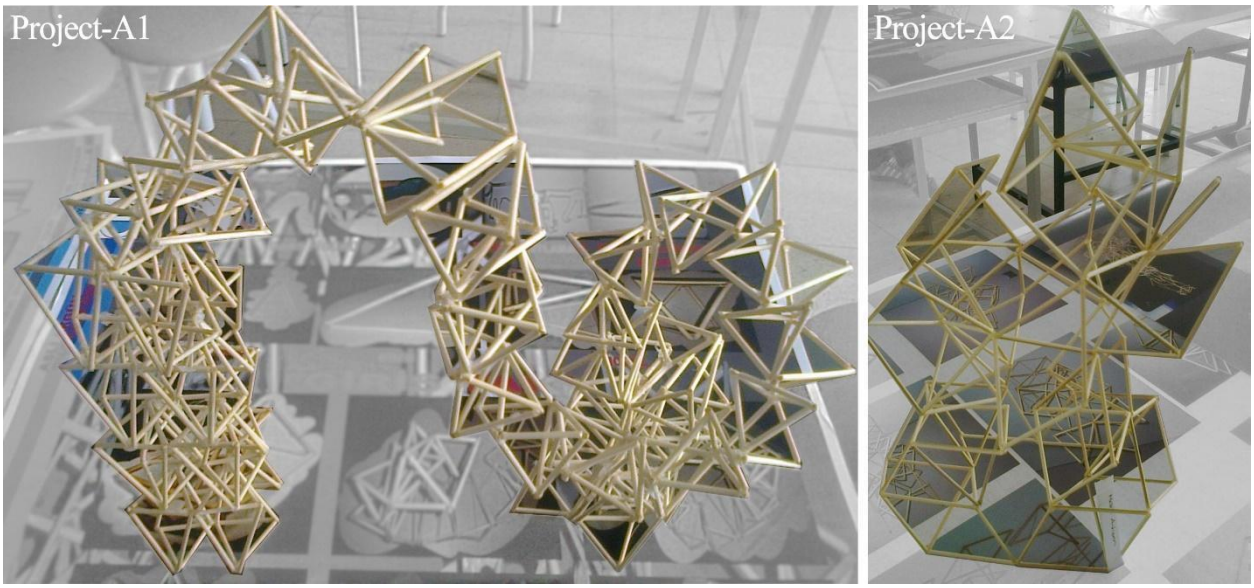


Figure 8. Final models of Study 1

Problem definition and procedure of Study 2 had many differences comparing with Study 1. In the first stage of Study 2, there were footages of dance figures which is taken by the long exposure method in the design task. This provides to see multiple positions of the dancer in a scene to perceive the potential volumes created by the body movements. In addition, there were some images regarding the expected outcome. Students had to organise their own performance and record it, rather than selecting a ready performance video. The duration of the video should be five or ten seconds. The camera should be standing in a landscape position. They should record it around the architecture department by placing obstructions in the frame. Any action was allowed for the performance, such as running, jumping, falling and so forth. After that, students needed to pause the recorded video twenty times and draw each scene on the same page as a superposed composition. This drawing activity carried out in two phases. In the first phase, they have just drawn a realistic presentation of figures. In the second phase, we directed them to abstract the scenes while sketching by reducing the body details. Figure 9 is shown in the selected sample of drawings.

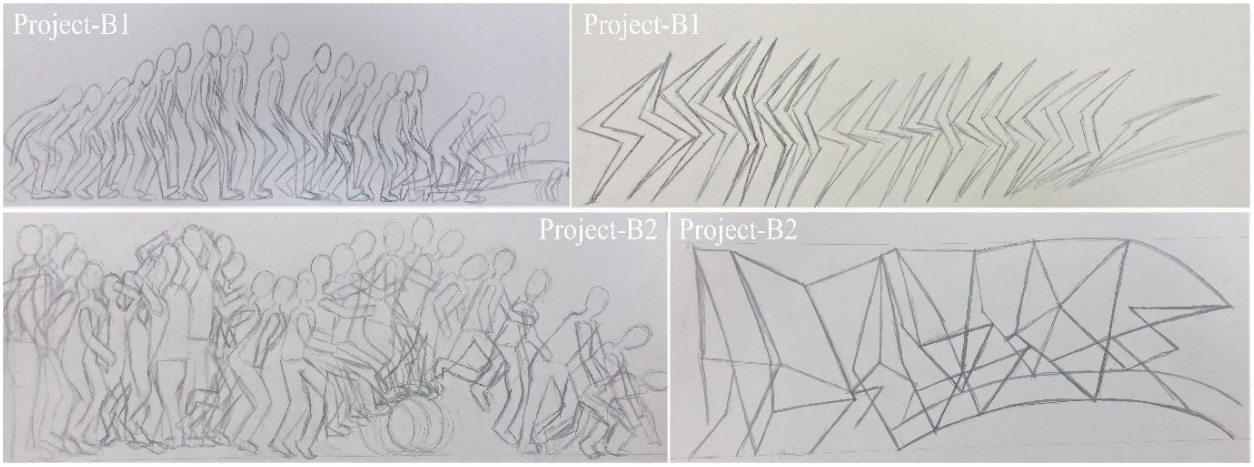


Figure 9. Superposed compositions of Study 2

The scale of the sketch was 1:10. In the second stage of Study 2, they were required to build a model from their superposed sketches. There were two options for the material of the model: wood and metal. Figure 10 is shown in the selected sample of models (Project-B3 is added for just a comparison of material impact).

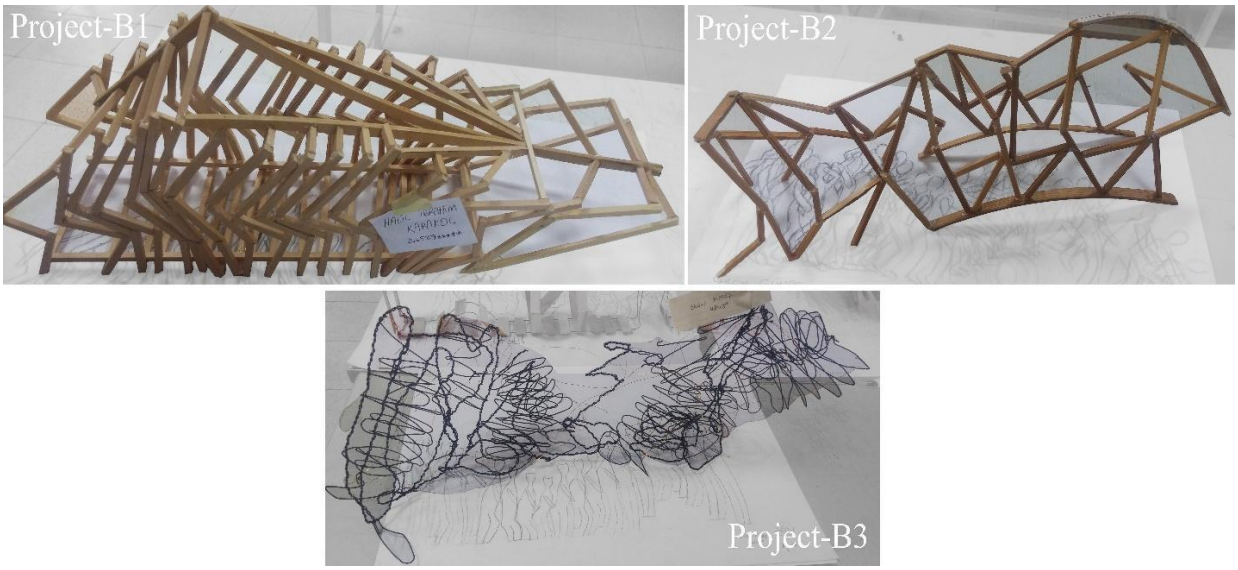


Figure 10. Final models of Study 2

5. DISCUSSION

The reflections of students depending on the distinction of the design process need to be examined to grasp the influence of different abstraction studies. We discussed two models, which consider body abstraction as a design method, within the parameters determined in Table 2.

Table 2. Distinctions of Two Abstraction Models

	STUDY 1 (2015 Spring)	**STUDY 2 (2019 Spring)**
Given Example	None	Included
Source of the Video	Selecting from Existing Videos	Recording by Themselves
Type of Movement	Dance	Running, Jumping, Lying Down, Bump
Number of the Selected-Used Scenes	10-1	20-20
Mode of Sketching	Independent Figures	Superposed Figures (All in One)
The Method for Production	Duplicative	Consecutive
Requested Outcome	Architectural Space	Abstract Model
Scale of Study	Unscaled, Except 1/10 Final Design	1/10 For All
The Material of Models	Wood	Wood and Metal
Critique of the Video	None	Just Technical Aspects

Given Example - While most of the outcomes of Study 2 (as seen projects B1, B2) were similar and did not differ from the images given in the design task, different volumes were formed in the outcomes of Study 1 (as seen projects A1, A2). In this case, the following questions arise: If the images of consecutive bodies were not included in the design task of Study 2, would the students imagine the twenty movements they have abstracted as a consecutive form? Figure 11 shows that given images are likely to restrict the perception of students.

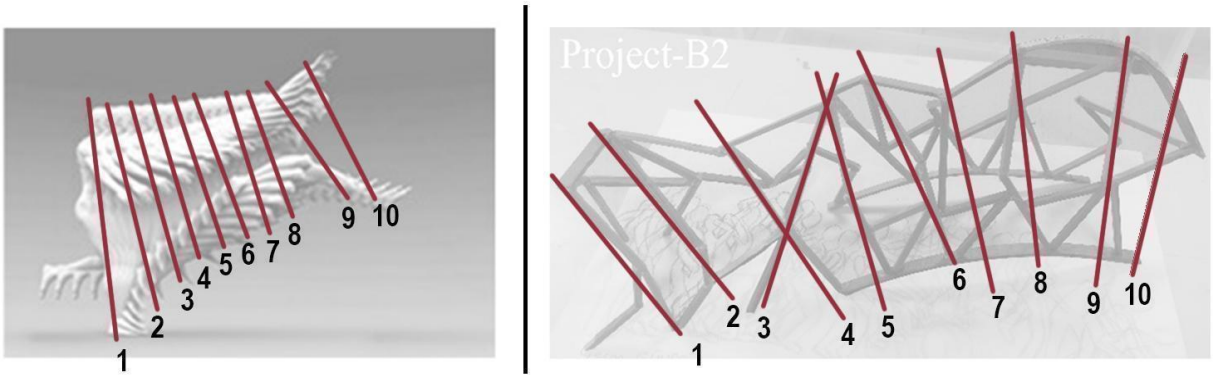
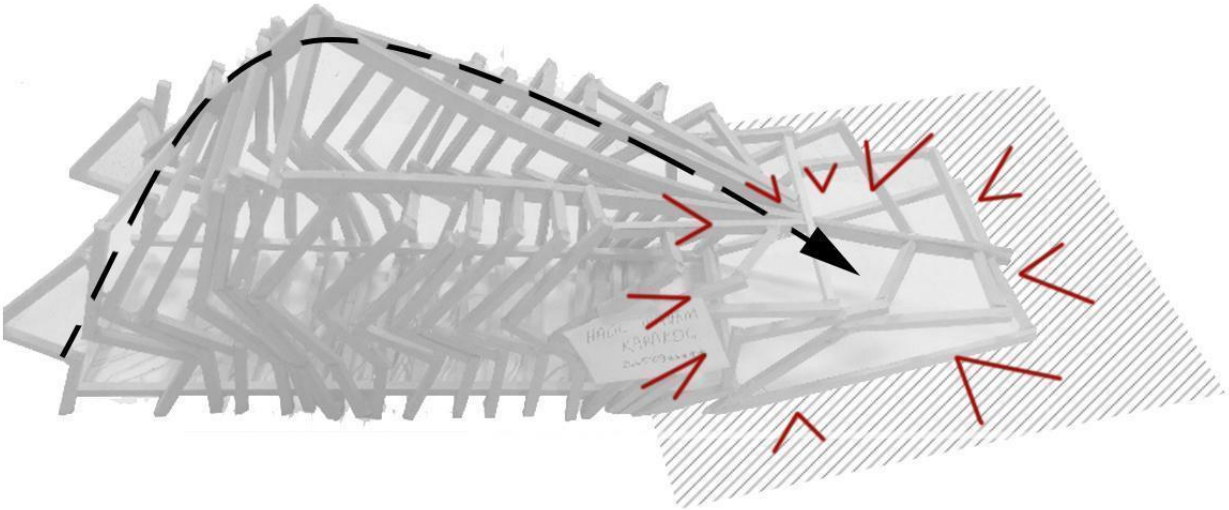


Figure 11. The similarity of given examples and design outcomes

Source of the Video - In Study 1, there was only a visual experience. However, the perception of other senses on volume has an important role as well. The designers watched the dance video in front of the screen without corporeal motion. Therefore, they cannot experience "tension" and "relaxation" moments corresponding to the emerging forms from a dancer's performance. This causes the volume created by the body to be perceived only as graphical forms. Nonetheless, since volumetric alterations can be sensed with designers' own body in Study 2, other senses' influence on the relationship between the body and space can be realised. For instance, the tension caused by the moment of falling down in model B1 (see, Figure 12) can be read from the convergence of horizontal parts at a point.



Figures 12. Falling down effect and tension of the bodily experience

Type of Movement - In Study 2, students tried to achieve dynamic movements by using joints. Nevertheless, the proposed actions are defined by limited joint movements compare with professional dancers. In Study 1, dancers could move many joints simultaneously, and more potential volumes could be created in space. In this respect, it is possible to draw the following conclusion: Although students observe the volumes that the body can produce in Study 2, they experienced this situation individually and with limited joint movements. Hence, students ignore many potential movements in every action it offers. Most of the designs focused on the abstraction of the human body's instantaneous images rather than understanding the potential volumes (see, Figure 13).

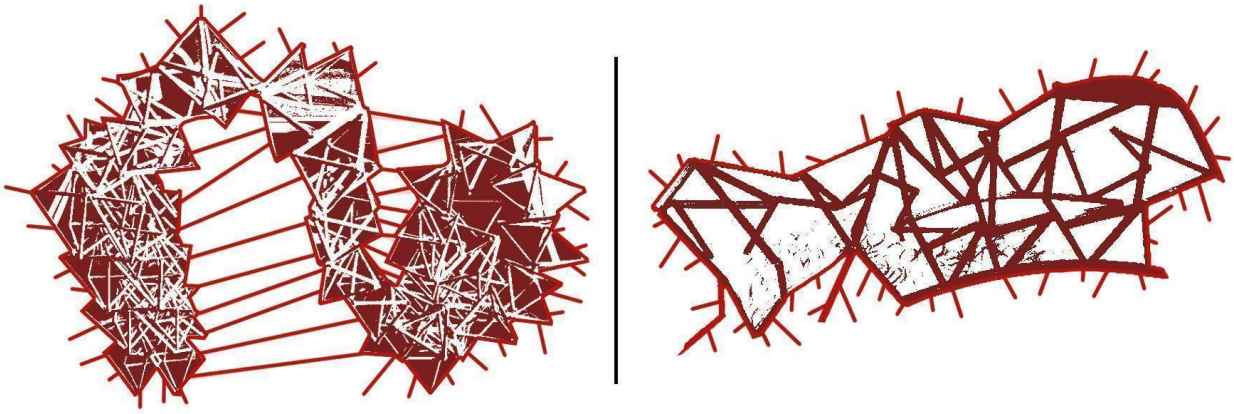


Figure 13. Potential volumes of design outcomes

The Number of the Selected – Used Scenes - Although ten scenes were selected in Study 1, a single module is required to be selected among the ten modules produced from these scenes in the following stages. From this point of view, other productions remain only an exercise and having more scenes and modules increase the possibility of exercising in just more various forms. The use of only one module prevents the student from a challenge to combine the various forms produced. In a nutshell, although students understand each movement very well independently, they may not be able to understand the relationship between the movements. It may be a better way to produce combinations from units and modules instead of selecting a single unit.

In Study 2, all selected movements were used. However, expecting the production of the model within certain dimensions constrain the students. Because of the frequently used scene, students may not be able to perceive the flow of movement in a holistic way, although they perceive the relationship between movements. Since when each selected scene is modelled, there is no opportunity for the student to design regardless of the limitation of scenes. For instance, if only the beginning and the end of the movement are known, the student may be able to construct the connections of the movement uniquely. Also, suppose students choose some of the units (in contrast to Study 1) without considering the order of the scenes (in contrast to Study 2). In that case, they can freely build it up and use different potentials to combine the units together (see, Figure 14).

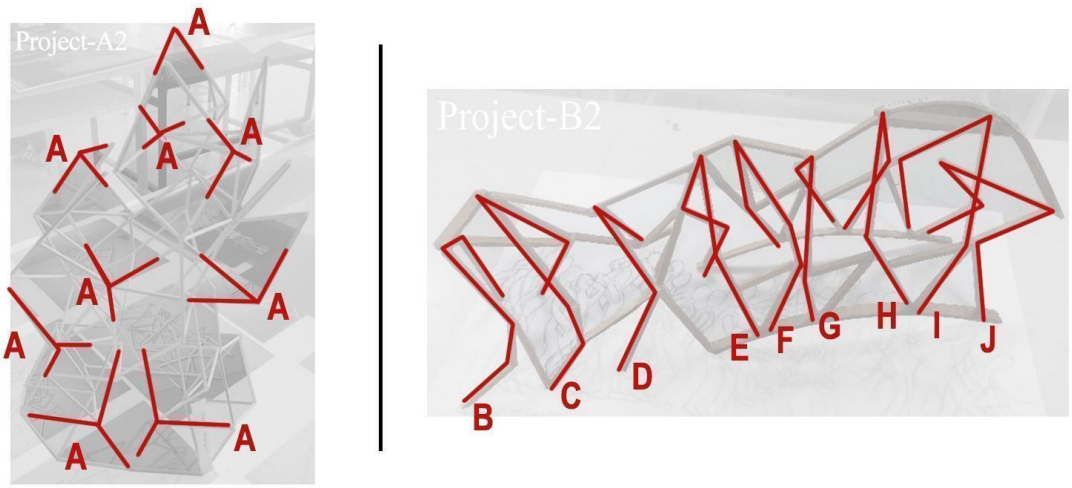


Figure 14: Free combination of the same unit and restricted combination of different units

Mode of Sketching - While the selected scenes are drawn and abstracted separately in Study 1, all scenes are superposed in a single drawing in Study 2. The superposing technique may help analyse the volumes dynamically scanned by movements, similar to producing long exposure images. In other words, this method provides to see multiple positions of the dancer in a scene to perceive the potential volumes created by dance. Nevertheless, combining the whole movements into a single drawing restricts the students with a defined volume perception and prevents them from discovering potential volumes. Thus, selecting separated scenes as in Study 1 and superposing exercises by combining earlier and later scenes can encourage understanding the volumes defined by the body. "Separated superposed drawings" can also avoid restriction of a single total volume.

The Method for Production – In Study 2, as a result of the consecutive forms obtained by the abstraction of movements, the design outcomes mostly defined a linear form and a volume in a direction (see, Figure 15). When the duplication method is used as in Study 1, a growing volume is developed on all axes. These volumes vary depending on the unique approach of each student. In this respect, it is possible to draw the following conclusion: Organization of movements in a consecutive way led students to make space which is created just by the repetition of the body. It causes the prevention of perceiving flexible volumes.

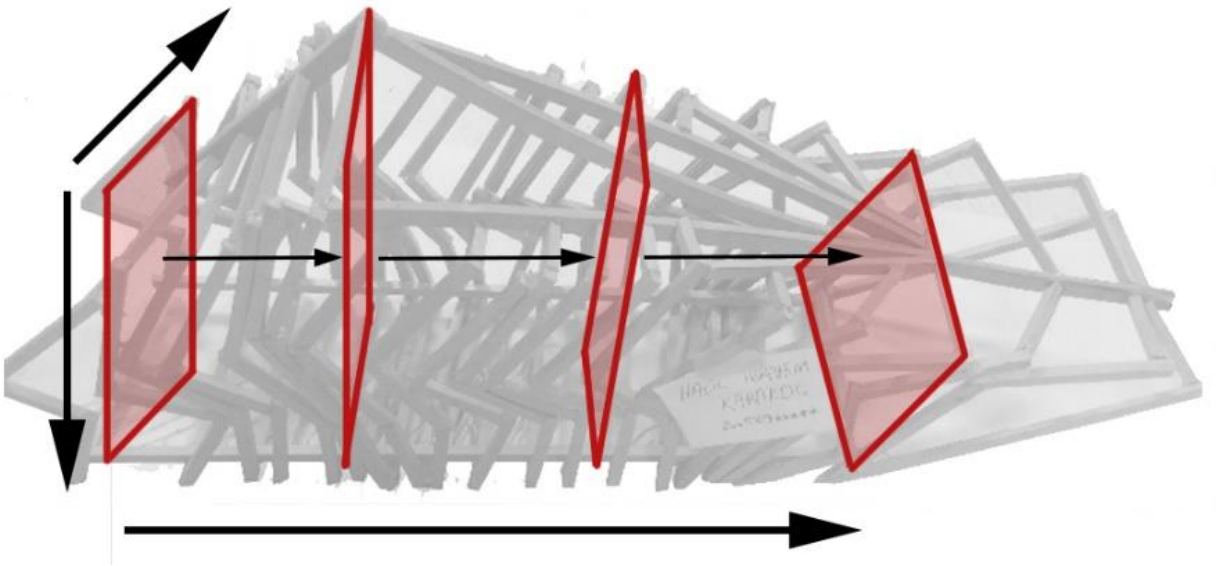


Figure 15. Confined dimensions of the model

Requested Outcome - When the design problem expects producing the architectural space as in Study 1, the designer's perception of volume is not limited to just the shape of the body. Thus, students can develop alternative volumes arising from the structure and a volume produced by the body. It integrates corporeal perception with spatial concerns and prevents the creation of volume just defined by the body. On the contrary, the models of Study 2 are not related to the environment as an architectural space.

The Scale of the Study - The movements of the body become insignificant while forming the volume when the study is conducted without a determined scale. Moreover, the units produced are moved away from the perception of the body and transformed into pure construction elements. If students work by considering the scale in each phase, they can follow how the body produces a unit throughout the process. The body becomes out of concern after the unit is produced, as in model A2 (see, Figure 8). In Study 2, since there is a determined scale throughout the process (1:10), the scale of the body is the concern of students in all stages. Hence, they were not confused by many scales without purpose.

The Material of Models - Unlike Study 1, two material options were available for models in Study 2. The abstracted models made with wood in Study 2 were better-organised structures than metal. Metal allows the production of more fluid volumes because of its flexibility. However, we observed that students tend to lose control in the structural sense while working with metal, such as in model B3 (see, Figure 10). In both studies, the students were directed to choose one of the materials. Nevertheless, two materials have different advantages (e.g. wood: rigidity, metal: fluidity). The composite use of the two materials may allow both to define a structure and to reflect the ambiguity of movements.

Critique of the Video - While there was no discussion about videos in Study 1, only technical issues were discussed in Study 2. The students' critical thinking skills, especially about abstraction and movements, could be improved if discussions were made on the following issues: dynamic feelings resulted from videos, potentials of movements, body-movement-space relationship and so on.

6. CONCLUSION

The aim of the paper is to explore the potentiality and limitations of the body-abstraction process by comparing the impact of two different educational models on the cognisance of the students and their progress. The distinctions between the two studies were analysed depending on various parameters. General implications and propositions of the paper as follows:

- Design outcomes were similar to given examples when students were exposed to the organisation of the bodies from the image. This finding suggests avoiding to show examples regarding the abstraction study.

- When the designers experienced movements by their own bodies, they were aware of volumetric alterations. In body-abstraction studies, the body should have an active role in understanding its spatial capabilities rather than analysing recorded body footage.

- Limited types of movements directed students to focus on only the body rather than space which could have been explored with the body. Therefore, students should go beyond the limitations of movement types.

- Using only one scene for modelling caused the loss of potential of other scenes. Nevertheless, using all scenes limited the student's mind with the order of scenes. Thus, they need to feel free regarding the amount of scenes they wish to use.

- Separation of drawings, instead of superposition, can encourage understanding the volumes which are defined by each body.

- Expecting architectural space rather than unspecified structures as a final design integrates corporeal perception with spatial concerns.

- While metal allows the production of more fluid volumes because of its flexibility, it tends to lose structural sense. Models with wood have defined more stable structures due to their rigidity. Hence, wood is likely to be suitable to keep the structural comprehension of students.

In a nutshell, this paper contributes the existing literature from dance (as an awareness of bodily presence) to abstracted images and modellings (as a concrete representation of abstractions) with these regards. All in all, this paper may provide a guideline to possible future research to understand diverse techniques revealing key elements of the body-abstraction process. A new model can be the reconfiguration of parameters used in this

paper with a new perspective. As a limitation of this research, feedback on the sketches and models in different stages wasn't recorded and analysed. Thus, further research should investigate the possible impact of feedback in the process. In this sense, body abstraction practices as a fundamental part of design education need to be clarified to build new educational models.

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Notes
Figure 5, 6, 11, 12, 13, 14, 15 are visualised by the authors.

REFERENCES
Binder, T., Löwgren, J. & Malmborg, L. (Eds.). (2008). *(Re)Searching the Digital Bauhaus*. Springer Publishing Company.
Boucharenc, C. G. (2006). Research on Basic Design Education: An International Survey. *International Journal of Technology and Design Education*, 16, 1-30.
Bulat, S., Bulat, M. and Aydın, B. (2014). Bauhause Tasarım Okulu. *Atatürk Üniversitesi Sosyal Bilimler Enstitüsü Dergisi*, 18(1), 105-120.
Collins Dictionary. (n.d.), Abstraction. In *Collinsdictionary.com dictionary*. Retrieved November, 27, 2020, from https://www.collinsdictionary.com/dictionary/english/abstraction
Cregan, K. (2006). *The sociology of the body: Mapping the abstraction of embodiment*. Sage Publications.
Cross, A. (1983). The educational background to the Bauhaus. *Design studies*, 4(1), 43-52.
Dearstyne, H. & Spaeth, D. (Ed.) (1986). *Inside the Bauhaus*. Architectural Press.
Dervişoğlu, E. (2008). *Mekân ve Beden İlişkisi: Mekânın "Bedenle Kavrayış" Üzerinden Değerlendirilmesi* [Unpublished master thesis]. Istanbul Technical University.
Droste, M. (2002). *Bauhaus 1919-1933*. Taschen.
Ehn, P. (1998). Manifesto for a digital bauhaus. *Digital creativity*, 9(4), 207-217.
Erkenez, S. and Ciravoğlu, A. (2020). Güncel Beden Kuramlarının Mekanı Dönüştürme Olasılıkları. Megaron Journal, 15(3), 399-411.
Ersoy, Z. (2011). 'Building Dancing': Dance within the Context of Architectural Design Pedagogy. International Journal of Art & Design Education, 30(1), 123-132.
Forsythe, W. (2011). Choreographic objects. In S. Spier (Ed.), *William Forsythe and the Practice of Choreography: It Starts from Any Point* (pp. 90-92). London and New York: Routledge.
Frampton, K. (2001). *Studies in Tectonic Culture: The Poetics of Construction in Nineteenth and Twentieth-Century Architecture*. Phaidon Press.
Funkenstein, S. L. (2007). Engendering Abstraction: Wassily Kandinsky, Gret Palucca, and "Dance Curves". *Modernism/modernity*, 14(3), 389-406.
Gencosmanoglu, A. B. and Nezor, S. (2010). Criticising architectural education through abstraction. *Procedia Social and Behavioral Sciences*, 9, 1335-1341.
Godfrey-Smith, P. (2009). Abstractions, Idealisations, and Evolutionary Biology. In A. Barberousse, M. Morange & T. Pradeu (Eds.), *Mapping the future of biology: Evolving concepts and theories*, (pp. 47-55). Springer.
Grosz, E. (2001). *Architecture from the Outside*. MIT Press.
Hançerlioğlu, O. (2000). *Felsefe Ansiklopedisi: Kavramlar ve Akımlar* (Vol. 5). Remzi Kitabevi.
Huang, E. R-P. (2001). *Body in Space: The Sensual Experience of Architecture and Dance* [Unpublished master thesis]. Massachusetts Institute of Technology.
Huxley, M. (2017). The Dance of the Future: Wassily Kandinsky's Vision 1908-1928. *Dance Chronicle*, 40(3), 259-286.

Jones, M. R. (2005). Idealisation and abstraction: A framework. In M. R. Jones and N. Cartwright (Eds.), *Idealisation XII: Correcting the model Idealisation and abstraction in the sciences* (pp. 173-217). Poznañ Studies in the Philosophy of the Sciences and the Humanities (Vol. 86). Rodopi.

Kandinsky, W. (1926). Tanzkurven: Zu den Tänzen der Palucca. *Das Kunstblatt*, 10(3), 117-121.

Laban, R. (1966). *Choreutics*. Macdonald & Evans.

Levy, A. (2018). Idealisation and abstraction: Refining the distinction. *Synthese*, 1-18.

Locke, J. & Woolhouse, R. S. (ed.) (2004). *An essay concerning human understanding*. Penguin books.

Merleau-Ponty, M. (2005). *Phenomenology of Perception*. Routledge.

Morris, D. (1997). *The Sense of Space: An Essay on Spatial Perception and Embodiment in the Spirit of Merleau-Ponty's Phenomenology of Perception* [Unpublished doctoral dissertation]. University of Toronto.

Online Etymology Dictionary. (n.d.), Abstraction. In *etymonline.com dictionary*. (2020), Retrieved November, 27, 2020, from https://www.etymonline.com/word/abstraction#etymonline_v_39979

Pallasmaa, J. (2012). *The eyes of the skin: Architecture and the senses*. Wiley.

Russell, L. (1930). Science and Abstraction. *Journal of Philosophical Studies*, 5(17), 84-93.

Sarıoğlu Erdoğdu, G. P. (2016). Temel Tasarım Eğitimi: Bir Ders Planı Örneği. *Planlama Dergisi*, 26(1), 7-19.

Schiller, G. (2008). From the kinesphere to the Kinesfield: Three choreographic interactive artworks. *Leonardo*, 41(5), 431-437.

Schlemmer, O. (1987). Man and Art Figure. In W. Gropius & A. S. Wensinger (Eds.), *The Theater of the Bauhaus* (pp. 17-48). Wesleyan University Press.

Siegmund, G. (2011). Of monsters and puppets: William Forsythe's work after the 'Robert Scott Complex'. In S. Spier (Ed.), *William Forsythe and the Practice of Choreography: It Starts from Any Point* (pp. 20-37). London and New York: Routledge.

Spier, S. (2011). Choreographic thinking and amateur bodies. In S. Spier (Ed.), *William Forsythe and the Practice of Choreography: It Starts from Any Point* (pp. 139-150). London and New York: Routledge.

Spuybroek, L. (2008). *The Architecture of Continuity*. V2 Publishing.

Sutil, N. S. (2014). Mathematics in Motion: a Comparative Analysis of the Stage Works of Schlemmer and Kandinsky at the Bauhaus. *Dance Research*, 32(1), 23-42.

Tschumi, B. (1994). *Architecture and Disjunction*. MIT Press.