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AIM

The aim of the Journal of Design Studio is bringing different design studio researchers together on a multidisciplinary design studio research platform. This design studio research platform gives the researchers who made experimental studies in their design studio education to share their works with the other researchers in the same area or similar research fields. The scope of the Journal of Design Studios include all research and experimental works realized in all type of design studios.

SCOPE

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Editorial

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Editorial

The first issue of the Journal of Design Studio's fifth volume's is currently accessible. The Journal of Design Studio celebrated its fifth anniversary with this issue. This issue has one book review and nine research articles. Starting with this issue, Turnitin similarity control has been applied for all journal articles.

"Variants of Design Studio: A Phenomenographic Research on Students' Conceptions of Design Studio Environment" by Önen Günöz and Belkıs Uluoğlu is the first article in this issue. The conventional design studio environment is being challenged by an expanding number of nontraditional studio training methods. Each instructor chooses a strategy based on their attitude toward design and architecture as well as their perspective on education, and to some extent, they reflect their perspective in the design of their studio course. This is due to the instructor's essential role in the design studio. The findings explained in the article shed light on how studio conditions are felt from the viewpoint of the learner.

The second essay, by Ayorinde S. Oluayemi, is titled "An Exploration of Conceptual Prototype of an Artistic Handcraft Wallet (AHW) Design." An artistic handcraft wallet (AHW) design is being explored as a conceptual prototype as part of a studio practice research that involves both virtual and physical prototyping. Findings also show that the process and final product/finishing/design output of virtual and real physical prototyping are different at the satisfactory level. It is also noted that translating CAD virtual prototypes into actual tangible physical things presents difficulties. It is also understood that the right atmosphere for learning is required for the right psychology to start creating good ideas.

Derin İnan, Başak Uçar and Onur Yüncü are the authors of the third research article which is entitled as "Alternative Scale(ing) Practices in Architectural Design Studio". There is a chance that an attempt to expand the definition of scale(ing) to include a variety of reference units and their scalar articulations will spark new associations in architectural design studios. The paper discusses potential readings of these various scale(ing) conditions with regard to a number of design tasks carried out at architectural design studios. The fundamental goal is to challenge these direct comparisons to the reference unit when determining size and proportion, and subsequently potential scales of architectural space. The goal of this particular way of analysis is to reach various scale(ing) circumstances, whose internal reference system is questioned by the alterations and modifications to the major reference unit's definition.

The article which is entitled "Interview with Chat GPT to Define Architectural Design Studio Work: Possibilities, Conflicts and Limits" written by Ekrem Bahadır Çalışkan. According to the study's goal, a case study interview with Chat GPT is planned and carried out to define and examine potential problems and useful information for third-year architectural design studio work. In order to highlight the opportunities, challenges, and stakeholder role limitations of artificial intelligence, recordings are given along with an evaluation survey using the Delphi technique among experts.

Sudipti Biswas was the authors of the article which was focused on anthropometric considerations on designing the wet spaces. The title of this article is "Design Studio Insights: Anthropometric

Considerations for Ergonomic Design of Wet Services”. In order to teach ergonomic considerations in a design studio setting, this article describes an anthropometric research. It shows an anthropometric dataset that was created during the studio exercise for designing bathrooms and kitchens. Due to the dearth of anthropometric information relevant for architecture in Bangladesh, academic and professional architects in Bangladesh consult several reference standards to include ergonomics into design.

The research article was written by Tatyana Kusumo and Apriani Kurnia Sarashayu and is titled "Plasticity Imaginaries as Sustainable Design Pedagogy". This essay's discussion of design class methodology is based on student reflections from the class "Architecture and Waste: Plastic by UMN." The goal of the course became how the sustainable approach could influence students' actual daily actions. By splitting the class into two equal sessions of theory and practice, the technique creates loops in the design process by using a practice-based paradigm. The outcome demonstrates that emphasizing the process and connecting what is being done in the class and workshop to real-world situations can have a positive influence on students' perspectives on sustainability.

The authors of the study "Evaluation of Distance Education and Formal Education on Architectural Design Studio Practices and Student Perception with Comparative Analysis: Antalya Bilim University" are Serpil Fatma Ertürk and Setenay Uçar. With student-centered assessments, the project seeks to lay the groundwork for a future architectural education system. Through the use of student comments and course evaluation questionnaires, the research compares and contrasts the effects of traditional education and distance learning on architectural studio practices.

Rahman Tafahomi was the authors of the article which was focused on Hegel’s philosophy and thoughts in architectural studio. The title of this article is “Tracing Hegel’s Philosophy and Thoughts in Educational Styles of Architecture Design Studios”. In this study, two research foundations are compared using content analysis and narrative based on organized observation. Results show four connections between Hegelian philosophy and design studio activities in architecture, including precedent studies and historical dialectic, learning by doing and self-consciousness, crits (critiques) and idealism, and master-apprentice and master-slave conceptions, respectively. The results show that Hegel's philosophy has an impact on studios that operate based on traditions, disciplines, and styles to regenerate activities in architecture design studios. Consequently, while Hegelian concepts permeated the works of successor philosophers in the fields of phenomenology, hermeneutics, existentialism, Marxism, and structuralism, instruction in architecture design studios has persisted without the resurgence of ideas.

The article which was written by Buket Metin is entitled as “Multilayered and Interacting Course Design Approach in Architecture Education: A Case of Building and Construction Technology Courses and Studios”. The main idea of the paper based on the opinion “building construction and technology is a vital part of architecture education since it gives understanding of the instruments and processes used in designing and constructing buildings”. On the other hand, multidimensional and interconnected relationships within the domains of architecture education might not be adequately reflected in educational curricula, or there might be issues with implementation. The educational quality and outcomes are strongly impacted by creating the architectural education curriculum based on these interdependent linkages.

“Dreaming for Sivas: Selections from Architectural Studios, 2014–2021 (Sivas için Düşlemek: Mimari Stüdyo Seçkileri 2014–2021)”, edited by Uğur Tuztaş and Pınar Koç, published by YEM Publication: 2021, is the book review that finishes this issue.

Variants of Design Studio: A Phenomenographic Research on Students' Conceptions of Design Studio Environment

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Abstract: Especially in the last two decades, there has been a call for change in design studio education. Today, a growing body of unconventional studio teaching approaches is challenging the traditional design studio setting. Given the central role of the instructor in the design studio, each instructor adopts an approach according to their disposition on design and architecture, as well as to their view on education, and to some extent, they reflect their view in the design of their studio course. This also enables students to explore different approaches to design and architecture while exposing them to different pedagogical positions. This scenario, viewed from the students' perspectives, raises two intriguing questions concerning studio education and the range of studio environments: (1) What is the range of studio teaching approaches embodied in design studios? (2) In what dimensions do they differ regarding students' learning experiences? This paper is a phenomenographic research aiming to map the range of current studio environments from a pedagogical standpoint through students' conceptions. For this purpose, we interviewed ten graduates from three architectural schools about their studio experiences. Through a phenomenographic analysis, we elicited four qualitatively different conceptions of studio environments. Further cross-category analysis revealed that the conceptions varied in several dimensional themes. The results provide insight from the student's perspective on how studio environments are experienced. This information may contribute to our understanding of the studio environment, its underlying pedagogy, and how students experience learning.

Keywords: Architectural design studio education, Design studio pedagogy, Design studio experience, Student perspective, Phenomenography.

1. Introduction

Teaching design is not a simple task, nor is there a given approach to how to teach design or design pedagogy, but rather a perpetual search and continuous readjustment. Especially in the last two decades, among scholars of architectural design education, there has been a rising state of restlessness about the future of

the design studio and a call for change. The question of 'in what direction is the change needed' gets various replies from design education practitioners within design education literature, but perhaps more importantly, within their studio practice. Design studio today is –as it has always been– also heavily dependent on the instructor's decisions. It is primarily the

instructor who creates the studio environment. Each instructor adopts an approach according to their disposition on design and architecture, as well as to their view on education. To some extent, they reflect their view in the design of their studio course. In this sense, the studio environment and its underlying pedagogy are bound together.

Today, in many architectural schools, each student is generally exposed to a different instructor almost every semester. They find themselves in different studio settings, engage with diverse design philosophies, and experience alternative design methods, but also a different pedagogic approach altogether. This scenario, viewed from the students' perspectives, raises two intriguing questions concerning studio learning experiences and the range of studio environments with an emphasis on their underlying pedagogy: (1) What is the range of studio teaching approaches embodied in design studios? (2) In what dimensions do they differ in terms of students' learning experiences?

This paper reports phenomenographic research aiming to examine architectural design studio education through students' conceptions of different studio environments. For this purpose, we interviewed ten graduates from three architecture schools in Turkey. Our ulterior motive, however, is to examine the pedagogical structure of the design studio from the students' perspective addressing its key dimensions, such as power relations, epistemic beliefs, and delivery system. The contribution of this study is considered in two ways. First, it will inform us about the topography of current studio teaching practices and approaches. Secondly, this information may provide a better understanding of the studio environment, its underlying pedagogy, and how students experience learning.

2. Background of the Study

2.1. Studio Practices Today: A Multi-polarized Field

Since the early 70s, different design methodologies have been adapted to architectural design education. Each adopted

methodology entailed a distinct set of rules that govern the design process and studio practices as they provide "legitimacy to a set of techniques and tools for design activities in the design studio or the learning setting" (Salama, 2017, p.119). For decades, until the late 90s, these studio models were a major impact on studio instruction. Even though different studio models have been practiced in architectural design studios for more than half a century, the pedagogic domain of design education was relatively in a "homogeneous 'naturalized' form" (Webster, 2008, p.64), which relied on the long-established tacit assumptions on studio education such as "knowledge and application are learned separately... studio assumes the mastery of the design instructor... the student has to believe in the power of design instructor... the studio is ruled by the unquestioned authority of the instructor and the critic... the current studio culture rewards students with the 'best looking' projects" (Salama, 2017, pp.75-79).

Especially in the last two decades, however, there has been a shift within the studio approaches towards practical ends and action-oriented tendencies. These action-oriented, 'hands-on' approaches constitute a new trend within studio teaching practices. Within this trend, many novel approaches became valid, including exploiting cross-domain tools and techniques, exploring emerging representational possibilities, utilizing virtual technologies, integrating informal design activities, incorporating interdisciplinary learning, and encouraging participation and collaboration in studio organization. Even the most common and *traditional* studio activities, such as juries, can be performed in a *non-traditional* fashion (Brindley et al., 2000). At one end, juries can be held in a most formal way where jurors sit in the front row, students in the back, and the presenter stands in front of their project, and as the jury comments on each work publicly, each student 'defends' their project. At the other end, in an informal setting where all students stand beside their presentation posters and models, a larger group of jurors visit students individually or in small groups to give feedback, or the student calls them from whom

they want feedback. The setup alters the learning environment (especially in the affective and emotional domain) and, thus, the learning experience.

While these emerging studio practices are a result of a shift in our design paradigm –from a positivist, simplistic, linear, fragmented, and object-oriented view to a situated, more complex, non-linear, holistic, and process-oriented view– a similar shift has occurred in our view on teaching and learning, which we believe, is also foremost influential on contemporary studio education. Today, an educator’s responsibility is not described as ‘passing their knowledge to students, but rather as *creating a learning environment* that facilitates learning (Seidel & Shavelson, 2007). In this sense, each studio instructor is organizing their studio as a learning environment not only according to their design approach but also their view on teaching and learning.

While these new and emerging approaches constitute a significant amount of studio practice, the traditional setting of the studio holds to exist, preserving its norms, which are based on the master-apprentice mode of teaching, with little or no change (Webster, 2008; Goldschmidt et al., 2010; Salama, 2017). Current design studio models exhibit extreme poles of studio approaches in many aspects of design education, not only in the means of studio content and design process but also in their pedagogic approach. Simultaneously looking at these poles will give us a more accurate picture of design education today and provide a more solid and truthful ground to investigate the pedagogy of the design studio.

2.2. Research on Studio Education

It is widely acknowledged that there needs to be more research on architectural education and design studio teaching practices, and given the complexity of the studio setting, there is much for exploration. Since the 1980s, a substantial body of literature on studio education has subjected the instructor as the main exponent in the design studio and the crits (desk-crits and juries) as the primary form of communication

and assessment focusing on different aspects of communication. Most of the research in this field is instructor-oriented, meaning they focus on what the instructors are doing to understand ‘how things work’ in the studio. In other words, they investigate ‘the parallels of shared practice’. A large number of topics have been objected to investigation: studio style and format (e.g., Webster, 2008; Wang, 2010; Salama, 2017); teaching strategies (e.g., Quayle, 1985); formal reviews (e.g., Anthony, 1991/2012; Brindley et al., 2000; Webster, 2007); knowledge communication in desc-crits (e.g., Uluoğlu, 2000; Goldschmidt, 2002; Goldschmidt et al., 2010), instructor's roles (e.g., Quayle, 1985; Dinham, 1987; Attoe & Mugerauer, 1991; Goldschmidt, 2002; Webster, 2004), and examples of 'good practice' (e.g., Attoe & Mugerauer, 1991; Cho, 2009; McLaughlan & Chatterjee, 2020).

In recent decades, a current line of investigation adopts a more hands-on approach and focuses on ‘the peculiarities of individual practice’. These experience-based studies centralize studio activities and offer critical analyses based on experiencing specific design tasks or a studio setting in a particular context. The importance of these studies is that they can be catalysts for re-thinking studio education and pedagogy as they are trialing new studio practices with a wide spectrum of pedagogical orientations and tendencies. In this sense, some key issues and practices that gain traction can be categorized as: adopting new models of teaching and learning (e.g., constructivist learning: Kandemir & Uçar, 2011; dialogic learning: Hou & Kang, 2006; blended learning; Yurtsever & Polatoğlu, 2018); focusing on different modes of thinking skills fostering design thinking such as critical thinking (e.g., Bose et al., 2006), creative thinking (e.g., Gordon, 2018), and parametric thinking (e.g., Cenani & Aksoy, 2020); integrating group work and collaboration within (e.g., Hill, 2016) and across studios (e.g., Qureshi, 2019) and with other disciplines (e.g., Kim et al., 2015); adopting non-design activities (e.g., play as a model for design: Farivarsadri & Alsaç, 2006), methods (e.g., storytelling: Khalili, 2023), and mediums (e.g., poetry: Liddicoat, 2017;

cinema: Cairns, 2012) for designing; and altering studio organization by incorporating informal studies (e.g., Almaç, 2018; Turgut & Cantürk, 2015).

Beyond the pivotal role of the instructor, the significance of the juries and desk-crits, and the centrality of the design tasks and their context, there is still a lot more going on in the design studio. Immanent aspects or ‘the unseens of practice’, such as hidden agendas, emotions, and social and power relations, are largely ignored by researchers. In this regard, Dutton's (1987) adoption of the notion of *hidden curriculum* from educational studies and the study by Austerlitz et al. (2002) are significant additions to architectural education literature as they expand the examination of studio pedagogy by bringing into focus questions concerning the ideology of knowledge and the discipline, orientation of education, and power relations and social practices which shape the experiences of students and teachers. There is little research focusing on the unseen aspects of the studio; however, their implications can be seen in other studies by Schön (1985, 1987), Dinham (1987), Anthony (1991/2012), Koch et al. (2002), and Webster (2007) among many others.

The unseen parts of the studio practice, as implicit assumptions and unmeasured structures connecting components of education, have an overall effect on the educational environment operating at the unconscious levels of learning.

2.3. Pedagogic Dimensions of the Studio Environment

Pedagogy, in design literature, is a term that is often misused in narrowing its extent to refer to the techniques and strategies deployed in teaching or the very act of teaching itself. In that sense, the pedagogy of the design studio remains, to a large extent, under-theorized. Most of the literature on studio education describes its pedagogy either about Schön's (1983, 1985, 1987) notion of reflective practice and associated cognitive mechanisms (namely *knowing-in-action*, *reflection-in-action*, and *reflection-on-action*) or about contemporary instructional theories (such as

learning-by-doing, problem-based instruction, experiential learning) without further examination of their philosophical stance on learning. This issue has also drawn the attention of a few educational researchers.

De la Harpe and Peterson (2008) analyzed 119 art, design, and architectural journal publications over the recent decade. Most architectural articles are about ‘studio reform’, followed by ‘instruction approaches’. In none of the publications in architecture, academics arguing for a ‘studio education reform’ use learning and teaching theory from educational sciences to position or explain their perspective on studio education, and their “underpinning theory appeared intuitive and coincidental, with ideas not yet crystallized or coherently synthesized into a whole” (de la Harpe & Peterson, 2008, p.143).

Pedagogy is the study of both how to teach and why to teach. Therefore, it affects both; how a teacher sees the act of teaching and why teaching (and learning) and education are important in society (Sandri, 2002). According to Trigwell, Prosser, and Waterhouse (1999), pedagogy encompasses an educator's construction, philosophy, and beliefs about their practice. It is an educator's worldview or ‘lens’ that shapes the way they see their practice, the function of education, and the methods and goals of learning. Individual values of academics influence the content, instructional strategies, and pedagogy used in practice (Olafson & Shaw, 2006). Pedagogy is better understood as a theoretical framework to outline the act of teaching underpinned with a learning theory encapsulating philosophical, political, cultural, social, cognitive, and affective aspects.

Different frameworks have been developed to examine the pedagogy-in-use (Seidel & Shavelson, 2007; Weimer, 2013). Although they have different orientations, they highlight social, ontological, and epistemic levels of pedagogy in learning environments. For the objectives of this study, as a framework to investigate the design studio as a learning environment, we consolidate the dimensions of

the pedagogic structure into three broad areas – *power relations*, *epistemic assumptions*, and *theories on learning*– (Figure 1) allowing them to expand through students’ conceptions and focus on their attributes.

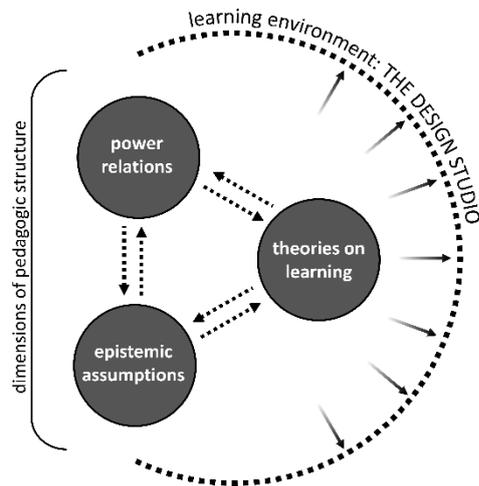


Figure 1: Framework of the study: Pedagogic dimensions of the studio environment

Power relations (authority):

Power relations mainly encompass issues with authority. Given the central role of the instructor in the design studio, authority is one of the central concerns of studio pedagogy. Educational literature distinguishes two sorts of authority: being *an authority* and being *in authority* (Winch & Gingell, 2008). To be *an authority* is to have knowledge and expertise that can be relied upon, which is also a necessary condition for education. Being *in authority*, on the other hand, is to have the entitlement to have one’s wishes acceded to. Recently, there has been rising opposition to the latter, arguing that authoritative instruction entails indoctrination by presenting the material as unquestionably true and uncontroversial, undermining students’ autonomy. Hence the role of teachers should be changed to non-authoritarian models, such as facilitators (Winch & Gingell, 2008).

In the same vein, instructors’ position regarding their authority has been investigated by Quayle (1985), Dinham (1987), Attoe and Mugerauer (1991), and Goldschmidt (2002), showing that instructors adopt different profiles in different

situations. Different situations can refer to different stages of design, the diverse needs of individual students, or a preference for personal style. Each researcher has elicited a set of profiles according to the instructors’ approach. Even though the profile sets vary, each set forms a continuum from the instructor acting as an ‘expert/master’ to acting as a ‘coach/facilitator’; in other words, from authoritarian to less-authoritarian roles.

Epistemic assumptions:

Epistemic beliefs relate to implicit assumptions individuals hold regarding the nature of knowledge and the process of knowing. According to Hofer (2000), epistemological beliefs operate on four mutually independent and polarized dimensions: *certainty* (fixed, static – evolving, dynamic); *simplicity* (compartmentalized – contextual); *sources* (transmission from external authority – construction through interaction); and *justification* (through an expert source – inquired evaluation). Despite its intrapersonal virtue, epistemic beliefs are also social and disciplinary constructs (Olafson & Shaw, 2006). On a disciplinary level, they constitute a shared set of explicit and implicit assumptions that collectively elucidate one’s dispositions on and attitudes toward the acquisition, structure, representation, development, and application of knowledge. Thus, to an extent, epistemic beliefs translate into one’s pedagogical orientations (Olafson & Shaw, 2006).

In architectural design studio education, disciplinary epistemic dispositions have implications on many related issues as controversies on foci and objectives of teaching practices involving different bodies of knowledge, skills, and cultures: defining architecture as a *discipline* of design vs. *professional practice* of designing; *artistic* vs. *socio-cultural* perspectives; *skill-based* vs. *knowledge-based* studio practices; *real-world* vs. *hypothetical* design situations; presenting *bodies of facts and theories* vs. *methods of exploration* (Teymur, 1992; Koch et al., 2002; Wang, 2010; Salama, 2017).

Theories on learning (and teaching):

Learning theories develop hypotheses that describe what learning is and how its processes take place; thus, there is a conceptual connection between learning and the act of teaching. In terms of defining our educational practice, there are three threshold learning theories: behaviorism, cognitivism, and constructivism. These theories are often discussed in opposition regarding how they define learning processes, as they present a shift from a receptive-accrual view of learning to a cognitive-situated view (Whitcomb, 2003).

The Behaviorist view characterizes learning in terms of skill acquisition through knowledge transmission. It relies on mimetic activities, such as explanation and demonstration by the teacher, followed by student practice and continual feedback that reinforces learning, and thus has a product-focused orientation (Shunk, 2009; Wilson & Myers, 2000). Conversely, the constructivist view defines learning in terms of meaning construction through effective participation in practices of inquiry and discourse, including exertions of skills, and thus has a process-focused orientation (Shunk, 2009).

Given the complexity of design learning, it is only natural to assume that different situations will call for different approaches –tools, models, methods, etc. (Wilson & Myers, 2000); hence, both types of activities, skill-based and inquiry-based, are necessary. However, it is the dominance of the activities that shape the studio environment. As mimetic activities lay at the core of traditional studio teaching and learning models, behaviorist principles operate almost by default, for they are explicitly or implicitly introduced by the instructor or adopted by students. During the flow of the studio, methods of conditional endorsement kick in, sometimes due to their ease and convenience or due to personal limitations related to communication.

Also, the main concern about the mimetic model is that it entails a more simplistic view of learning and eases surface learning strategies (Marton & Säljö, 1976), such as mimicking the instructor's demonstration without reflecting

upon it or blindly following the instructor's critiques without considering how they want to develop (Oh et al., 2013). The success of the design is limited to the language and the frames of reference of the instructor (Koch et al., 2002). It should be noted that these three dimensions do not operate independently but consistently. Just as an authoritarian position implies the dominance of the instructor's epistemic view and congruous delivery methods, certain delivery methods and epistemic positions require or deny certain authority levels. In other words, these three dimensions align as they consolidate into a whole as a learning environment in a studio setting.

3. Methodology of the Study

The focus of this paper now turns to key pedagogical features of different studio environments in architectural education. It will proceed with an outline of the methodology used.

Phenomenography

For the pursuits of the study and the nature of the research questions, it was crucial to adopt an approach that grants an understanding from an insider's perspective, those who experience it. On that account, this study adopts a phenomenographic approach to investigate conceptions of diverse design studio teaching approaches embedded in the various studio environments. As a research method, phenomenography has been suggested "for the study of the different understandings or conceptions of phenomena in the world" (Marton & Booth, 1997, p. 136). Thus, phenomenography focuses on people's varying conceptions of a given phenomenon and not on the phenomenon itself.

The central concern of phenomenography is to make sense of how people handle situations or phenomena by understanding and describing how they experience them. This approach rests on a primary assumption that individuals vary in how they experience, understand, and conceptualize reality in the surrounding world in a "limited number of qualitatively different ways" (Marton & Booth, 1997, p.112). In phenomenography, the qualitatively different

ways are known as the ‘variation’ of experience. The main interest of phenomenographic research is to surface the range of these variations in a qualitatively relational perspective as a collective experience of phenomena rather than focusing on individual experiences (Bowden, 2000). Hence phenomenography search for qualitatively different but logically interconnected conceptions; the focus of the research has been on key aspects of the collective experience of variation, as opposed to the richness of singular descriptions of individual experience. Put another way, the general goal of phenomenographic research is to develop and reveal the qualitatively different ways in which something is experienced and to describe the inter-relations between these variations.

Data collection and analysis

For this study, we interviewed ten graduates from three different architectural schools in Turkey. Interviews were conducted with participants whose graduation dates did not exceed ten years. We approached graduates as ‘former students’ and not as professionals. Concordantly, the focus of the interview questions was on their studio experiences as students and not how their design education relates to their practice. Of the ten participants, five were from Istanbul Technical University, three from Mimar Sinan Fine Arts University, and two were from Yıldız Technical University. In the results section, we will refer to the participants by numbers to maintain their anonymity. Also, this study aims to investigate the range of studio approaches and environments from an insider’s perspective (those who experienced it as students), not across institutions. To prevent any conjectures on the educational status of these respected institutions, any indicators that might associate participants or categories of descriptions with institutions were also redacted from the extracts and replaced with appropriate phrasing in box brackets.

The data collection was carried out via semi-structured, in-depth interviews conducted by the first author. Each interview lasted between 59-123 minutes, totaling 648 minutes. During

the interviews, participants shared their experiences as students from a total of 63 architectural design studio courses in varying depths and details, which provided sufficient data for phenomenographic analysis. The domains of inquiry were the divergent studio experiences and features of those studio environments that shape these experiences.

Each interview started with preliminary questions on their design education background, which helped them quickly browse through and reflect on their past studio experiences. Next, the participants were asked to classify their studio courses freely according to their chosen criteria. This question was asked purposefully prior to mentioning any keywords or concepts related to the aim of the study. Therefore, it is assumed that the answers to this question are highly related to participants’ conceptions of how they have conceived the studio environment they have been exposed to. The following questions were structured depending on participants’ classifications of exposed studio settings and aimed to get a more detailed description of each category with concrete examples.

The analysis of the transcripts requires several readings. The initial phase of the analysis is *familiarization*. Here, individual descriptions were loosely grouped regarding the responses to the first question. For each transcript, *condensed versions* of preliminary statements were constructed, prioritizing completeness and representativeness. Condensed descriptions were pooled and *compared* to identify the distinct characteristics of each studio experience and grouped into *draft categories*. This grouping was performed repeatedly to ensure no overlapping across groups, which resulted in four empirically based *final categories*. Final categories have been derived from collective data; therefore, no category derives from a single transcript. In the results section that follows, participant quotes are used to offer an illustration of each category. Finally, the categories were objected to a meta-analysis to identify cross-category themes to elaborate the framework giving rise to possible

dimensional characteristics of studio experiences.

4. Conceptions of the Design Studio Environment

In this study, participants appeared to conceptualize the design studio environment in four qualitatively different ways: *A: Studio as an instructor-centric environment*, *B: Studio as a dialogic & discursive environment*, *C: Studio as an environment of inquiry & discovery*, and *D: Studio as a cooperated environment*. The descriptions below show what makes the categories of conception different. The focus is on pedagogic aspects that differentiate the studio as a learning environment. Later, we articulate the internal relations between these variations. The categories are defined with a name and then presented with excerpts. Index codes in parentheses following the excerpts represent each participant.

We will continue with detailed descriptions of variants of studio environments:

A: Studio as an instructor-centric environment

The main character of this conception of the studio environment is that it evolves around the instructor and their administration; thus, the descriptions mostly pivot on the instructor's approaches and attitudes. The instructor is both *in* and *an* authority. While as *an* authority, the instructor holds the necessary knowledge and skill sets. This is also appreciated and admired by the students:

“[*The instructor*] approached rather from a technical point and provided all the necessary data... That appealed to me. His comprehensive knowledge and the way he introduced and communicated with them made me feel like, ‘right, with technical competence and detailing, this job can be truly accomplished’. He provided that.” (P09)

Being *in* authority, however, becomes problematic as it puts them in an arbiter position making their approach uncontroversial, and, to that extent, is also illustrated by the students

with disapproval. Still, except in a few cases, these two attributes go hand-in-hand and result in a “felt hierarchy” (P07) between the student and the instructor. However, being in authority reveals itself most apparently during routine-crits as indoctrination or, as described, as “pushing the student towards an end” (P08).

The nature of studio critiquing is unidirectional, adopting a transmission model of learning and mainly involving the instructor simulating and drawing the right way of handling the current situation by “correcting the work with their red pen” (P06).

“You wait nervously for your turn as you will soon present your study to the instructor, and he will tell you okay or not okay, accept it, or strike it out... [*The instructor*] had solid opinions like ‘you need to do it this way; why are you pushing this; you need to put this over there; this needs to be like that’ and such.” (P04)

The impression by the student is, however, passivity: “giving you no space, where you remain in a doer position” (P09). The routine-crits are held one-on-one, individually with each student, or as a group with others remaining as audiences. Peer critiquing is not likely, if at all. The main scope of the crits is aimed at the immediate solution of the design problem at hand. To that end, that a student develops an authentic approach is mainly disregarded: “that your design meets the technical requirements is more important than that you are progressing with your design research, or that your design being novel” (P06).

Regarding knowledge content, the subject matter is limited to those of the profession of architecture, usually excluding the alternative discourses in the field of architecture. “[*In our school*] a building is a building. And these other things are not of relevance” (P06). Finally, in the overall studio environment, students’ active involvement is rather limited, and the studio experience is recurrently described with adjectives such as ‘uninspired’, ‘dry’, ‘boring’, and ‘depleting’.

B: Studio as a dialogic and discursive environment

The main character of this conception is the dialogic approach of the instructor. Here, the focus of the descriptions shifts to the reciprocal character of the instructor-student communication and the transformative nature of this interaction. The structure of studio critiquing is dialogic, as a two-way event. The instructor's style and attitude reflect an appreciation of the students' authenticity regarding their tendencies, interests, and conceptualizations. This accord between the parties has a motivational effect and feels 'right': "A good instructor, though, guides to look at the right things" (P03), or "I felt like we were truly speaking the same language" (P05).

The knowledge content of the studio extends to other domains exceeding professional knowledge. The cross-domain knowledge is introduced mainly by the instructor. However, sometimes when it coincides with the common interest, the instructor incorporates the concepts brought up by students into the studio context. The design instructor models their intellectual and professional versatility by introducing adaptable cross-domain concepts and strategies to help students develop their ideas and appreciate the value of these intellectual tools:

"[*The instructor*] implied that you can find your answer not only within the limits of architecture but also from other domains... and reflected that attitude within the studio... That there might be something an architect can also learn from a scientific documentary; this is what I have gained from her" (P05).

The students feel encouraged to develop their approaches and conceptions not only about the design problem at hand but also about design and architecture in general through the current design situation by "approaching the [*current design*] situation in a broad spectrum of issues" (P03). This results in two ways; the emergence of variety among design approaches in the studio and a transformative effect on student's approach:

"The project theme was an office building... And I was studying working habits and how these are changing over time. That was something outside of the professional domain, but [*the instructor*] guided me and encouraged me to look that way and think differently, which I also wanted... In that studio, I learned that as an architect, you need to look from different perspectives and work in different scales when you design" (P05).

There is less reliance on an 'expert' and confirmation was sought from more than one source; also, the ideas of peer critique and self-reliance emerge: "There were times when you take the studio assistant's critique as a reference before the instructor's, or sometimes even a peer's critique can be as influential" (P05). To that extent, the instructor "lets the students be" (P05), which in return has a motivational effect: "In a way, it was like action and reaction, and that felt right. The more you do something that produces an impulse, the more response you will get from the instructor. Accordingly, to get more response, you bring out more" (P05). Finally, the overall studio environment and experience are recurrently described with adjectives such as 'interesting', 'enlightening', 'mind-opening', and 'exciting'.

C: Studio as an environment of inquiry & discovery:

In this description, there is an explicit focus on the studio process and increased active involvement and self-reliance. The scope of the studio focuses mainly on two interrelated activities: problem-framing by questioning and meaning production by establishing connections through research: "At that semester, there was no design problem; there was a design question. You were expected to develop a problem out of it and suggest a solution" (P02).

Compared to the previous category, the content and objectives of the studio broadened. Regarding content, besides current issues such as migration and social and economic transformations, abstract or hypothetical issues, as well as extreme situations, become topics of

the studio. The focus of how students see the content is exploratory -tasks or discussion topics that go beyond the design situation at hand in order to illustrate a concept to be understood:

“There was this topic, ‘building underwater’, where classical gravitation does not work, and another force is also pushing from the bottom. It was like investigating the effects of some invisible forces or transformations. They were like social and economic transformations, and it was about how you would integrate them into your design” (P04).

The communication in the studio is multi-directional. Besides one-on-one desk crits, discussions are held collectively with the whole studio or in small groups. To foster group discussions and exploratory content, the instructor tries to arouse inquiry and curiosity by prompting provoking questions and acting as an “exciter” (P09). Besides group discussions, informal peer interaction becomes inherent in the studio flow. So that the studio becomes more of “a place for discussions rather than a workplace”. “It was an environment to discuss with people, first with the instructor, but also with peers” (P4).

As in the previous category, there is no ‘felt hierarchy’ in the studio, and the level of the instructor’s involvement is perceived similarly, as “minimal guidance” (P04) and “mild suggestions” (P09). However, here as a difference, the instructor is mainly viewed as an ‘experienced companion’ (P09) who presents possibilities to move on or a “controller” who prevents the student from “entering dangerous grounds” (P08).

Different from previous categories, the exploration of different representation tools, techniques, and mediums also becomes a subject matter, such as drawing with oil paint, collaging, modeling with different materials, digital animation, etc. The introduction of different representation methods comes with different scenarios; either the instructor expects them as studio tasks or suggests during crits as a possibility, or students themselves bring them

up. Finally, the overall studio environment and experience are mainly described in terms of non-confinement (such as ‘feeling free’ or ‘trying [*something*] freely’) and motivation (‘encouraging’, ‘enthusiasm’, and ‘excitement’).

D: Studio as a cooperated environment:

This description shares, to a large extent, the same features as the previous category. However, the main characteristic that distinguishes this category from the previous is the extent of student participation. The main character of this description is students’ active involvement as decision-makers, and its motivational effects.

Compared to the previous category, the active involvement of students extended. The studio is loosely structured, allowing students to spontaneously participate in the studio organization as decision-makers of the studio activities and process. Partaking in studio organization also has a significant motivational effect on the students, described in terms of self-actualization.

“I remember; we were manipulating the studio. We gathered and discussed, ‘[*the instructor*] wants to do this, but wouldn’t it be better if we have done that instead.’ And we pushed it; ‘let’s do this, go there or see that’ ... I did not feel like I was a student, but rather as a character, involved in creating the whole environment with other studio partners” (P09).

To that extent, experiencing design as a situation becomes an integral part of the studio process: “as a group of friends, we were shaping the studio towards the experience we want to live” (P09).

The direction of feedback is multi-directional. Regarding routine-crits, peer input becomes almost as important. Active peer input is also prompted by the instructor rather than being spontaneous, as opposed to previous categories.

“[*The instructor*] oriented us towards that end... In the studio, we were a close friend

group... We were assisting each other by our own, acting as jurors. We gathered as a collective consistently since we were few in numbers in the studio... and many of us already had the intentions for such roles” (P09).

Relations between categories: Dimensions of the studio environment

The category descriptions derived from the data provide evidence that the learning experiences in the studio environment are conceptualized in qualitatively and significantly different ways. A cross-category analysis of the descriptions reveals several dimensional themes where the differentiation is most apparent: ‘positions in the studio’ –positions regarding the balance of power between the instructor and the student, per the instructor’s role; ‘direction of feedback’ – the status of communication regarding the person or source from which the feedback (as a generalized form of knowledge communication) is originated; ‘orientation and focus of instruction’ –dispositions, tendencies, priorities, and emphasis that emerges in the process of studio instruction, (primarily but not limited to studio crits, also including broader horizon of expectations); ‘studio content and

knowledge domain’ – content and scope of the issues in the design studio included in the design process and studio crits; and ‘active agents of the studio environment’ –people who are seen to have responsibility for the creation of the studio environment, and the role of the student (Table 1).

While these dimensional characteristics define the differences across studio settings, they also affect the studio learning experience in various ways. In this sense, *positions in the studio* determine not only the roles of the instructor and the power relations but also the level of dependency during the learning processes. In the same vein, *direction of feedback* also signifies the source of knowledge and how knowledge is generated in the studio; *orientation and focus of instruction* and *studio content and knowledge domain* imply how learning is framed; and *active agents of the studio* is a reflection of the level of student's responsibility of learning. The differences in dimensional characteristics in how studio learning has been experienced can be seen in a continuum. This continuum ranges from dependence to self-reliance and autonomy, expert-sourced to self-generated and socially

Table 1: Summary of dimensional characteristics across categories

	A: Studio as an instructor-centric environment	B: Studio as a dialogic and discursive environment	C: Studio as an environment of inquiry and discovery	D: Studio as a cooperative environment
Positions in the studio	Instructor is <i>an-</i> and <i>in</i> authority; expert; felt hierarchy	Instructor as guide or mentor; authority out of respect; no felt hierarchy	Instructor as experienced companion or controller	Minimal guidance; instructor as facilitator
Direction of feedback	Unidirectional; transmission	Dialogic; response is encouraged; some peer input	Multi-directional; informal peer interaction	Multi-directional; peer crit sessions
Orientation and focus of instruction	Task-oriented; immediate solution of design problem at hand	Situating architecture in a broader scope; conceptual transformation	Understanding concepts through research and discovery; meaning production	Facilitating experience
Studio content and knowledge domain	Disciplinary knowledge and professional domain	Interdisciplinary knowledge; broader scope of academic and intellectual world (inclusive of personal interests and conceptions)	Transdisciplinary knowledge; broader scope of practice	View on learning extending to experiencing a design situation
Active agents of the studio environment	Active instructor; no student input	Mainly active instructor; emergence of student input	Active instructor and active student	Collective agency; students as decision-makers

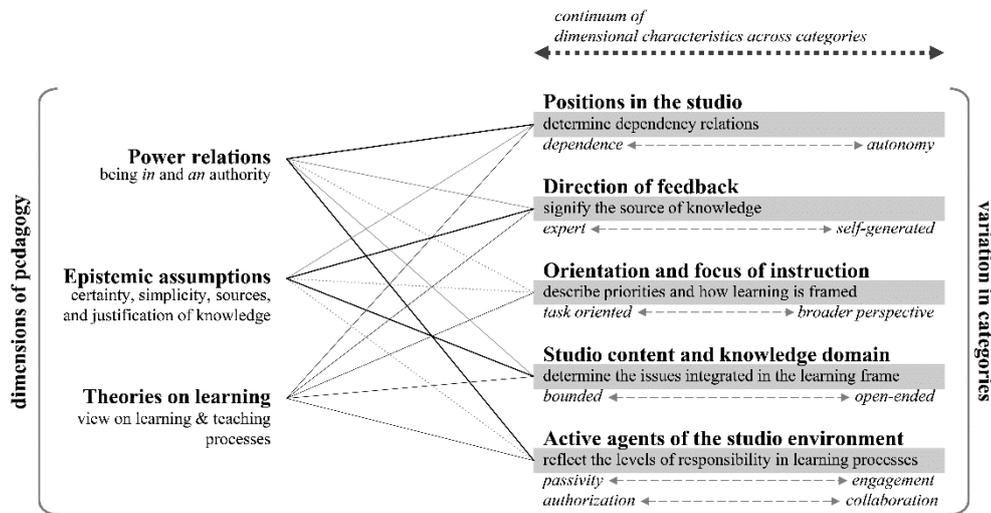


Figure 2: Relevance of framework to variation in categories

constructed, task-oriented to situated in a broader perspective, bounded to open-ended, passivity to active engagement, and authorization to collaboration. In this way, the dimensional attributes illustrate a relationship across the conceptions; this relationship is one of increasing integration, participation, and situatedness with decreasing authorization. These distinct yet inseparable features operate together in shaping the studio environment.

These characteristics are parallel to the dimensions of pedagogy as the framework of this study. However, the relevance of their components is not homogenous all around. While some pedagogic dimensions have a more direct and robust relation, some have a more subtle effect on variations of studio experiences (Figure 2). For example, regarding the level of participation, the continuum formed from authorization to collaboration or from dependence to self-reliance is bounded to the pedagogic dimension of authority more directly than the other two dimensions or, in terms of the content and context of the studio, the shift from being bounded to open-ended has a more robust relationship with epistemic beliefs as opposed to others.

Regarding the interconnection of components that shapes the studio environment, the description of category A resembles the

traditional setting of the design studio the most, as described by Webster (2008), Salama (2017), and Ward (1996), while other descriptions illustrate the directions of non-conventional models of studio teaching with different pedagogical structures. In this sense, we must note that while each cross-category dimension forms a continuum, the same is not valid for the categories themselves, implying that a category is holding an advanced or progressive position than the previous one. Just as ‘the whole being different from the sum of its parts’, these variants of studio environments do not progress towards an end, but instead, they have different orientations. In this sense, this study does not imply any appraisal regarding their educational value and contribution to the education of future architects. Instead, it draws attention to differences in their pedagogic structures.

With its emphasis on categories and not individuals, phenomenographic analysis results do not generally include quantitative data. However, it is interesting to note that category A: Studio as an instructor-centric environment, constituted most of all studio experiences described during interviews, followed by categories B: Studio as a dialogic and discursive environment, and C: Studio as an environment of inquiry & discovery, and most of the ideas for D: Studio as a cooperated environment came from one participant, with occasional

contributions from other participants' experiences. Also, regarding the distribution of the categories, it was only the descriptions of Category A which came from all participants. Meaning all participants in this study had an experience of the design studio as an instructor-centric environment. Moreover, three out of ten have only provided descriptions of this category. Which means they have experienced the studio as an instructor-centric environment only. We do not have quantitative data to further investigate the distribution of different studio environments, and such analysis is also outside the scope of this paper. However, we believe this information is significant as it illustrates the general topography of current studio teaching approaches in our schools of architecture.

5. Conclusion

The re-design of the design studio is an ongoing debate among scholars of architectural education. In this debate, pedagogic dimensions of studio education need to catch up to design-related issues within the professional domain. Given that the design studio has a distinct pedagogic structure, this gap gains more importance. Regarding this gap, we suggest studio educators engage with educational research as it will provide valuable insight to reflect on their own teaching practices. To that extent, this study provides a research-informed perspective from which the pedagogical structure of the design studio can be further explored.

By identifying students' conceptions of studio learning environments, this study takes a broader look at their underlying pedagogic structure and the way students experience architectural design learning. The results reveal a more holistic view of studio teaching practices, one that is grounded in the students' context. The findings reveal critical aspects of variation in how different studio teaching practices alter the overall studio environment and students' experience of studio learning. To that extent, it should also be noted that investigation through students' perspectives is a valuable approach to discussing studio pedagogy since student-centered research

approaches will provide further insight into what happens in the studio.

The results also reveal that the topography of current studio teaching practices relies, for the most part, on traditional norms. The challenge before us as studio educators is to make more effort to re-think and re-design the design studio education and, while doing so, to pay attention to the pedagogic implications of our practice.

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An Exploration of Conceptual Prototype of an Artistic Handcraft Wallet (AHW) Design

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Abstract: The exploration of a conceptual prototype of an Artistic Handcraft Wallet (AHW) design is a studio practice study that engages the experience of both virtual and real physical prototyping. This article is method based .i.e. it unfolds the method used in the design of AHW. It involves the use of 5H + 1H for design thinking. Simulation of AHW involves CorelDraw X5 and Adobe Photoshop CS5 for motif, surface pattern and object transformation. The real physical prototyping involves studio experiment on textile decoration to produce AHW. The significance of this exploration is to fulfil one of the objectives of Industrial Design Department, Federal University of Technology, Akure, Ondo State, Nigeria. That is, students have to develop creative, aesthetic and industrial skills needed for product design. The findings show that design thinking is important for insightful design. Art and design making like AHW can bring up analogy that are useful for social design. Moreover, the findings show that it is enjoyable to use CAD during conceptual prototyping depending on the designers' optimum proficiency in the use of CAD software application. Finding as well reveals that the satisfactory level of virtual and real physical prototyping are different in terms of process and end product/finishing/design outcome. It is also noticed that there are challenges tackling the translation of CAD virtual prototype to real tangible physical products. It is also realized that suitable learning environment is needed for the proper psyche to initiate good designs.

Keywords: Artistic Handcraft Wallet, CAD, Conceptual Prototyping, Handcraft Textile Embellishment, Self-expression, Social Design, Textile Printing Techniques.

1.0 Introduction

Artistic Handcraft Wallet (AHW) design in this study seems to be a form of 'art for art sake' because prospective consumers are not considered. That is to say, the design is not done on the basis of the taste of a particular target consumer but on an artistic basis (i.e. self-expression). However, the design outcome can also possess societal dimension either accidentally or deliberately. This can occur as a result of its relation with the society or meaning of the product. Although, it is a form of craft-art; it is still related to certain aspect of product design (i.e. the construction and making of

shape for a product according to the needs or taste of the potential consumers). This is because of the fabrication process it entails. The purpose of this fabrication process is to produce a complete, skillful and artistic invention. Based on this notion, it should be acceptable to conclude that AHW design is not 'art for art sake' because it has utilitarian purpose.

This article will describe the rationale of the design so that an observer can understand this AHW design beyond its visual appearance. According to Tinio (2013), viewers will also discover many different processes that

transpired in the creative process of an artwork if the information are provided. Tinio also mentioned that the viewers will undergo high involvement when such an observer can see the various stages that contributes to the specific methods used by the artists in turning an idea to an actual artwork. This is because knowledge about the artwork is important if a viewer want to experience the actual aesthetics of an object. According to elaborate likelihood model, a highly involved consumer will be more likely to attend to and process components of the actual message. Hence, tending towards memorability of the message and consent to the message if positively understood (Oluyemi, 2021).

According to one of the objectives of Industrial Design Department in the Federal University of Technology in Akure, students have to develop creative, aesthetic and industrial skills needed for product design. This is one of the onuses of this design. Product design is the set of elements of a product that consumers perceive and organize as a multidimensional construct comprising of aesthetics, functional, and symbolic dimensions (Homburg, Schwemmler, Kuehnl, 2015). Meanwhile, the AHW is not intended for a particular consumer because the design is positioned in self-expression craft-art. Art itself is broad in definition '*...but first and foremost it is self-expression by demonstration of one's skills, knowledge, thoughts, experiences, perceptions and emotions (Karppinen 2008). It supports the ability to creatively express an innate aspect of one's psyche (McWilliam and Dawson 2008)*'. As basis to the design of AHW, Pollanen (2011) attests that craft as self-expression can enhance the sense of personal identity. This is one of the notion of this design as the designer is a student of the department of industrial design. The designer attempts to unfold personal identity through AHW. However, if viewers understand the creative process involved, they may be influenced positively and socially by experiencing the product meaning as the artist/designer does.

1.1 Artistic Production

Artistic production is labour intensive and method based. It requires technical expertise

and skills including the money to buy materials. It also involves the psyche of the artist in terms of ability to initiate a particular project by making certain decisions that are necessary to the completion of such project. '*Evidently, a significant degree of work autonomy is a fundamental component of artistic practice; each artist not only has the freedom and flexibility to decide when and for how long she or he will work, but she or he also controls the pace, intensity and quality of creative output (Bain, 2005)*'. However, the students working in the studio are mentored by the lecturer or instructor. It is expected that they know and understand design through the instructors, design knowledge, access to information, and they are also influenced by the works of the other students (Bodur & Akbulut, 2022). One of the differences between design and artistic production includes mass production and user-oriented product design to mention a few (Bodur & Akbulut, 2022). Accordingly, this paper is about artistic production since is not conscious of a target consumer but self-expression and it focuses on the exploration of conceptual prototype of an Artistic Handcraft Wallet (AHW) design.

1.2. Craft-Art and Product Design

Craft-art seems to be limited to the elementary schools. Also, the modern civilization seems to treat craft art as an object of obscurity. This design though a form of craft-art will be positioned in the domain that is both design related as well as art related. This is a kind of product design that engages art infusion. Art infusion as introduced by Hagtvedt and Patrick (2008) is about the use of art elements in product design just as it is common to advertising and packaging. This kind of art can be abstract art .i.e. the use of elements whose meaning is only well known to the artist than to the viewers. This can enhance consumers' perceived prestige and uniqueness (Mumcu and Kimzan, 2015). To position the design of AHW within a rationale that is between art and design may seem anomaly. Perhaps, it is an area of ambiguous nature of design problem which allows richness and creative solutions (Reiter-Palmon et al., 1997). Therefore, it is possible to

define various design processes (e.g. AHW design) as unique (Yalcin, 2021).

1.3 Pocket/Wallet

The design of AHW in this exploration is not about e-wallet. Due to present technology development, e-wallet can be more popular in the e-commerce than the type of wallet this design conceptualizes. A young ICT prodigy concern for new information in the aspect of pocket/wallet can be the e-wallet. The use of wallet should not be termed archaic because a lot of people still use it as daily routines. Just like a person goes about holding his/her mobile phone so is the wallet a mobile object of design (based on the way people handle it). The mobile phone is not locomotive on its own; it is the human being that carries it along as they walk about. Likewise, wallet is mobile based on that same analogy aforementioned concerning a mobile phone. It should be welcomed that whatever may be the technological advancement in the aspect of e-wallet, its idea originates from the functionality of the historical wallet. Just as e-wallet relates with financial transaction so do the historical wallet.

Pocket may be viewed as an embodiment of memory and lives of the owner. Can we agree with the notion of this design that the things we carry about on daily basis reveal a lot about the degree/status and complexity of our lives? Some carry car keys, travel cards, credit cards, debit cards/ATM cards, handkerchiefs, tissue papers, drug or pills, house keys, office keys, ID cards, membership cards, voters card, passport, pens, diaries and to mention a few. Accordingly, the design of AHW is to create originality in such a way that another version (i.e. a copycats' version) identical to the AHW will be difficult to be achieved for the purpose of personal value and identity. Thus, AHW has symbolic function. For more personality or ownership, markings or patterns that will show prove of ownership are used. This is an aspect in which present design is positioned. There are complex or simple ways of expressing ownership in which there will be distinction void of copycat encroachment. This aspect of novelty is the position of this design concerning AHW. It is worthy of note that handcraft

engaged in the creation of a personalized pocket/wallet allows the presenting of unique and exquisite appearance that foster one's personal value. We can agree that both male and female still fancy wallet/pocket partially or totally.

1.4 Conceptual prototyping

The initial step of the design process where ideas are brainstormed, developed and expressed through the use of representations can be referred to as conceptual stage. This can help students to transform their intuitions and concepts into a graphical representation or context for the purpose of solving particular problems. Conceptual prototyping is the creation of simple, incomplete models or mockup of a design for the purpose of exploring preliminary design ideas quickly and inexpensively (Collins Dictionary, 2012). Accordingly, the exploration of the conceptual prototyping of the AHW will be in the initial form as virtual prototype. This is expected to involve the use of CAD software as well as the computer system before proceeding to the craft-art aspect of the work where a real or physical wallet will be handcrafted as end product.

1.5. The use of Computer Aided Design (CAD) in Studio Practice

Prior studies clarify that CAD reduces the production time required for completing certain task and has assisted students to process digital information faster. This aspect of information technology also makes students' ideas and creativity to be more productive (Iyendo & Alibaba, 2015). Cenani and Aksoy (2020) also attest to the fact that CAD software eases design process and improves the quality of the end product. Many studies carried out in graphic design and other design related field adopt the use of CAD. Examples includes *Appraising the Effects of Computer Aided Design (CAD) on the Creative Behaviour of Design Students in Tertiary Institutions in Nigeria: A Case Study of the Federal University of Technology Akure* (Oladumiye, Hassan, & Adelabu, 2018); *Zobo Tea Package Design Prototype Allied with Product Onomastics* (Oluyemi, Oladumiye, & Adelabu, 2021); *Innovative and sustainable toothpaste packaging design* (Malea, Tzotzis,

Manavis, & Kyratsis, 2020); *Efficiency of the Use Of Graphic Programs (AutoCAD, Compass, CorelDraw) in Higher Technical Education (Fakhritdinovna, 2021); The Conceptual Framework of Quality Product Design Based on Computer Aided Design (CAD) by Saleh, Rasul, & Affandi (2018)* and to mention a few. The fact is that there are a lot of studies on computer application among which CAD is confirmed to have enhanced students' creative behaviour and more CAD related courses are expected to be integrated into the curricula of tertiary institutions (Oladumiye et al., 2018). CAD is expected to be a tool for improving good design (Unver, 2006). This means CAD is not the initiator of the design but a tool for improving the already available concept. It is observed that the production of a sustainable product quality and innovation ecosystem is not easy (Iyendo & Alibaba, 2015). The question is why is it challenging for students to translate CAD works to physical works?

1.6 Intuition in Design Creativity

Intuition is the process of bringing out or unfolding one's self. It occurs when an individual reveal his or her self from within. Intuition may be seen as a knowledge that is self-centered in that it is based on self-explanation without external reference. However, this cannot be completely true because the frame of reference or schemata of the designer will still affect his or her intuition. The schemata of a professional designer will be quite different from that of a novice; hence, a professional designer may have a useful or relevant intuition. Such relevant intuition is said to be of a successful usage as it can help in the aspect of creative design solution, choice of knowledge, problem determination and choice of alternatives (Yalcin, 2021). *'Intuition may be associated with magic, the paranormal or the unconscious depending upon one's understanding of knowledge and reality (Yalcin, 2021)'*. Thus, the more knowledge a student acquires, the more such a student should be able to put his or her intuition into successful usage. Yalcin (2021) also declares that the combination of intuition, creativity, and rationality are relevant for the creation of

strongest potential for successful project. It is also possible to agree that intuition has both positive and negative consequences (Dane, Rockmann and Pratt, 2012). However, it is helpful in a creative design solution (Yalcin, 2021). Intuition plays an important role in the creation and development of new ideas (Yalcin, 2021).

1.7 Product Appearance and Attribute

AHW is a personalized design which is not targeting a particular consumer; however, it can still be referred to as a product because it may coincidentally grab attention of a coincident consumer who may be in love with it. Certain part of the design may grab his or her attention. The connoisseur may criticize it; however, a particular art lover may approve and like that same art work that has been criticized by the connoisseur. This means an appearance attribute in such artwork suits the identity or taste of such art lover. This is as a result of the separate compositional elements such as forms and patterns to mention a few that make up the product appearance. A product is a composition of several elements that are blended holistically to achieve a particular sensory effect. It involves the arrangement of various parts, details, colour, and form to mention a few. The combinational elements and other features of the product can give a product the appearance that can be described as appearance attribute that create overall impression of the product. Examples of such attribute according to Blijlevens, Creusen, & Schoormans (2009) includes modernity, simplicity and playfulness. For AHW, viewers may perceive playfulness in the process or outcome of this design because it is done based on intuition or self-expression.

2.0 Design Method

The method for AHW design consists of idea stage, design stage and feasibility stage. At the idea stage, concepts that support the rationale of this design are discovered. This serves as reference to the design of AHW. Observation as the process of acquiring knowledge through the use of one's sense organ is also adopted. Accordingly, pictures of wallet are obtained from Google images for observation purpose. Also other kind of wallets that can be observed

among those used by students in the studio are also observed. Secondary data are also obtained from literatures and websites. Website is included because it seems scholastic publications on this aspect are few. It is also important to note that the identification of data in this design process uses 5W+1H as follows:

(a) What? This design is about Artistic Handcraft Wallet (AHW). AHW is somehow proverbial; wallet is utilitarian but it can connote 'Secret', 'self', 'An Aspect of Ones' Life on Earth'. This is not a general knowledge but personal to the designer. 'Secret' as regards wallet means 'an enclosure for undisclosed things'. It can also mean 'an enclosure in form of *hole-and-corner*' for private or confidential things'. 'Self' as regards wallet means 'character and identity of the owner'. The 'secret' of an individual has relationship with the term 'self'. The undisclosed, private, confidential things or items enclosure in someone's wallet can reveal certain attributes about his or her character or identity. All these aforementioned analogies about wallet can be considered as 'An Aspect of Ones' Life on Earth'.

(b) Why? Students of the department of Industrial design have to develop creative, aesthetic and industrial skills needed for product design. Also, the design is based on the notion of enhancing personal identity through self-expression.

(c) Who? The designer of this AHW is the one involved as the creative artist and there is no supervision. The design is done to the satisfaction of the designer only. According to Bain (2005), artistic activities are responsibilities to be carried out to completion without supervision. Hence, there is freedom of expression. However, marks will be awarded by the evaluator i.e. the lecturer in charge.

(d) Where? The design studio is the venue where the creative artist engages in all artistic and design processes.

(e) When? After all consultations from literatures, internet and the environment, the

design process begins. It is a design that is not time bound because of its connotation. Even after, the wallet might have spoiled the connotation remains. The meaning remains even after the owner of the wallet has lost it.

(f) How? Computer Aided Design (CAD) is adopted for simulation purpose. Before, proceeding to the real object of design, the virtual prototyping will be done first. It is noted that common wallets are manufactured by using leather; this design of AHW is different in the aspect of material by using fabric instead of leather. Also, it is worthy of note that textile printing techniques and embellishment by using handcrafted techniques will be used as decoration and for meaning making purposes.

At the design stage, product structural details and other information are determined. All the information required for the design are supposed to be outlined in the AHW design brief. Design brief outlines the objective and purpose of design project. The creative process consists of the following:

2.1. Thinking process:

By thinking about AHW as 'Secret', 'Self' and 'An Aspect of Ones' Life on Earth'. It started by looking at some history related to wallet. An example is the naturally preserved body discovered on the Alpes of Italy in 1991. According to the historian, it is known as 'Otzi', the iceman'. According to archeologists, it is a mummy of 5,300 years old on which a blast made purse was discovered. This is a wallet that contains a flint dagger and a copper axe head but no money. From this short story, there is revelation of the old secret, old self, and past life of a particular person. Someone's wallet is personal just like the handset or GSM we have today. Just as people get accustomed to moving about with their mobile phone/handset/GSM. Likewise, we have people who always move about with their wallet. Just like cloth covers our nakedness, likewise do wallet keeps many secrets. This is a secret that does not wait at home inside the cupboard, shelf or wardrobe but it is made to be like mobile phone because we go out with such 'secrets'. However, many people do not use wallet because they are afraid

of their secret. They think of losing or misplacing their wallet. They want to avoid losing the wallet because if it is lost or misplaced, anyone who finds it will definitely open it. Then, the secret of the wallet's owner is known.

Accordingly, 'Secret'. 'Self' and 'An Aspect of Ones' Life on Earth' either figuratively or experiential can be related to wallet. The thinking process leads to social design as seen in Figures 1a, 1b and 1c. They are designed by using CorelDraw X5.



Figure 1a: Social design as a result of the thinking process by the use of CorelDraw X5



Figure 1b: Social design as a result of the thinking process by the use of CorelDraw X5



Figure 2: Examples of evidence of the existence of a person used as 'An aspect one's life on earth'.



Figure 1c: Social design as a result of the thinking process by the use of CorelDraw X5

Figures 1a, 1b and 1c show the kind of imagination or inspiration that occurred during the thinking process. Also, during the thinking process, objects that can be iconic for 'An Aspect of Ones' Life on Earth' are imagined. Someone's foot prints can be an 'aspects of life'. As human being we move about with our legs touching the ground. Then, in every step we make there are foot prints. These foot prints are considered as ones impact .i.e. an *aspect of one's life*. Either conspicuous or minor, we all make certain impact in life. Many a times, Ladies or women do wear high hill shoes. This punches holes in the soil. Old men, blind people and others that have walking disability do use walking stick or staff. These objects punch holes in the soil. For the purpose of this design, they are considered as icon for 'An aspect one's life on earth'.

All foot prints, the holes made by someone's shoe, the holes made by the walking stick and to mention a few are evidences that someone's has passed through a particular road or pathway (see Figure 2). It can also be related to evidence

of mobility, locomotion, existence or life. All the aforementioned can be akin to a person that is compelled to walk about with his or her wallet because of the essential things secured in it.



Figure 3: Comb as analogy for the significance of wallet to the owner

Figure 3 shows the image of a comb so as to illustrate it as another object seen as analogy to the significance of a wallet. As a comb is minor to a person who has no hair so will a wallet be to somebody who sees no need of using a wallet. In contrast to this, the comb will be very relevant to another person who has hair. This statement can also be used for a social design.

2.2. Research and Analysis:

Literatures on textile printing techniques are also used because all icons will be used as motif for pattern making on the wallet. Hence, the literature also focuses on textile printing techniques and decorative textile. Textile production can be referred to as the entire process involved in the conversion of fibres to useable fabrics. Fabric production processes can be applied in the domestic setting and the industry. These processes include weaving, knitting, crocheting, lace, embroidery, printing and textile finishing. In this design of AHW, textile printing techniques and embellishment will be used as one of handcraft techniques. Printing is the process of applying tools or machine for reproducing motif, symbols, text, images, designs or pattern on a particular surface. Fabric structure can be used for identifying a textile associated with a particular region or period (Omotoso.2006). In the case of AHW, the patterns generated as decorative fabrics reflect personal identity and values.

Comb and holes made by walking with foot, shoes or staff/walking stick are the identity of one's existence in this design (see Figures 2 and 3). These are used as motif for the printing process. Oguntona (1986) states that printing is the production of coloured pattern on textile by means other than dyeing and weaving coloured thread. There are many approaches to printing fabrics, but according to Vidyasagar (1998) all textile printing can be divided into four classes or styles; viz:

(a) **Resist Printing:** In resist printing, the fabric is first printed with a resist agent and the dyed. Resisting dye is printed on to the undyed fabric; the result can be either a white resist or a coloured resist, where a selected dye or pigment is added to resist paste and become fixed to the fibre during subsequent processing. Batik and tie-dyeing are examples of resist printing.

(b) **Discharge Printing:** This involves the removal of colour from a dyed fabric. In discharge printing a chemical is applied to the fabric in the form of a pattern. The chemical then removes the colour leaving white areas of fabric.

(c) **Direct Printing:** This involves applying of colour directly to the fabric using pigment or print paste. This can be done on white or coloured fabrics. If done on coloured fabric, it is known as overprinting. Under direct printing classification, there is block printing; it is a direct method of applying colour to textiles. It involves the use of blocks with patterns carved out of them. When printing a block print, a layer of water proof cloth is usually placed under the fabric to protect the fabric from dirt (Storey, 2008). Then a layer of cotton fabrics is stretched on top of the layer. Next, the fabric to be printed is stretched tightly across the table. A device called a 'sieve' is used to apply the colour to the block. After the block is placed on to the fabric, it then must be hit with a mallet which transfers the colour onto the fabric. Each time the block or blocks are placed on to the fabric, they must be registered to ensure the correct alignment. For each color in the design a separate block

must be used. Also, there is screen printing under block printing; a screen print is created by placing the screen face down on substrate and forcing dye paste through the open areas of the screen. The dye paste can only be applied to the substrate through the open areas of the screen. The dye paste consists of the appropriate dye for the substrate, a fixative if needed, and thickener. Hand screen printing is carried through out on a flat, solid table covered with a layer of tough felt and a washable blanket. Heat for drying the printed fabric may be provided either under the blanket or by hot air fans above the table. Fabric movement or shrinkage must be avoided during printing in order to maintain registration of the pattern. The fabric to be printed is laid on the table and stuck to the blanket directly, using either a water-soluble adhesive or semi-permanent adhesives.

(d) Embellishment in Handcraft Techniques: according to Kent (1971), there are several methods of decorating woven cloth other than dyeing and printing found among Africans. These decorative processes include stamping, painting on cloth, applique, and embroidery. Fabric painting is a very popular art form and can be used for the embellishment of printed fabrics. Freehand painting on fabric is particularly popular with artists and crafts people working with silk. Modern silk painting gained popularity in France at the start of the twentieth century. Designs using French or French inspired dyes are usually painted on white silk from Asia. However fabric painting is also popular with young crafters and artists, who use fabric paints to add freestyle designs to T-shirts. Specialists fabric paints are available that give a raised, three-dimensional finish. The term applique comes from the French, meaning "to put on." Applique techniques "apply" or attach pieces of fabric on top of or overlapping each other. Sections can be sewn together by hand, machine or even glued together. Many different types of fabric can be combined in applique, and there are many patterns available,

although many experienced crafters will make their own applique designs. Stamping can be done by using wood blocks or hard foams. The designs to be printed are inscribed using carving tools or on the foam using cutting tools or soldering iron. The numbers of colours on the design determine the number of blocks to be prepared. The other embellishment techniques is the use of embroidery; this is a method of decorating and embellishing clothing. It can be used to make attractive designs on garment, wall hanging or upholstery pieces. According to John (1967) embroidery is an art of making pattern on textiles and leather using threads of wool, linen, silk, and needle; and these designs are made of colours exhibiting intricate designs.

2.3. Rough Layout: The rough layouts for the AHW are shown in Figures 3a, 3b and 3c.



Figure 3a: AHW when closed



Figure 3b: Another view of AHW when closed showing the curve edges

This rough layout adopts the use CorelDraw as software for draughtmanship. The rectangular shape of the AHW when closed is 3.25 inches by 7.5 inches. This is to suit both sexes, either male or female. The curve edge also reflect feminine features and still matches both sexes because of flexibility and tactile reasons. However, AHW is a personal design and does

not target a particular consumer. It is designed to the satisfaction of the creative artist as it is a self-expression process. All stages of the creative process starting from idea stage to design stage and finally to feasibility stage are based on the study of forms, material (i.e. textile materials), printing techniques, pattern making, personal identity and values, layout craft art, art infusion to product design, and creating product that has connotative meaning.

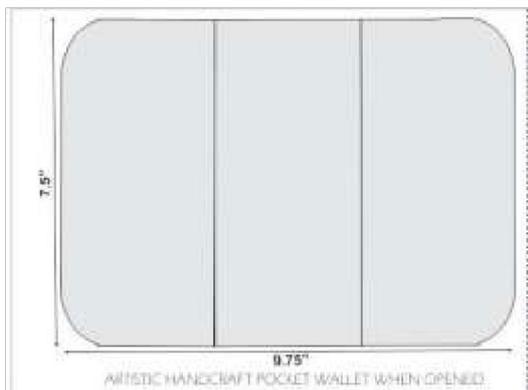


Figure 3c: AHW when opened

When the design method proceeds to the feasibility stage, the conceptual prototypes created during the design stage are actualized by using fabric materials that are embellished with handcraft techniques (i.e. the real physical prototyping that involves textile decoration by

using direct printing such as stenciling, stamping, and embellishing with paint). The printed fabric is further used to produce AHW by the cutting of the decorated materials to the form of actual AHW and the sewing process also takes place.

3.0 Result and Discussion

A.) Idea Stage

At this stage, the usefulness and usability of the AHW are considered based on affordance design.

The term affordance describes an object's utilitarian function or actionable possibilities (Javier, Fuente, Gustafson, Twomey, & Bix, 2014). The AHW have to be easy to handle/grab, open and its content have to be easy to be dispensed. Figure 4a is about affordance based design which centres on the usefulness of the object as well as its usability. The physical appearance of an object should suggest what it can be used for; if an individual finds it difficult to discover the usefulness or usability of an object via its physical appearance it becomes a false affordance. Accordingly, components of wallet that have the potential to catalyze actions in the use of the wallet are observed. The space for containment should be prominent (see Figure 4b). The use of zipper

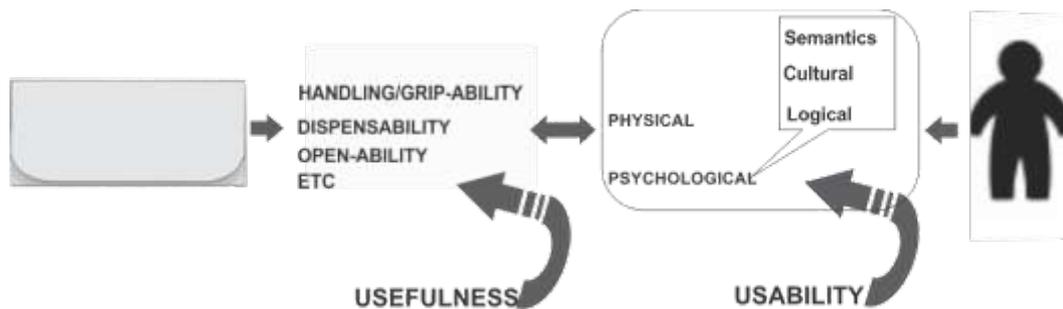


Figure 4a: Affordance based design consideration for the AHW



Figure 4b: Some of the actionable possibilities of a wallet

can suggest containment and opening. The wallet should be easy to be handled and it should be easy to put things into the spaces available for containment as seen in Figure 4b. To remove/dispense or put things into the wallet should be easy. The shape/form of the AHW is decided after other available wallets have been observed. The type of things that will be contained in the AHW determines the shape and size of the AHW. The shape/form of the AHW is decided after other available wallets have been observed. The type of things that will be contained in the AHW determines the shape and size of the AHW. ID cards, ATM cards either credit or debit card, money, business cards, small diary, and to mention a few are common things that people put in a wallet. A rectangular shape is adopted because of the likely things that will be contained in the AHW. Fabric material will be used for the AHW so as to decorate the AHW by using textile printing and embellishment techniques for pattern making.

By thinking about AHW as 'Secret'. 'Self' and 'An Aspect of Ones' Life on Earth' can be seen as the psychological aspect of the design which may be implicit to observer but experiential to the owner of the object of the design. This is the logical, semantics and cultural aspect of such an object as seen in Figure 4. This also pertains to the meaning that the user attaches or understands about the object. According to the theory of product language by Jochen Gros and Richard Fischer, product has two types of functions (Javier et al., 2014). The symbolism aspect and the usefulness/usability aspect. The use of comb, holes made by walking or by the walking stick/staff and foot prints are symbolic but not consumer-based. It is an abstract which only the creative artist is well aware of. This is because the creative process is self-expression based and not consumer based. That is the reason why the design is done in the studio without carrying out any survey, interview, questionnaires, focus group and participatory experiments.

B.) Design Stage

Now that a rectangular shape of size 7.5inches by 9.25 inches has been established for the AHW when opened. The pattern making aspect

requires motifs which are generated and adapted from holes made by walking (either with shoe or walking stick/staff), foot prints and comb (see Figure 5a, 5b and 5c).

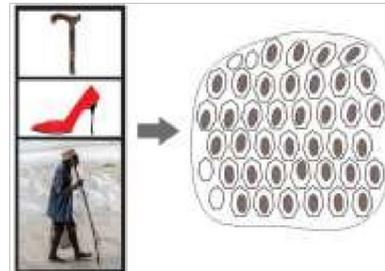


Figure 5a: Motif generated or adapted from the effect of walking with either shoe, walking stick or staff.

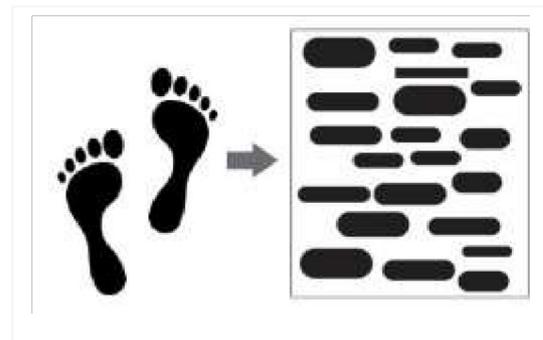


Figure 5b: Motif generated or adapted from foot print

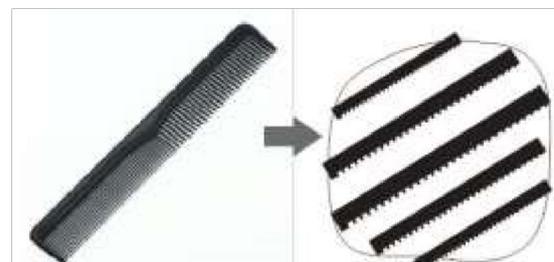


Figure 5c: Motif generated or adapted from comb.

The holes that can be seen as a result of the staff, shoes or walking stick while walking are represented with oval-like shapes in Figure 5a. Curved edge rectangles are adapted for foot

prints while one-sided serrated rectangle represents the comb in Figure 5c. CorelDraw is used for generating all these shapes. These are abstract representation, so it deviate from the real object in terms of geometry (see Figure 5b). A brick or diamond simple repeat pattern is used for the pattern making as seen in Figure 6. The motifs are repeated in a form of diagonal pathway (see Figure 6).

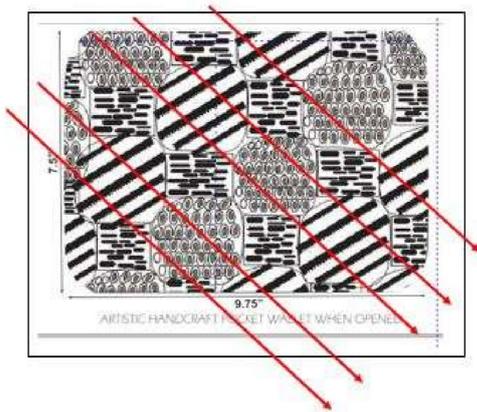


Figure 6: Brick or diamond simple repeat pattern for the AHW

Major CorelDraw tools used are the rectangle tool, ellipse tool, shape tool and intersect. The one-sided serrated rectangle representing the comb is constructed by using rectangle and intersect (see Figure 7); the curved edge rectangle is also constructed by using shape tool. It is assumed that if dyeing is involved a light colour is necessary because dark colour will destroy the initial design. The white part of

the design can still absorb and retain dye pigment; however, it is also possible to use textile ink or paste to cover the white background if well planned (see Figure 8).



Figure 8: When dyed with lighter colour or textile ink or paste covers the white background

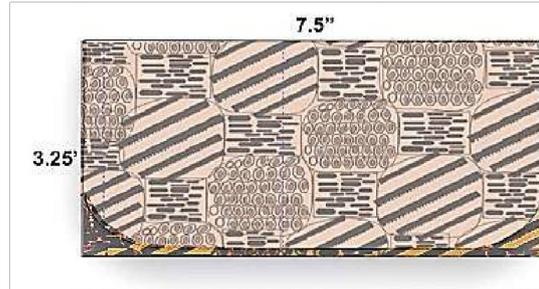


Figure 9: Decorated fabric surface on AHW when closed

Figure 9 shows decorated fabric surface on a simple view of AHW when closed. Already available wallets in the market or those used by students in the studio are also compared in the

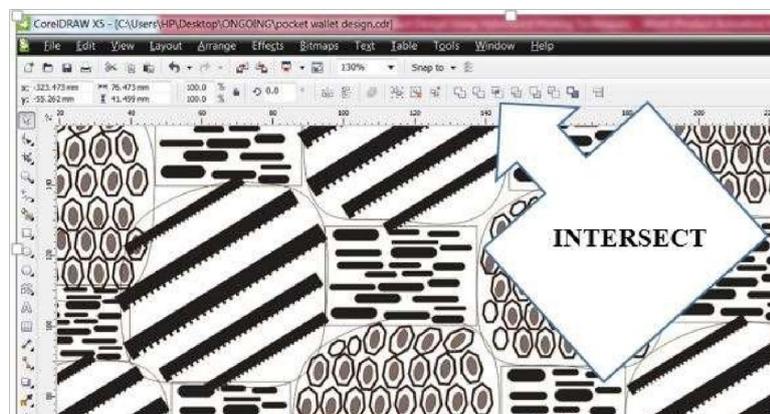


Figure 7: CorelDraw Interface showing the tools for intersect of shapes

lens of the idea / concept of this design. Accordingly, Adobe Photoshop CS5 is used by opening the files containing the design and the available wallets. Tools or properties that enables this kind of simulation include transparency, opacity, layers, warping, scaling, distorting, skewing, and rotating (see Figure 10). All these are under transformation of object of design in Adobe Photoshop editing menu. On the tool menu, eraser is also used for cleaning unwanted region of the layers. So far, computer application in this design seems to make the object of design more gorgeous, easy and somehow practicable. Instead of several sketches and trial of preliminary designs like colour rough, CorelDraw X5 and Adobe Photoshop CS5 foster the design method with rapid development. That is, the concepts/ideas and the possibility of examining available wallet in the lens of the conceptual prototype created during this exploration are carried out by only these two software. It can be noted that design works are not in isolation or independent in terms of computer application.



Figure 10: Adobe Photoshop Interface showing the tools or properties that enables this kind of simulation

That is, someone can use more than one application for a design. Depending on level of proficiency of the designer in the use of CAD, design works can be done with a single application or more than one. Meanwhile, the notion of this exploration is that designers can use compatible multiple software to achieve their objectives or aims.



Figure 11a: Prototype as a result the AHW personalized pattern experienced on already existing wallet in the market

Through virtual prototyping, the pattern created specifically for the AHW is experienced on the appearance of already existing wallet in the market (see Figure 11a). This is a form of simulation that foresee the possibility of such pattern on other objects. The motif representing effect of walking and comb are conspicuous on the wallet. It is assumed that the owner of such personalized design will not easily forget or misplace the wallet because of the personal identity, meaning and value. It is assumed that the product meaning can create a bond or attachment between the product and the owner; thereby aiding memorability (see Figure 11b). This leads to another social design as a result of the thinking process that continues to the design stage.



Figure 11b: Social design as a result of the thinking process that continues to the design stage

The pattern specifically for the AHW is used on available wallet in the market and a social design is generated as seen Figure 11b. Figure 11b is a social design because human being can be influenced by the text used in the design; especially, viewers that understand the concept or idea of the pattern in terms of the meaning that is in the mind of the creative artist which connote 'Secret', 'self', 'An Aspect Ones' Life on Earth'.



Figure 11c: Prototype of the AHW personalized pattern experienced on already existing wallet in the market

The diamond simple repeat pattern is conspicuous on the surface of the wallet as seen in Figure 11a, 11c and 11d. It is appealing, unique and valuable. CAD software like Adobe Photoshop and CorelDraw to mention a few can perfectly foster the presentation of design idea with creativity, design and fabrication characteristics (Wang, 2020). Furthermore, AHW design is planned to be artistic; thus, the already designed pattern will be further embellished so as to minimize the possibility of copycat version of the AHW. Examples of such handcraft techniques of embellishment includes stamping, painting, applique, and embroidery. Meanwhile, the stamping and painting techniques of handcraft embellishment are



Figure 12a: Drawing of motif, cutting of stencil and using the stencil for silk screen printing

further used. Bunch of broom stick with paper tape is used for the embellishment in such a way that another version identical to the AHW will be difficult to be achieved. This is to create originality, personal identity and value.



Figure 11 d: Prototype of the AHW personalized pattern experienced on already existing wallet in the market

C.) Feasibility Stage

This is the stage for actualizing the conceptual prototype by making use of physical tools, equipment, and materials. At this stage the AHW is manifested not as virtual prototype but as the original wallet that can be used in the real life daily routine. To manifest this AHW in real life the following stages are also followed; viz: the materials used for the direct printing includes binder, textile printing paste, stencil, silk screen, stencil, cutter, pen, paper, squeegee, broom sticks,(masking) paper tape, gum, and card board. Stenciling, stamping and painting methods are the decorative textile methods used.

The motif is drawn on a paper (see Figure 12a). The motif is later cut out as stencil and used for printing on fabric through the silk screen plate.



Figure 12b: Screen printing and attaching paper tape diagonally to the dry surface of the fabric

The textile paste has to be mixed with emulsion which serves as the thickener. The squeegee is used to force the paste through the silk screen and stencil (see Figure 12b). Later, the printed fabric was covered with paper tape to serve as resistant for the printing paste not to reach some part of the fabric. Diagonal pattern was used for the fabric design as diamond simple repeat pattern (see Figure 12b).

The paper tape is attached diagonally and a stamping technique is used to create a strip effect on the fabric by making use of broom sticks (see Figure 12c). This is to create originality in such a way that another version (i.e. a copycats' version) identical to the AHW will be difficult to be achieved.

A thick paste is used in order to create the impression of impasto painting on the fabric. Later, the tape is removed to reveal the new design (see Figure 12d). This is a similitude of

glazing because the effect of the stamping changes the colour scheme. Further embellishment using hand painting is also used to paint motif on the fabric.

They signify 'Value', 'Personal Identity', 'Secret', 'Self' and 'An Aspect Ones' Life on Earth' either figuratively or experientially. Just like cloth covers our nakedness, likewise do wallet keeps many secrets, so the AHW or wallet protects or secures personal identity. Bunch of broom stick with paper tape is used for the embellishment in such a way that another version identical to the AHW will be difficult to be achieved. This is to create originality.

At the end of this hand painting and stamping the appearance of the fabric changes in terms of colour scheme (i.e. the process acts as a glazing for the former layer of colours). The former



Figure 12 c: Painting with textile ink and the use of bunch of broom stick for stamping



Figure 12d: Removal of paper tape to reveal the new design



Figure 13a: Some of the materials for the sewing

chocolate or dark brown is now having an orange glazing over it.

The printed fabric was sewn with machine to form AHW. Figure 13a shows some of the materials for the sewing. Although, not all of them are used. The tape rule is important for the measurement of the dimension ascertained for AHW (see Figure 13b). The zipper selected have to be harmonious with the colour of the AHW, so the colourful ones like red, orange,

green and to mention a few are not used. The zipper with chocolate or dark brown colour is used.

The choice of colour for the thread also involve the choice of harmonious colour. To include more functional purpose to the AHW, the key holder ring is also included (see Figure 13b). The decorated fabric is cut according to the ascertained dimension of the AHW and sewing continues as seen Figure 13c. The printed fabric



Figure 13b: Some of the materials for the sewing and accessories for the AHW

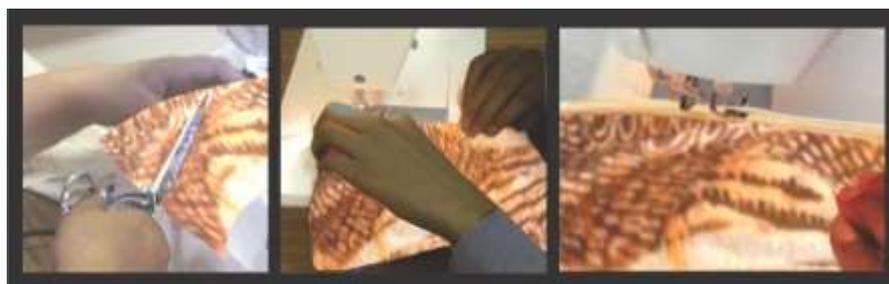


Figure 13c: Cutting of decorated fabric and sewing



Figure 14: End product of the fabric decoration and AHW

was sewn with machine to produce AHW with the use of hand crafted decorative textile (see Figure 14 and 15). The product of the feasibility stage .i.e. AHW can still be considered to be both utilitarian and aesthetic.

By conceptual prototyping through the use of CAD, the designer does not experience the actual tactile sense of the materials and the use of the physical tools or equipment for implementing the AHW. However, the experience of conceptual prototyping through the use of CAD is enjoyable, interesting and engaging. It is in agreement with the declaration of Robertson, Calder, Fung, Jones and O'Shea (1995) that young people understand and enjoy using CAD. This can be possible when the designer has the optimum proficiency in the use of CAD software application. According to prior declaration, CAD software eases design process and improves the quality of the end

products (Cenani & Aksoy, 2020). The design of AHW does not refute this truism; however, the end product of AHW seems somehow objectionable in terms of finishing compared to the conceptual prototype. Meanwhile, the aesthetic assessment of a product may be considered as highly subjective. This means everyone has individualistic view concerning the characteristic of a product and can be dependable on the extent of how much an object of design can attract prospective users.

The finding from this design reveals that it is very challenging to use handcraft method to achieve a design predetermined through the use of Computer Aided Design (CAD) at the level of this design. This is unlike sketching which does not include more details in terms of photographic effect. It is surprising because it is expected that the handcraft work should be more enjoyable or interesting both in the



Figure 15: Artistic Handcraft Wallet (AHW) Physical/Real Product

process of making and finishing. The reverse is the case; the designer enjoys the conceptual prototyping through CAD more than the physical hand craft practice. As a developing country where there is still iota of digital divide affecting the use CAD one will expect that the handcraft practice should be enjoyable, interesting and engaging. The finding is that the conceptual prototype through the use CAD seems to be perfect, gorgeous and appealing while in the virtual environment. By time the real or actual physical AHW is carried out, there is sense of limitation to achieving product as gorgeous as the virtual prototype. The real now seems to be less attractive as the virtual prototype. At the end of the feasibility stage, the designer of the AHW feels satisfied with the conceptual prototype than the real physical AHW. However, this depends on the level of skill or expertise of the designer in handling tools, equipment and other technicalities. Other factors that might have influenced the design outcome include the psyche of students which might have been negatively affected as result of the poor financial status, lack of motivation, instability in the educational program, nonchalant attitude of government to necessary need of the students and the university to mention a few.

4.0 Recommendation

Art and design making can bring up analogy that are useful for social design. That is to say, inspiration for social design can be obtained from self-expression/intuition during the process of art and design making. This can be useful for publicity design or public art. The thinking process according to daily routines of human being in AHW design generates social design that can be presented in terms of poster design or any other graphic visuals. For instance, analogies or metaphors in terms of texts are unconsciously developed during the design process of AHW. Similar studies can be carried out but it has to involve several designers. Unlike this study which centres on one designer. Consumers' perception can be put into consideration in other studies. Also, further studies can be carried out to find out reasons why certain CAD works are challenging or

difficult to be translated to real physical products.

The inexpensive advantage of using CAD for conceptual prototyping can be more enjoyable by students if adequate funding are directed towards useful infrastructure such as digital tools/equipment needed in various design schools. This is believed to be the responsibility of the government in a developing country like Nigeria. Meanwhile, students, technologies, instructors and lecturers in the design schools strive, struggle and lobby on their own to get improvised and substandard means of design making. For better design making, this paper suggests that there should be strong synergy between the industries and institutions of higher learning offering design related courses. Industries and government agencies should motivate and encourage students as impetus for positive contribution to the society and industries. Also, the government and funding agencies should renovate, fund and provide encouraging machines, tools, and equipment for carrying out and implementing physical object of design. However, government and other stakeholders might have been trying in the past; now, they need to do better so as to avoid remaining underdeveloped in this contemporary era of increasingly advancing technology.

5.0 Conclusion

The conceptual prototype of AHW design in this paper engages the experience of both virtual and real physical prototyping. The findings show that design thinking is important for insightful design. Findings also includes the possibility of generating social designs that can be used for publicity or manifesto graphics when working on proverbial items. This is because the process of experimenting during the virtual and real prototyping serves as inspiration. Moreover, the findings show that it is enjoyable to use CAD during conceptual prototyping depending on the designers' optimum proficiency in the use of CAD software application. However, there is sense of limitation to achieving real physical product as gorgeous as the virtual prototype. This is evident in the case of the AHW design's end product that is not satisfactory and exquisite to

the designer. The designer feels dissatisfaction concerning the end product. Thus, one of the opinions engendered as a result of this exploration is that suitable learning environment i.e. well-equipped studio is needed for the proper psyche to initiate good designs.

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Alternative Scale(ing) Practices in Architectural Design Studio

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Abstract: Commonly associated with the accurate representation of reality according to a specific ratio, which depends mainly on measuring and precision, the notion of scale has been considered an operative tool in architecture to perceive and indicate the size of anything according to a reference system. An effort to challenge the concept of scale(ing) to include diverse reference units and their scalar articulations holds the potential of instigating novel associations in architectural design studios. Possible readings of these alternative scale(ing) conditions are discussed in the paper in reference to a series of design exercises conducted at architectural design studios. The main intention is to question these unmediated associations to the reference unit in the determination of size and proportion, thus possible scales of architectural space. This particular method of analysis aims to arrive at various scale(ing) conditions, whose internal reference system is challenged by the changes and shifts in the definition of the major reference unit. Each different scale(ing) condition studied through the given exercise was regarded as an act of confrontation for readings of scale as well as presenting provocative challenges to the architectural design processes. With this standpoint, the paper proposes a multi-layered reading of scale that argues the reference unit's instrumentality in the definition of architectural space and proposes an alternative methodology of integrating scale in architectural design education.

Keywords: Scale, Scalability, Reference Unit, Precision, Design Studio.

Introduction

Influenced by the changes in the understanding of measurement and the tools of precision that are standardized in time, the notion of 'scale' is often defined as the true representation of reality according to a specific ratio. Defined with different metrics and tools in different periods and contexts, the notion of scale and the ways of studying different scalar

conditions have always been an operational agent in architecture. The reference system(s) used to specify the size, as well as the operations embraced to study the scalar conditions are mainly defined through accustomed metric references or standardized body-related operations. However, the desire of standardizing the act of scaling can limit the definition and use of scale in architecture,

where it is commonly considered to be an operative tool to perceive and indicate the size of anything according to a reference system. Although the reference system(s) used in scale(ing) practices vary according to different contexts and periods, they depend mainly on metric systems, which are universally acknowledged and therefore eliminate the possible ambiguous conditions of scale. These ambiguous conditions may either be directly related to unstandardized measurements or sizes or refer to perceptual shifts due to contextual conditions.

However, the attempts to re-question the notion of scale in architectural education by diversification of the reference systems and the inclusion of the notions of subjectivity, interdependency, non-standardization, and ambiguity can alter the appraised practices and readings of scale in design studios. This in return may define new opportunities for initiating design processes in architectural design education. Therefore the paper aims to present a discussion on the alternative methods of utilizing 'scale' as a pedagogical challenge in the design studio. In doing so, it proposes a design methodology, where a series of given objects, defined as initiators or reference units, were put under various operations of scale(ing). However, these scale(ing) operations are applied not through altering the given standard measurements of objects but through analysing their potential to create architectural space. This methodology is argued to explore an alternative utilization of scale, where certain measurements, precision or standardization qualities of scale were replaced with variable qualities that are interdependent to their potential of scale(ing) of architectural space, thus introducing new strategies for initiating design thinking.

This methodology proposes a surpassing approach to the standardization of scale(ing) in reference to a metric system or square meters but discovering new tools and units in the understanding of scale. The aim is not only to provide different conceptualizations of scale(ing) but to analyze how these methods can initiate diverse articulations of

architectural space. The paper subjects a series of design exercises conducted in third-year architectural design studios, where alternative scale(ing) practices were utilized with the introduction of multiple reference units. It will try to unfold a discussion on the possible benefits of this methodology in understanding scale in architectural design studios and how different measures can initiate a self-derived system in the articulation and designing of architectural space. The main intention of the paper is to discuss the process and outputs of these exercises and scrutinize whether alternative reference units, rather than the metric system or the human body, can be used in architectural design practices.

A Methodological Framework for the Notion of Scale

The discussion on scale in architecture dates back quite far, but it mostly benefited from the perceptive connotations that can only be defined through measurable or perceivable qualities, falling behind revealing other potentials in the formation and conceptualization of architectural strategies. For example, the discussions on scale, especially in architectural schools, seldom question the relativity or subjectivity of scale(ing) practices, on the contrary, this attribute of scale is regarded as not ideal or preferred as it may cause the erosion of the rational ground of discussion. However, when we look at the history of scale and the emergence of different measuring systems, we come to realize that measuring standards are always apt to change according to who measures, and the tools selected for the practice of measuring. On another level, the concept of precision that seems to dominate the many practices of scale(ing) also turns it into a mental tool rather than a tool that is directly related to the human body as its major source of reference. The conceptualization of scale as a mental tool besides being an operative tool for measuring and representing reality, calls for the study of both measurable and immeasurable conditions (Lukinbeal 2016). [1] Scale, in these conditions, may lead to the discovery of even intangible properties. Questioning what is immeasurable in

conjunction with what is measurable, and the tools or methods of measuring, is believed to pave the way for discovering alternative approaches of utilizing the scale as; ‘. . . not simply an external fact awaiting discovery but a way of framing conceptions of reality’ (Delaney & Leitner 1997).[2]

The idea of scale(ing) as one of the major practices of architecture, undoubtedly got influenced by the changes in the understanding of measurement and also the ways and which it was standardized in time. The idea in the standardization of measuring systems dates to the initial study of body proportions by Vitruvius in *Ten Books on Architecture*. The analysis was later transcribed with slight alterations by Leonardo da Vinci as ‘Vitruvian Man’, which provided a more accurate study of proportions and measures in respect to the relations between the body and its parts. The proportions of the body in the Vitruvian Man were defined in their relations to basic Euclidian geometries. Therefore The Vitruvian Man represented the utilization of the human body in relation to a calculable or measurable geometry, by analyzing the proportions of its parts as a calibration device for understanding the nature of things, thus relating man to nature (Lukinbeal 2016).[3]

The human body can be regarded as one of the earliest tools that define our conception of scale, especially in architectural discourse. However, the capacities or qualities of the human body have always been closely associated with the idea of measurability, therefore of scale(ing). The practice of scale(ing), mostly benefitting from conventional measurement systems, developed to divorce from bodily references as its major source of existence historically. All the measuring units with direct reference to body parts, like; *cubit, inch, feet, arşın*, develop to be more abstract but even more precise, especially after the invention of meter as a standard, universal measuring system (Tavernor, 2005). Historically the traditional units of measure, which varied hugely from place to place and were untidy mathematically, were replaced with the metric system in the

aftermath of the 1789 French Revolution. Metric system was based on the SI (*Système International*) units, which we still use today to communicate information on measure, and which is devoid of possible associations to bodily proportions. Even though scalar comparisons through the human body call for a relative condition rather than a consistent one, one can still trace the development of standard measuring tools, for example, a metric ruler, through its relations with the human body in history. [4] Therefore whenever one tries to define or argue the scale of anything, the reference unit that creates the part of the whole scale almost always affects the final data.

Looking closely at the metric system, it becomes obvious that the reference unit as a part repeats itself and initiates another part of a whole in a consequent manner. In this system, the relationships and dependencies between the parts are usually direct and contingent. For example, a *centimeter* in a metric system repeats itself ten times to define a larger part or a whole that is composed of smaller units, which is a *decimeter*. However, *decimeter* as a whole is composed of smaller part(s) and repeats itself to define another whole such as a *meter*. Successive repetition of the same unit value defines whole(s) which are part(s) of other whole(s). The reciprocal relationship between part(s) and whole(s) in a metric system necessitates the questioning of how part(s) act in the formation of whole(s) or how they repeat themselves to attain the desired whole. The structure of the whole(s) is usually clear and well-defined so that one can easily decipher the constituent part(s) and identify the “ontological dependency” between them. (Türkay Coşkun, 2017) Considering the structure of a whole, where part(s) and part(s) of these part(s) come together to form a structured whole, Brentano states that “wholes are things which need to have parts...a thing exists in itself if it can exist without being a proper part of another thing - if it is possible such that there is nothing of which it is a proper constituent.” (Brentano, 1981)

However, an architectural design process may demand a more flexible dependency between

the part(s) and whole(s) of a unit system to study the conditions, cases and experiences of architectural space. What if the reference unit, which is considered to be the constituent part of the metric system repeats itself but initiates the definition of another part or whole? As Husserl questions, what if the whole which is the larger part of the metric system does not necessarily need to have part(s)?

Although the metric system has a direct and ontological dependency between parts that relate to the other part(s) and whole(s) in the same manner, their relations may vary and blend into one another when subjective concerns are included. Blending of part(s) and whole(s) in various ways initiate the consideration of new and diverse dependencies between them, which may also originate alternative practices for architects. Consideration of alternative dependencies between part(s) and whole(s) opens up new grounds for discussions and discoveries. Therefore, their amalgamation initiates the questioning of the metric system(s) as the only reference system used for understanding and studying the scale in architectural design.

Even though the concept of scale is an inherent part of architecture, the concept is seldom questioned critically in architecture schools or in architectural practice. One pioneering study that challenges this association for discovering alternative measuring systems where the metric system is intentionally overlapped with another system belongs to Le Corbusier and his renowned work; the *'Modulor'*. In his words the main idea behind the Modulor was defined as: *"In a matter of building houses meant for men, the metre seems to have introduced a strange and unreal method of measurement, which, if looked at closely might well be found to be responsible for the dislocation and perversion of architecture."* (Le Corbusier, 1950/2011). Le Corbusier's Modulor, tries to break away from conventional measuring methods to embrace a different measuring system based on the proportions of the male figure and the golden ratio. The Modulor Man is the outcome of this search for determining the right proportions of

units, and in this case also 'new parts' for architecture. Therefore, it not only synthesized two separately used units of measurement, the empirical system (feet & inches) and the French metric system, but also sought to define a relation between the body's form and nearly all designed objects, from the scale of architecture to the scale of artifacts. (Le Corbusier, 1950/2011). The idea was to initiate a visually more pleasing and apprehensible system for measurements since the scale(ing) practices are derived from human scale but not limited to its exact measurements. The Modulor tried to introduce a different scale(ing) methodology, which can be named as a scale for architecture that is inspired by the scale developed, for example, for musical scripts. The work of Le Corbusier, besides failing to raise a common acknowledgment in the architectural milieu, was one of the most and maybe only controversial and experimental attempts in questioning the operative relationship of architecture with proportions, systems of measuring and scale(ing).

However, attempting to challenge the practice of scale(ing) requires a deeper inquiry into its instrumentality. For example, how scale(ing) is argued in the paper is devoid of its limited use as a tool indicating the change in size or means of representation. It was tried to be regarded from a larger context where the size of an object is discussed through its relativity with a reference unit, which can only be defined according to many external inputs like a human body, measuring techniques and tools, or construction methods (Anderson 2002). [5] So the main point of departure is to disable the singularity of a measuring system or a reference unit but on the contrary enable the possibility for the multiplication and variation of the reference units. The flexibility offered through the multiplicity of reference systems enabled Le Corbusier for example, to study architectural scale not only in metric units, but also in relation to other reference units such as the human body. Any reference unit (be it an abstract unit in meter system or a more relative one defined through body parts) holds a certain amount of equivocality directly affected by

either our subjective intentions or incoherent contextual conditions, scale(ing) can enable the interpretation of altered dimensions, relationships or amount of detail and therefore can be utilized for exposition and speculation in architecture.

Understanding Scalability Through a Reference Unit

The studio exercises subject to this article include the output from different years. One common attribute in all exercises is the discussion on the notion of scalability. Scalability was discussed in relation to the concept of flexibility in particular scale(ing) systems. It can be regarded as the quality to be able to grow or change size without impeding the main working principles. Scalability is directly related to a system that does not get affected by major decreases or increases in the number and quantity of certain things (*parts*) that compose the whole. This tolerability has of course certain limits to it. The studio examples in this first category, focusing on the limits of tolerance to such increases or decreases, tried to uncover the potentials of each and every element depicted as a reference unit from different contexts. These initial exercises weren't directly carried out till the end of the design process in the studio as in the later examples discussed in this paper, but they were preparatory exercises for analysing the interchangeable or inter-dependent relation between the parts and whole in architecture.

Here the students introduced a list of various different elements that are chosen with reference to the context or extracted from particular situations without contextual limitations (Figure 1). There is no single size or proportion required in the selection or determination of these reference units. Scalability as a quality was applied to various units that are regarded as reference units, such as an umbrella or a bathtub, a shower cabin, a bed, a counter etc. Even though each example defines a particular reference unit, they do not recall an immediate determination on size initially, yet the chosen element itself becomes the very tool of measure that can be altered or modified within the limits of tolerance.

Therefore, all the analysis rather than adopting or responding to a system of measurement outside itself, regarding any conventional systems of scales, introduce their own system of scale(ing) through their very beings. Here the definition of scale(ing) does not refer to the particular size of the object but recalls for a comparative and sometimes speculative study to discover the potentials and constraints of different scale conditions and how they became interdependent to one another. Most of the studies preferred to use collages, photomontages or pictogram graphics instead of conventional scale-based drawings and architectural representations. This allowed students to be able to think independently of the actual measures of the units taken as a reference in all analyses and to focus on the reference units' tolerance levels of scalability graphically.

'Multiplication' and 're-size', were applied as the two major operations in these initial exercises. Constant repetition of resize and/or multiplication operations were considered to trigger part-to-whole conditions and hence define an experimental ground for architectural design education. When the same unit is resized or multiplied recursively in a metric system, the relationship between the parts, between parts-to-whole, or even between several wholes remains constant. Therefore, the accustomed relations of the reference unit continue to serve the architect in the design processes. However, if the reference unit is not a standardized one like the metric system, the repetitive execution of certain operations redefines the scalar relationships in each cycle anew (Delanda 2011). [8] During the iterative application of resize or multiply operations, the architect continuously questions the scalar references and the interrelations between the reference unit and the output; namely part-to-whole relations. At a specific recursion time, when the project starts to lose the relative scale and the reference unit, the part-to-whole relations are re-questioned and the output of a certain recursion is defined as the reference unit of another recursion cycle. Therefore, the relative condition of the reference unit is also updated at each iteration.

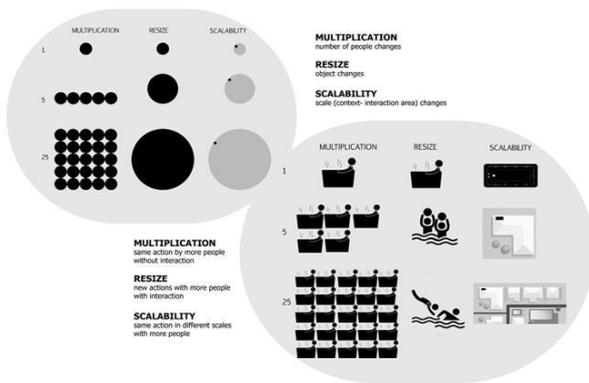


Figure 1: Scale(ing) conditions _ Measures of Scalability. (TEDU Architecture Archive, Melis Acar, Çağrı Koçer)

In these exercises not only does the definition of a reference unit at each example change but monitoring the change reveals how a unit's manifestations alter under different scalar actions like multiplication and resize. Taking a 'bathtub' or a 'shower cabin' as a reference unit, for example, can manifest diversified contemplations when multiplied over a certain number or after a specific amount of resizing. And while the 'bath' as a unit may respond to the same series of actions differently, another

preferred reference unit of the shower cabin can react in a completely different manner (Figure 1 & 2). There is no straightforward formula for both of the actions, which can transcribe to exact mutual coordination between the increase in the number of units with respect to the increase in the number of services achieved per unit. All the tactics applied also cause the metrical information and measurements to become redundant leaving its place in the discussion of part-to-whole.

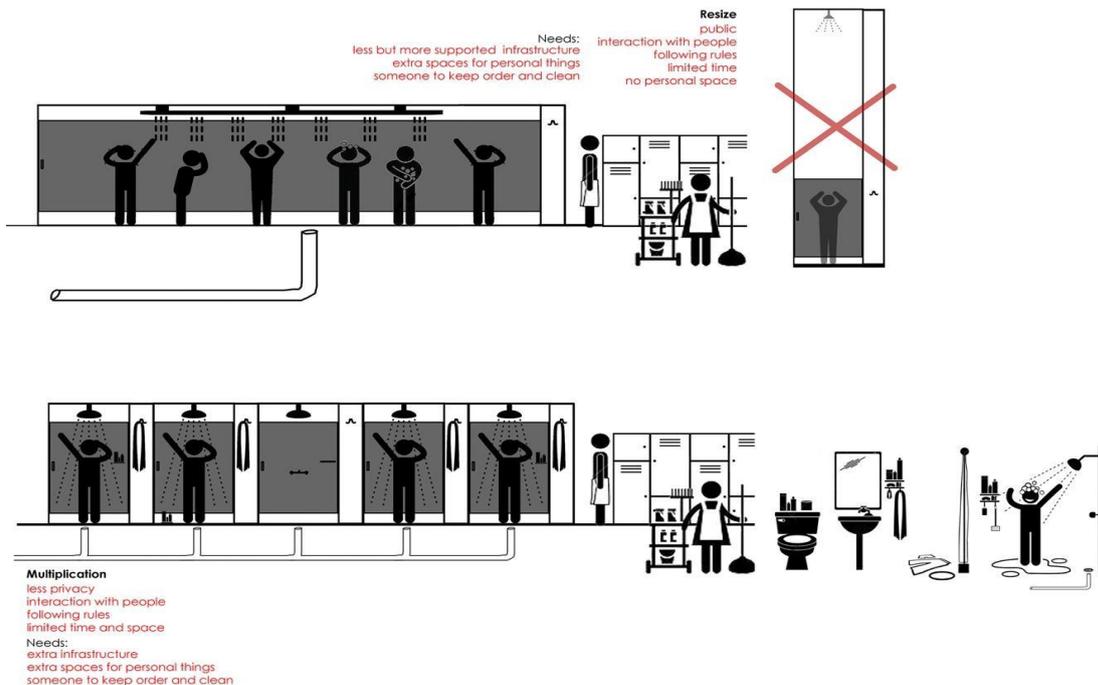


Figure 2: Scale(ing) studied in pictograms; multiplication & re-size of 'shower cabins'. (TEDU Architecture Archive, Elif Köse)

To give but one example is to compare different reference units as a shower cabin and an umbrella; each unit can respond to certain services like sheltering for an ‘umbrella’ or showering within a shower cabin (Figure 2 & 3). When the unit gets multiplied up to a certain point the capacity of the total response also increases proportionally. However, after a certain number of multiplications, there is a disruption in the equation resulting in the obscuring of the reference unit’s role in the formation of the whole. It is discernible in the series of studies that after a certain number of multiplications, which is, by the way, may differ when the reference unit changes, the individual unit begins to lose its individuality and identity to become part of a pattern or an order. So the initial reference unit as the identifier of various scaled conditions starts to lose its capacity to define the very same

relations after a certain number of multiplication, causing the reference unit to lose its instrumentality within the process. Both reference units, shower cabin and umbrella, were initially designed for individual use. The multiplication of the single reference unit and the resizing of the single unit may seem to result in increasing the capacity of service however both actions change the limits of tolerance of the reference unit as well as its inert qualities respectively.

In these exercises, the students came to realize that the measuring tools can be diverse, however, these tools are also not static entities that can prolong their validity throughout the design process. The constant change of the reference unit under different actions for example like multiplication is evidence for bringing out the dynamic quality of the process



Figure 3: Scale(ing); multiplication & re-size of the ‘umbrella’ as a reference unit. (TEDU Architecture Archive, Elif Köse)

that carries the potential to further transformations in our conceptualization of scale and hence the architectural space. Challenging the concept of standardization, which can be considered as one of the elemental qualities of measuring and scale(ing) practices throughout history, these exercises intended to explore the potentials of non-standardization in scale(ing) practices and how this strategy can alter the conceptualization of scale as an ever-changing, adaptive or even responsive instrument in the way we relate with our environment. This strategy initiating the failure of measurement provided an experimental process for students in realizing the moments of the inadequacy of the reference unit for the scale(ing) process. It is in these moments that representing architectural space can flourish as the students started to develop alternative ways of understanding, perceiving and conceptualizing the qualities of architectural space as a whole together with the parts that compose that whole.

Scaling up & down in architectural practices can be regarded as a common conventional strategy for responding to possible needs and requirements. It is very likely that the resizing of the unit radically changes our ways of interacting with the object as a reference unit, with one another and with the context. In certain examples, the reference unit taken as a shower and a shower cabin resized in two different manners defined as proportional or disproportionate resizes (Figure 2). [6]

To achieve the desired increase for example in the case of shower cabins, all three different strategies which were defined as the multiplication of the reference unit, the proportional resize and disproportionate resize of the same unit, all produce diverse scale(ing) practices and configurations. The resize operation also has a direct response to the inherent definitions and contextual relations. For example, there is a range of tolerance to what extent the bath as a reference unit can be enlarged and still continue to be defined as a bath. As seen in the example of Figure 4 the inherent features of a bath lose those qualities to turn into a pool after a certain limit of enlargement. Similar quests provide different ranges of tolerance when we compare a bath, a working space, and a living room, all of which carry the potential to define a library or a cinema under different scaling actions (Figure 4). Resizing the reference unit not only changes the initial size and measurements of the very same unit but radically changes the way we conceptualize the architectural space. Exploring how certain elements occupied by architectural space can be transformed to replace it through the exercise series enables the students to question the definition of architectural space in reference to a specific condition, dimension, program, etc. Therefore, embracing the tools and methods of scalar practices in architectural design education is regarded as holding the potential of challenging the conventional definition and practice of architectural space.

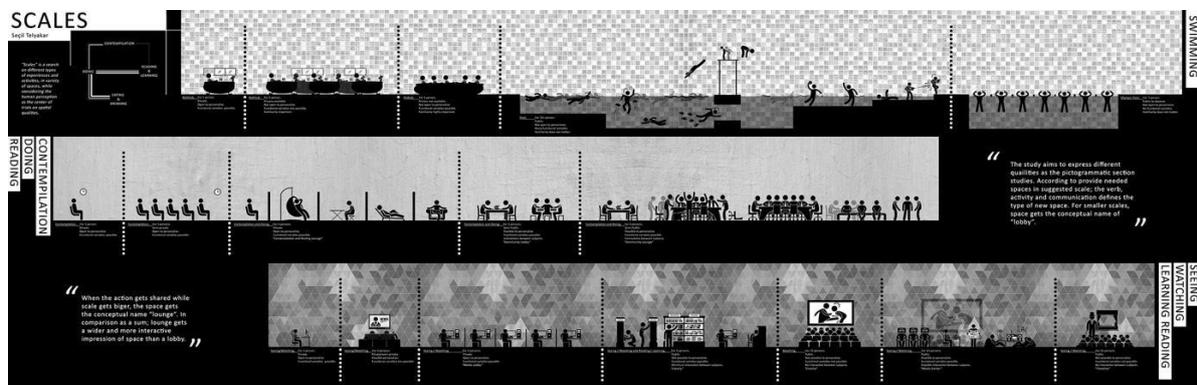


Figure 4: Scale(ing) studies: multiplication and re-size of swimming & working spaces (TEDU Architecture Archive, Seçil Telyakar)

Following these initial studies through the concept of scalability, in the following years, the studio offered to work with a reference unit not only as an initiating exercise for understanding the limits of scalability but an extended strategy that enabled the study of different relations between part-to-whole, in a semester-long project in the studio. For all the discussions in this paper, the selection of the reference units was done according to the content of the assigned architectural program. Therefore all the exercises intend to question the network of relations both defined through the reference unit (parts) and the architectural space (whole).

Reference Unit for Initiating Architectural Program

In order to extend the instrumentality of scale(ing) and scalability, in the following years the design studio initiated the scale(ing) exercise not only as a short exercise for the discovery of interdependency between the reference unit and the whole but as a semester-long assignment that runs parallel to the development of design and its programmatic requirements. The students were given the program details, where they were expected to define the spatial conditions and requirements in reference to the studied scalar conditions of the reference units that were introduced in line

with the program. They were expected to define the spatial requirements not only in reference to meter squares but also in reference to the number, size and interrelations of the reference units. However, it should be noted that these exercises do not aim to disregard the metric relations or human scale, rather they aim to diversify the number of reference units considered in a design process.

In the first project, which considers the design of a marketplace in İzmir in the third-year design studio, the “counter” was defined as the initiating reference unit. Similar to the previous exercises, the students started working with resize and multiplication operations on reference units to develop an initial understanding of the relationship between architectural space, architectural program and spatial experience. Of the two examples analyzed for this specific design exercise, the first example explored the potential implications of resize and multiplication operations, where the counter, as an element, lost its acknowledged conditions and started to get recognized as a spatial/volumetric unit, providing a volumetric scale as an initial design idea. (Figure 5)

Focusing on the volumetric quality of the counter, the example in Figure 5 explored the

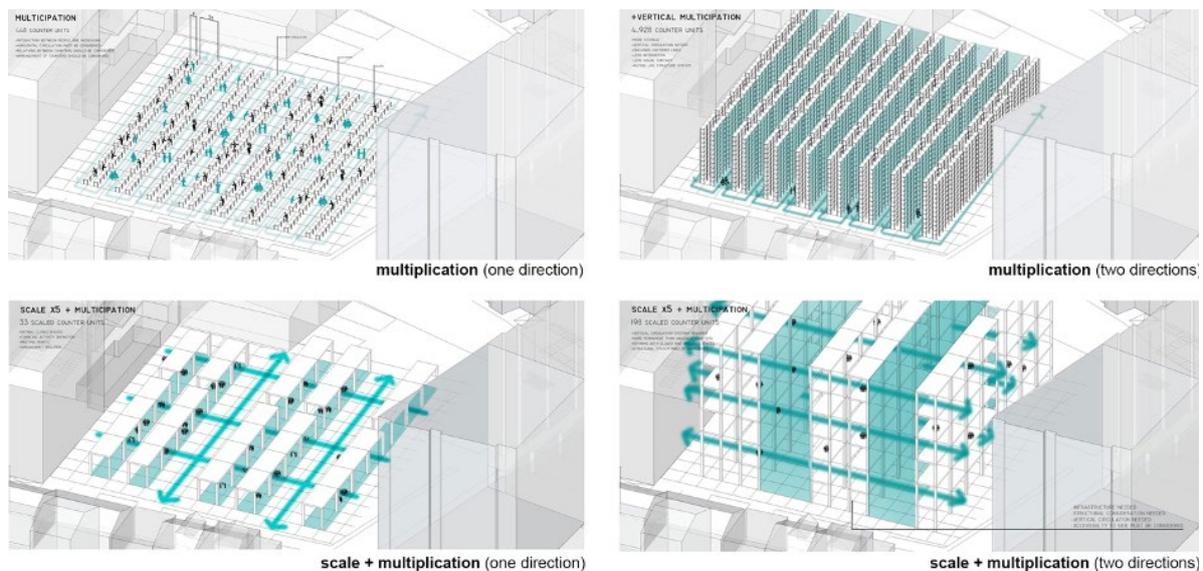


Figure 5: Scale(ing) studies: Multiplication + resizing operations applied in diverse scales and numbers. (TEDU Architecture Archive, Elif Ezgi Öztürk)

potential of the third dimension of the counter and derived an alternative reading of the counter as a significant part of the architectural program, hence the structuring principle of the architectural space. The volumetric potential of the counter and its proportional relations were considered the major references in the subsequent stages of the design process. In the further stages of design, the contextual conditions of the site provided the project with another layer that started to work together with the discovered scales of the reference unit. As indicated in Figure 6, at the further stages of the project, the design utilized the multiplied condition of the counter as a volume that indicated a three-dimensional reference grid as an initiating idea of design. Overlapped with other requirements and conditions studied in the design process, the counter with various sizes and numbers enabled an alternative scalar experience that is used in defining the properties, dimensions and relations of architectural spaces.

In this operation series, recursive application of these scale(ing) operations was intentionally sought in order to experience the extreme conditions of scalability and its tolerance levels. [7] The exercise revealed that, when the reference unit was scaled up and multiplied several times, the relative definition of the reference unit is disoriented, where it is not a 'counter' anymore, but rather a volume or a space. More recursions result in various new reference units such as a 'block' or a 'volume',

including scaled up & down and multiplied conditions of an initial reference unit, which has lost its referential definition to the human scale. The reference unit (counter) is a discrete element (part) of which collectives (wholes) are defined through several recursions of resize and multiplication operations.

The part and whole condition defined through these exercises depend on the relationality of the discrete reference unit and the collective, which is assessed through these relations. The reciprocal condition of parts and wholes is open to interpretation since they are defined through the multiplicity of relations. In order to take the advantage of this approach, the students urge to study the scalar relations of the reference unit and extend its existential givens to include various relations, where the micro/macro definitions are connected to many others. [9] This approach has the potential of defining the scale, not as a metric unit, but rather as a network of relations, which constructs contingent definitions of scale. Accordingly, scalar recursions turned out to incite conditional definitions of architectural space that are dependent on the selected framework, where the part and whole (collective) transform each other's definition constantly.

Possible conditions and implications of the reference unit that is studied in the first phase of the assignment initiated the definition of various architectural spaces, which were

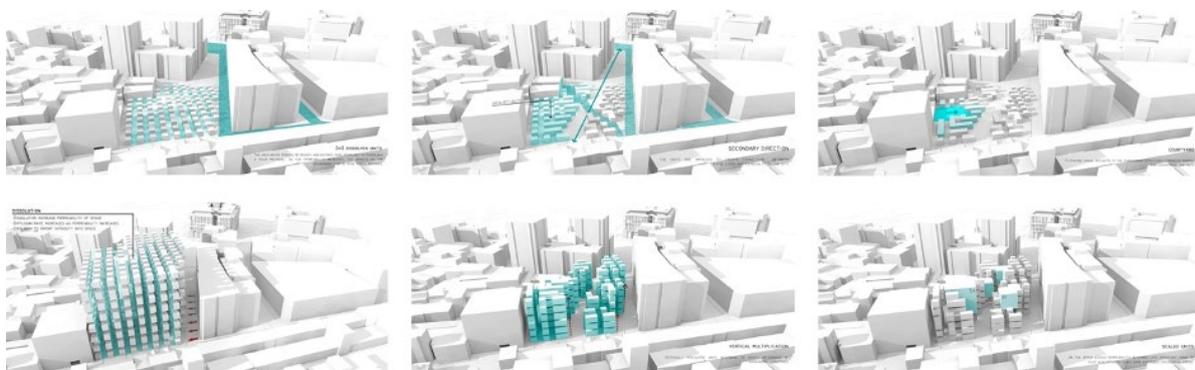


Figure 6: Volumetric search for the marketplace that is initiated by scalar operations. (TEDU Architecture Archive, Elif Ezgi Öztürk)

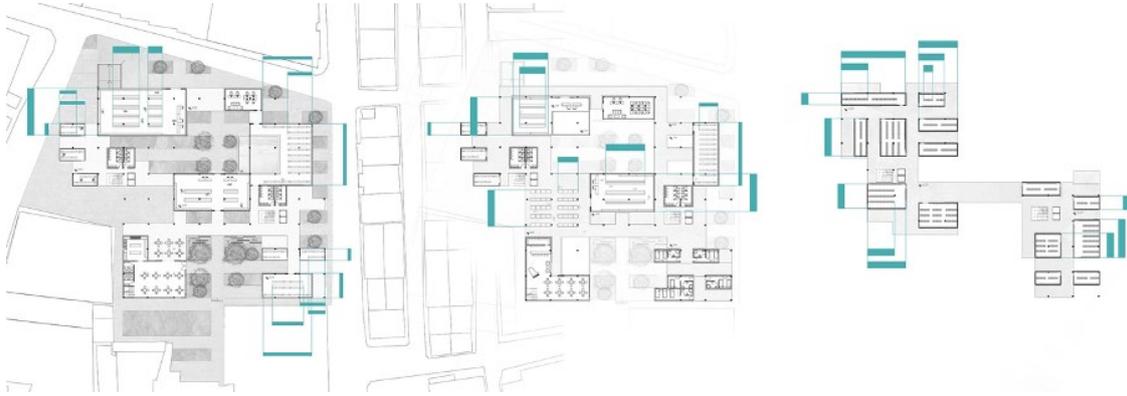


Figure 7: Different scales and sizes of the ‘counter’ initiate the differentiation of architectural spaces. (TEDU Architecture Archive, Elif Ezgi Öztürk)

defined in reference to this unit. Hence, the marketplace, which necessitates various use of the counter and related activities was studied with diverse conditions. In Figure 7, it is possible to signify these conditions which are defined in reference to the counter and its scalar studies. Different dimensions and conditions of architectural spaces are defined according to the number, size and relation of the counters with the other elements and their diverse conditions are indicated in the image. Although each project in the studio explored different potentials of an alternative reference unit, a second common approach in the case of working with a counter as the reference unit, was the quest on the number of users and levels of interaction with the counter. In the example indicated in Figure 8, the project explored the outcomes of resizing and multiplication of the reference unit in different directions and sizes for analyzing the spatial changes introduced through these operations.

For example, studying resize operations on the counter to its extremes resulted in the alteration of the relationship with the users. The users were considered not to be in front of/behind/near the human body but rather on it; like a tray. On the other hand, resizing the counter to the other extreme, like enlarging its scale, implied a different use as a platform for public activity. The counter as the reference unit becomes a shared surface as a result of these implications. Along with that, the multiplication of the counter initiated the definition of other activities and spaces such as circulation, accessibility, storage, etc. Exploring certain requirements and conditions through resize and multiplication operations, the project experienced the potential of scalar practices and focused on the arising spatial requirements.

In another example, as shown in Figure 8, the project considered the program elements and used various sizes and conditions of the

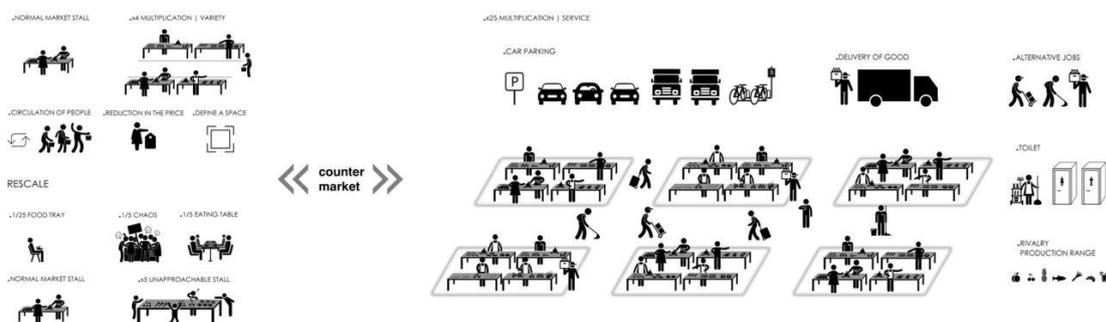


Figure 8: Scale(ing) studies: multiple scales of ‘counter’ and definitions of the marketplace. (TEDU Architecture Archive, Cansu Türk)

counter. The different scalar articulations of the counter were studied and discovered even before starting the design process. Since the exercise also aimed to appreciate various networks of relations concerning different conditions and sizes of the reference unit, the student was motivated to define the architectural space according to these relations in the design phase. Therefore the spatial requirements and additional activities enabled through the operations of resize and multiplication in the initial stages of design affected the architectural design process and the articulation of the spaces in the further stages of design. The main conceptual design idea was acquired by resizing the counter in a single direction, which later initiated a continuous surface that can be shared or used for collective purposes. This conceptual approach developed by working with the reference unit as a constituent part of the project discovered the potential of a single element the ‘counter’ and proposed this element as a continuous production line.

The design of the marketplace, as it can also be observed from Figure 9, benefited from this

idea of the production line as a major architectural element that organizes all the spatial configurations of the program. This example also accommodated the discussion of part-to-whole relations, where the scalar references were lost after a certain number of resizing and the scalar references of the counter as a significant element or part became futile within the whole. Therefore, it is possible to state that when the reference unit was scaled up disproportionately, it may start to lose its relative scalar condition defined in reference to the human or metric scale, opening up new discussion grounds for students to question the ontological attributes of the reference unit, where it is not a ‘counter’ anymore.

In another year a similar exercise was re-adopted with the introduction of a new reference unit. In this design studio, the main aim was to design a housing complex in Ankara. The new reference unit introduced to students parallel to the housing assignment was a ‘bed’. At the initial stages of design all the students applied diverse multiplication and resize

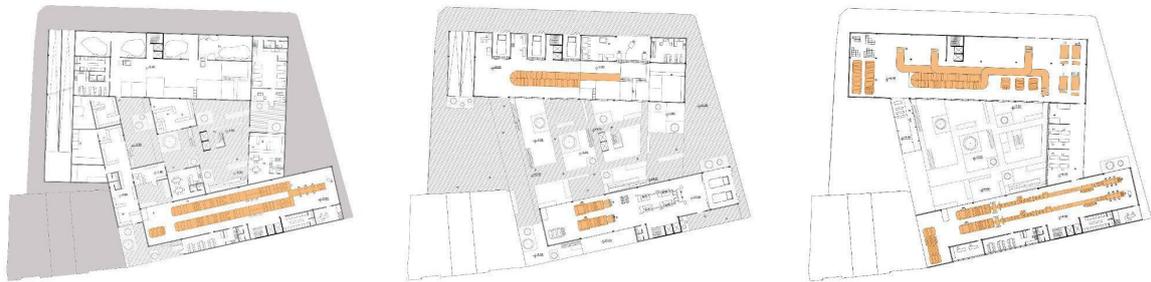


Figure 9: The resizing of the ‘counter’ as a production line enables spatial architectural articulation. (TEDU Architecture Archive, Cansu Türk)

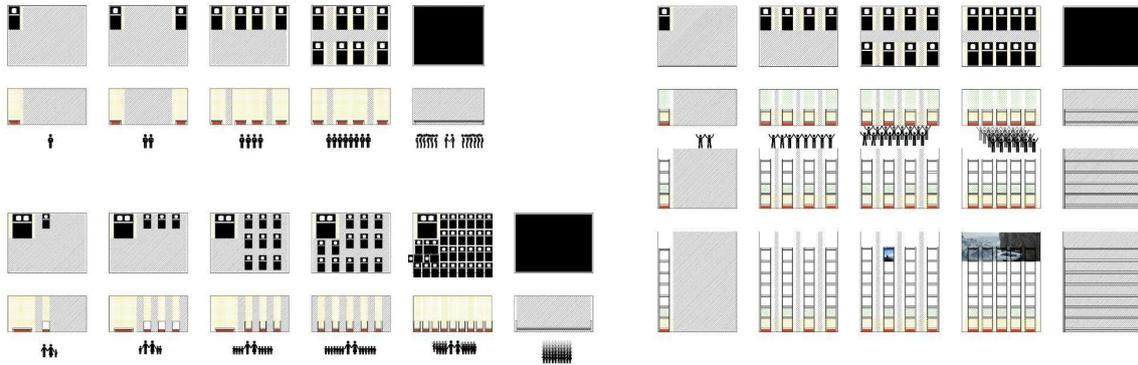


Figure 10: Different articulations of architectural space through the study of the 'bed' as a reference unit. (TEDU Architecture Archive, Doğuş Can Kadoğlu)

operations consecutively on the reference unit and tried to initiate the search for the ergonomic use of the bed and the distances near, around, and between a number of bed(s). Overlapping the conditions of the bed, with the dimensions and the number of people, the exercise opens up the discussion of the minimum and maximum number of beds and questions the privacy, and publicity conditions. Resizing and multiplication of the 'bed' as a significant architectural element enabled the discussion of the components or parts of a housing project and how they correlate with the number of inhabitants residing in that architectural space. (Figure 10) Furthermore, it defined a critical position in assessing the relation between the bed and the space it is inhabited in. Many issues related to the program, like the number of people using the space, in relation to the proportion of the space, and the level of privacy/publicity were

the prevailing topics that stemmed from the discussion of the bed as a reference unit.

In Figure 11, the articulation of the reference unit initiated a design framework for understanding and discussing the altered states of housing, and the use of the bed as a surface to live, rest, work, etc. Considering the bed as the minimum requirement of a living unit, it was intended to define a new living condition where the bed was the ultimate element and where the size of the living unit has become interdependent on the scale(ing) of the bed. While defining the minimum living unit, the example project in Figure 11 extraverted and distributed the other activities of a conventional living unit to the public zones. Discovering the potential of the bed as a reference unit initiated defining the dimensions of the living unit and also the conditions of privacy and publicity in a housing complex. In

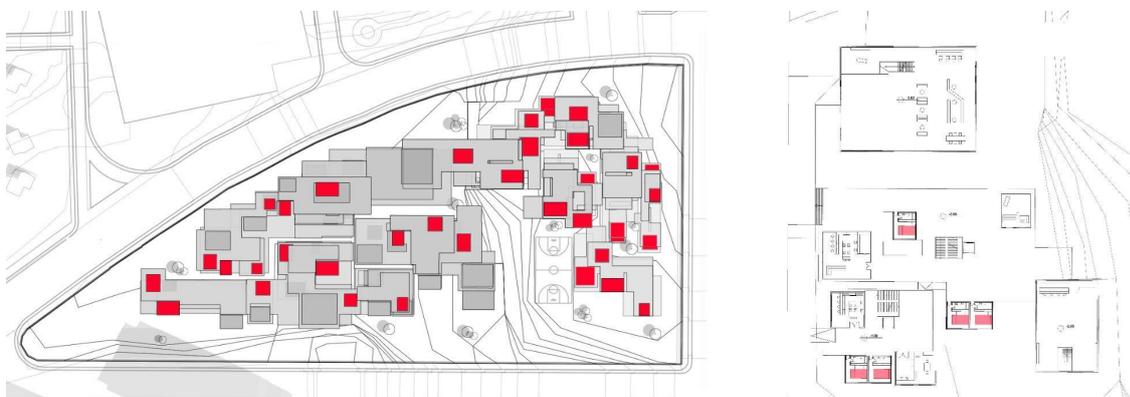


Figure 11: Proposal for a living complex that is initiated by the study of the 'bed' as the reference unit. (TEDU Architecture. Avlin Asır. Melike Zevnep Silahsör. Mirav Yüksel)

the conceptual framework of the project, individual living units, having a single bed of which sizes were defined according to the time spent in the living unit, contrasted with the multiple beds initiating a shared living unit.

Final Remarks

The scale(ing) exercises in the design studios of different semesters are believed to introduce new opportunities for initiating design processes in architectural design education. Initially, the idea to adopt an unconventional method for scale(ing) started with studies on scalability. In the earlier examples, scalability was introduced in the studio to analyse how the adaptation of atypical reference units does not recall an immediate determination on size, yet how the chosen element itself becomes the very tool of measure that can be modified within the limits of tolerance. Very soon the students and instructors also discovered the potential of this scalar studies in influencing the emergence of a framework of design projects. Therefore, the later examples discussed in the paper presented a consistency in how they utilize scale in defining a conceptual ground for their projects. In these examples, the operations applied to the reference unit directly provoked the interpretation of the architectural program, hence the design of the architectural space and its spatial qualities.

Obviously, each reading provided its own reference systems and frameworks, which revealed discreet associations. For example, the study of the marketplace in relation to another unit will probably result in novel and various frameworks, which go beyond the standardization managed with metric units. Therefore, the areal definition of a condition/space/formation, etc. was extended to include various new network relations activated through diverse reference units. Testing the scalability tolerances in the configuration of architectural space and the elements that configure that space revealed how the two are contingent on one another. That is to say, the scalability tolerance analyzed through resizing or multiplication of reference units can define alternative scales in

the definition of the architectural space. Therefore, these series of scale(ing) performances provided an alternative pedagogical experience both for students and for instructors in initiating diverse scales that is devoid of accustomed strategies of scale(ing) based on pre-given information of site, context, program etc.

Through embracing the subjective readings of scale(ing) conditions and acknowledging the limits in the contemplation of scale and measure these exercises stretch the limits of perception and contemplation to include a framework for scale(ing) conditions which cannot be defined in reference to a basic and perpetual source of comparison or measurement. In that respect, the drive for the conceptualization of scale in reference to precision and standardization was challenged by acknowledging ambiguity and non-standardization.

Analyzing the design processes and outputs of different exercises, it can be asserted that studying various scalar conditions with different inputs and operations can extend the existential givens to include various conditions, relations, and measurements. It can also be noted that the diversification of measuring tools and units, and also the operations used to study scale provided contingent definitions of scale. Therefore, the outputs of the exercises can also be acknowledged as stretching the limits of perception and contemplation to include alternative conditions which cannot be defined only in reference to precise and standard sources of comparison or measurement.

The proposed multi-layered understanding of scale and the ambiguity of the scalar reference system can be considered as an implicit potential for architectural design processes and architectural education. This approach has the potential of defining scale, not as a metric unit, but rather as a network of relations, which can further transform our conceptualization of scale and hence the architectural space.

Endnotes

1. Lukinbeal studies the relationship of scale with the human condition and traces two specific accounts in the history of scale. According to Lukinbeal the scale is either considered as a mental artifact (mentifact), which defines its relationship with the human condition and as a representational device for the transcription of three-dimensional objects into two-dimensional representation. He uses the term together with sociofact and artifact in the discussion of cultural traits and explains the mentifact as ‘mental constructions which provide the psychological framework of a culture and carry out intellectual, aesthetic, spiritual, ethical or other psychological functions.’ (Lukinbeal 2016).

2. ‘Immeasurable’ and ‘unmeasurable’ are two terms that often used as synonyms to one another. However, in the scope of this article, there is a conscious preference in the use of immeasurable over unmeasurable as their definitions diverse slightly. Immeasurable signifies a quality of being extensive or extreme to measure, relates directly to the quality of the object whereas unmeasurable is referring to the lack of capability in measuring, therefore can be associated to the action of measuring.

3. A close survey to the history of scale and its relation to man reveals how the body provided the first referent from which scale as a ‘mentifact’ as declared by Lukinbeal, was constructed. As Protagoras (490–c. 420 BC) claimed, ‘Man is the measure of all things. Similarly, Leonardo da Vinci’s ‘Vitruvian Man’ (1490; Figure 2) linked proportions of body parts in relation to the earth (the square) and the heavens (the circle).

4. As in Emmons (2005): ‘Size Matters: Virtual Scale and Bodily Imagination in Architectural Drawing’, Tanju (2015): ‘Cetvel’, Bal (2020) ‘Cetvel: Elin Araçları, Soyu Tükenen Çizim Enstrümanları’.

5. The idea of trying to understand nature through the existence, gestures and actions of man has always been an issue since Renaissance in the search for how human beings meaningfully inhabit the world. In 20th century the issue also preoccupied many philosophers from Henri Bergson to Maurice Merleau-Ponty. According to Bergson, people understand the world through the body’s ability to act on things. Objects in turn become meaningful because they seem to shape themselves to accommodate these capabilities. See; Anderson, 2002.

6. Focusing on the action of resizing through different reference units is another scalar inquiry studied under the notion of scalability. Playing with the size of the reference unit was a tactic for observing the limits for scaling up & down, or playing with the tolerance level of the object at hand. It is a familiar strategy, which doesn’t belong to the field of architecture alone but was even subject to well-known literature like Gulliver’s Travels or Alice in Wonderland. For example, in Alice in Wonderland, the constant change of size of the heroine is employed as a significant aspect in determining the relationship with the context, her environment, and the people around her. The inconsistency of such scalar fluctuations provides Alice with new problems and opportunities to deal with. In Gulliver’s travels, on the other hand, size was employed as a significant aspect in determining our society’s relationship with morality. See; Swift, 1726 and Carroll 1871.

7. Continuous application of scalar operations is referred to as recursive processes in the paper, which takes its reference from Delanda’s statements on the assemblage theory and the multi-scalar conditions he discusses in relation to part-to-whole interactions. See; Delanda, 2011.

8. Throughout the paper multiplied conditions are deliberately differentiated from the recursive / iterative conditions, where multiplication is considered as an operation and the recursion / iteration is considered as a process. Recursive / iterative processes are defined as establishing practices that can repeat themselves or a sequence of operations or procedures, where the multiply operation can be repeated as a part of the practice.

9. This discussion is also valid in the universally accepted decimal metric unit systems, which are defined through unit multiples (of 10). As the measured values are repeated multiple times and outreach the cognitive capacity of the human, the unit multiples are applied for computational ease and the scalar ambiguity is managed through the shift in the scalar reference system (i.e. mili/canti/kilo... meter or gram/ kilogram/...etc.)

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Interview with Chat GPT to Define Architectural Design Studio Work: Possibilities, Conflicts and Limits

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Abstract: Design studio forms the backbone of architectural education. It is the first-place students encounter complex design problems that they should understand the context, search for the reasons, structure the demands, and develop creative solutions in the design process. The continuity and integrity of design studios are important, so the instructors have great effort to define and explore the project subjects and themes for each grade to make the environment more productive, creative, and collaborative. The meetings, web and literature surveys, and thoughts and experience of instructors enable the definition of an architectural design studio work. This research is to seek another knowledge source that could have possible contributions to this process. Chat CPT is a newly released artificial intelligence project that people can experience for months. It is a language model the training and learning continue. By the objective of the research, an interview with chat GPT is structured and executed to define and explore possible issues and valuable knowledge for third-year architectural design studio work as a case study. The recordings are presented, and an evaluation survey, Delphi technique among experts, is held to emphasize artificial intelligence's possibilities, conflict, and limits in taking the stakeholder role. Prominent findings are that AI continuously responds and presents important issues for requirements and concepts. It has limits on reaching the maps and conflicts in distinguishing the countries and institutions.

Keywords: Architectural design education, Defining studio, Artificial intelligence, Chat GPT, Delphi technique

Introduction

Design studio for architectural education is an important part of the architecture department's curriculum. These studios form architectural education's backbone, where students synthesize and use the technical and theoretical knowledge gained in other courses (Ozorhon & Lekesiz, 2021; Tuztasi & Koc, 2022). It is the first place where students are posed with complex problems regarding understanding the problem, searching for the reasons, managing contextual influences, and negotiating

programmatic demands (Caglar & Uludag, 2006). The projects start with the architectural education first years, and they have diverse scales and contexts until the end of the undergraduate education. The way they handle any design problem is improved, and creativity in their process is shaped by this continuous studio education method. In architectural design education, students develop drawing, conceptual, and critical skills that are informed by their ability to reflect upon the production of ideas in design processes and in the urban,

environmental, social, historical, and cultural contexts that define the architecture and the built environment (Rawes, 2007). Besides, the learning environment in the studio is for sharing experiences and ideas of the instructors and students where diverse variables should be initiated (Yurtsever & Polatoğlu, 2020). For these reasons, every studio semester, the studio subject, theme, features, and evaluation criteria are explored and defined by the instructors.

Research, discussions, and meetings are scheduled among instructors to define and elaborate for every new studio semester to maintain a design problem and context for students. Project subjects, requirements, location, and criteria are explored with diverse sources and methods within the curriculum. A proper in-depth exploration is needed to understand and instruct any architectural design process (Hettithanthri, Hansen, & Munasinghe, 2022). It is increasingly important for researchers and educators to find effective ways to stimulate students' creativity with open-ended problems (Park & Lee, 2022). This study stands at an inquisitive point that artificial intelligence (AI) can have any contribution to this searching and defining process of studio projects. The value and importance of the instructor's experience and knowledge of running a studio with the definition are obvious; however, the possible benefits, limitations, and conflicts of AI were examined through interviews with it/he/she. Chat GPT ('ChatGPT', 2023), one of the latest released language models, was used to have experiment. The third-year architectural design studio project is selected to be explored. In the paper, first the knowledge of architectural design studio and contemporary studies about Chat GP are presented, then the methodology is given to state the structure of interview. The record of conversation with AI is reported in the section, Delphi technique among is conducted to evaluate findings of interview.

Architectural Design Studio

In architectural education, design studio starts with a discovery of seeing design as a process of creativity within a contextual framework (Caglar & Uludag, 2006). Instructors decide

this framework within the objectives of the semester. The project subject, scale, studio activities, and context should be arranged due to the intended flow and earnings of the studio. The teaching process in architectural education is viewed from two aspects, the aspects of teaching and assessment (Utaberta, Hassanpour, Bahar, & Che Ani, 2013). A well-designed studio framework makes instructors and students take a proper role within the studio process. Thus, studio works are explored and defined for every semester with continuity and integrity.

Architectural design education is a process that revolves around studio courses, and design studios require an environment that fosters creativity and experiential learning (Yurtkuran, Kırılı, & Taneli, 2013). An architecture design studio, as the core module in each semester, leads the training process in the architecture program through a project-oriented activity. This process starts from the first year of study and continues until the graduation day based on precedents studies and design projects (Tafahomi, 2022). A design studio environment is a creative place that gives diverse opportunities for utilizing cases from real life or experiments without limitations.

Artificial Intelligence and Chat GPT

Chat GPT (Chat Generative Pre-trained Transformer), a large language model developed by OpenAI, is a form of artificial intelligence that can be used as a chatbot (S. Biswas, 2023; S. S. Biswas, 2023; 'ChatGPT', 2023; Mcgee, 2023a). A sufficient body of training data must be available in the form of tuples of input and output data (Landgrebe & Smith, 2021). Deep language algorithms and training sets were used to develop Chat GPT, which could interact in a conversational way (Caucheteux, Gramfort, & King, 2022; 'OpenAI', 2023). For years, the company has worked for research and made AI develop by training with the involvement of users free from the platform. The last released version was the 3.5th generation at the time of this research started; however, the fourth generation was released on 14.03.2023, which had the ancestors of Chat Gpt 2.0 and 3.0

(‘ChatGPT’, 2023; Floridi & Chiriatti, 2020). The chat box from web explorer is used to enrich freely with registration. An example of the user interface is shown in Figure 1. Talking to AI with a basic chat box is possible, and the answers are written within a while. The continuity of conversation could be maintained by giving references in user’s talk related to earlier subjects. At the left the menu could be seen to reach and manage recorded conversations. An upgrade purchase is available to use limitless, get faster response and priority access to new features.

Experiments with Chat GPT are increasing after the first announcement in November 2022. Some working and research articles seek possible capabilities and limitations over diverse subjects and methods. Asking it to write three stories (Mcgee, 2023a), asking about the best and worst U.S. Presidents (Mcgee, 2023b), or asking about the role of Chat GPT are some examples of seeking the

possibilities. Besides the scope, limits, and consequences of AI (Floridi & Chiriatti, 2020; Yang, Li, Zhang, Chen, & Cheng, 2023), playing games with GPT (Sobieszek & Price, 2022) and the potential use of Chat GPT in global warming (S. S. Biswas, 2023) could be found in the literature. Since the utilization of this kind of AI release started new, the amount of developed studies within the frameworks is limited. However, studies for diverse disciplines and methods seeking possibilities and limitations are expected.

With the developments, experiments, and training, AI will contribute more to all industries and scientific areas. Landgrebe (2021) listed some important issues that learning activities should accomplish to initiate AI: sufficient training data, storing data digitally, consistency, and variance. Thus, the released AI project like Chat GPT makes people participate in training by asking them to use it freely.

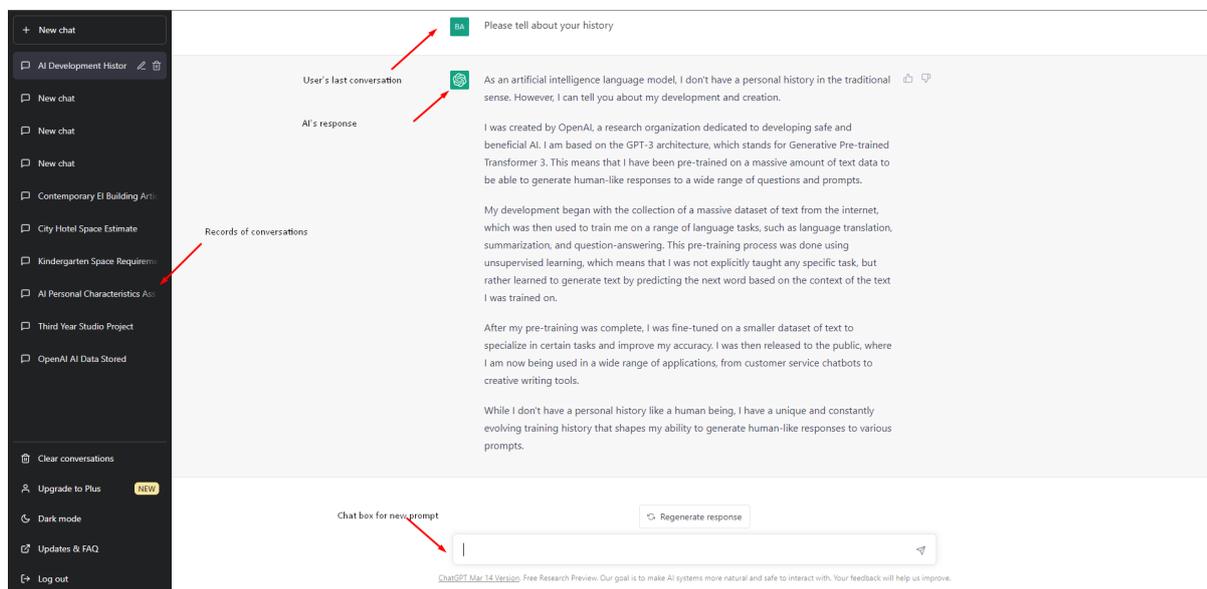


Figure 1: Chat CPT User Interface (‘ChatGPT’, 2023)

Methodology

The research is about the preliminary exploration of AI – Chat GPT considering capturing the knowledge for shaping the design studio works for architectural students. The third-year architectural studio is chosen for the examination since it is between the basic design, introduction to architectural design studios, and last year, final project studios. The research flow is presented in Figure 2. First, the framework of the semi-structured interview was defined in terms of the layout of the questions' themes, then registry to Chat GPT was done. The interview was executed with Chat GPT, and recordings were presented. Delphi Technique was executed among experts from universities to evaluate interview findings. It uses specialists to create present and future scenarios focused on particular problems (Renzi & Freitas, 2015). In order to analyze, produce, or validate knowledge from many experiences and points of view by establishing a shared scenario, a technique has been widely utilized and recognized since the 1960s (Renzi & Freitas, 2015; Şahin, 2001; Turoff & Linstone, 2002). Delphi technique has the advantages of allowing participants to express their opinions

on a research issue, connecting existing knowledge and areas of agreement, not requiring proximity or face-to-face meetings, reducing the impact of noise on communication, and collecting individual feedback for evaluation by groups of experts (Fink-Hafner, Dagen, Dousak, Novak, & Hafner-Fink, 2019).

The samples are surveyed through questionnaires or interviews, and surveys can vary from highly structured questionnaires to unstructured interviews (Ghosh & Robson, 2015). Interviews are one of the methods for collecting data from respondents. The focus group of interviews is decided according to research objectives. One respondent is capable of responding as a language model for this research. Besides, the semi-structured interview is decided to execute the experiment. The themes of questions are designed to explore the requirements and knowledge for defining third-year design studio work as follows:

- 1- Possible subjects and properties for a third-year design studio besides Turkey
- 2- Architectural program and concepts

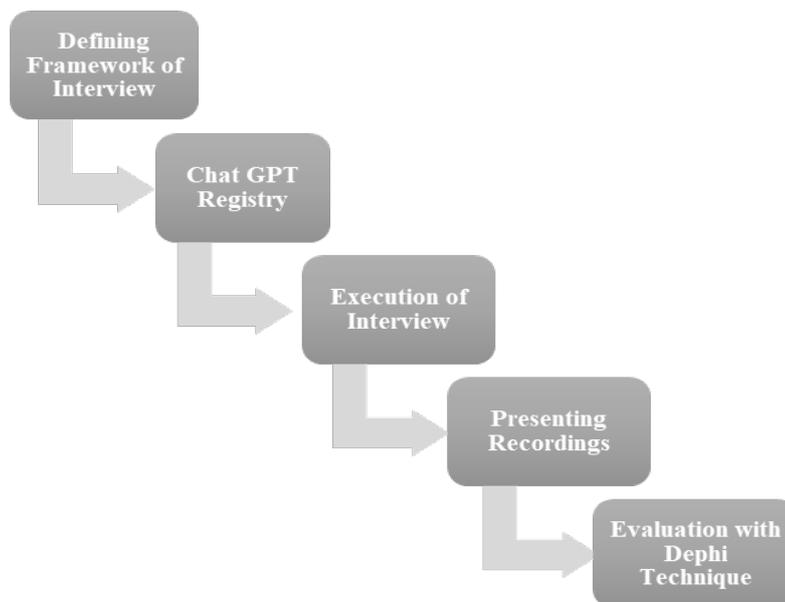


Figure 2: Research Flow

- for contemporary problems
- 3- Possible lands and proper student numbers for the studio
 - 4- Studio schedule and projects in the continuation

The semi-structured interviews are executed considering pre-decided questions subjects; however, it is known that the interviewer should be capable of arranging, expanding, and narrowing the issues due to the interviewee's response. Theme 2,3 and 4 questions will be asked after selecting a project subject from responses.

Findings: Interview with AI

This section presents the interview records with chat GPT which was made on 29.01.2023. It should be noted that sometimes the author re-asked the same question by adding the context of former ones to keep the interview continuity. The final questions were shaped due to the interview flow within the limits of structured themes. Questions 1,2,3, and 4 are for theme 1, 5 and 6 are for theme 2, 7,8 and 9 are for theme 3, and questions 10 and 11 are for theme 4.

(Q1) Author: What are the possible subjects for a third year studio project for architectural education?

Chat GPT:

- Designing a mixed-use development or urban infill project
- Creating a master plan for a campus or community
- Designing a housing project for a specific population or income group
- Developing a proposal for a sustainable or resilient building or community
- Investigating the preservation and adaptive reuse of a historic building or district
- Designing a transportation hub or other infrastructure project
- Creating a proposal for a public space or park
- Examining the design of a specific building type, such as a school or hospital

- Investigating the relationship between architecture and landscape or the environment
- Examining the role of architecture in addressing social or cultural issues
- Designing a community center or cultural facility
- Developing a proposal for an eco-tourism resort
- Designing a green roof or urban agriculture project
- Examining the relationship between architecture and technology, such as designing a smart building
- Investigating the design of disaster-resistant building
- Designing a co-living or co-working space
- Examining the design of a specific building type, such as a data center or laboratory facility
- Investigating the relationship between architecture and urbanism, such as designing a pedestrian-friendly street or neighborhood
- Examining the role of architecture in addressing issues related to accessibility and universal design
- Investigating the design of an urban renewal project or a brownfield redevelopment

(Q2) Author: Does it change due to country or university?

Chat GPT: The specific subjects for a third-year studio project in architectural education can vary depending on the country and university. Different countries and universities may place different emphasis on certain issues, such as sustainability, preservation, or urban design. Additionally, the resources and expertise available at a particular university can also influence the subjects that are offered. Some universities may have a strong focus on design and technology, while others may place more emphasis on research and theory. Additionally, some universities may offer studio projects that are focused on local issues and challenges, such as designing for a specific

climate or addressing the needs of a particular community.

(Q3) Author: How about the architectural education in Turkey?

Chat GPT: Architectural education in Turkey is provided by universities that have a Faculty of Architecture. The curriculum generally includes courses in design, history and theory of architecture, building technology, urban design, and professional practice. The architectural education in Turkey usually takes five years to complete, with the third year being the first year of studio projects. The curriculum of architecture education in Turkey has been changing in recent years to adapt to the changing demands of the industry and the profession. The focus is on providing students with a strong foundation in design and technology while also addressing issues such as sustainability and urbanism. The studio projects are also designed to reflect these changing demands, and they may include subjects such as sustainable urban design, smart building design, and adaptive reuse of historical buildings. Additionally, the architectural education in Turkey is also influenced by the country's history, culture, and context. For example, the curriculum may include courses on traditional Turkish architecture and the design of buildings for specific uses and functions, such as mosques or hammams.

(Q4) Author: What are the properties of 3rd year studio projects of architectural education in Turkey?

Chat GPT:

- Design-oriented: Third-year studio projects are typically focused on the design process and involve the development of architectural solutions to a specific problem or challenge.
- Integrated approach: Studio projects often integrate various aspects of architectural education, such as design, history and theory, building technology, and urban design.
- Site-specific: Studio projects are often site-specific and may involve the design

of a building or development for a specific location or community.

- Research-oriented: Third-year studio projects often require students to conduct research on a specific topic or issue related to architecture, such as sustainable design or urban renewal.
- Teamwork: Studio projects are often done in teams, which allows students to collaborate and learn from each other.
- Critique and feedback: Studio projects often involve regular critiques and feedback from instructors and peers, which helps students to improve their design skills.
- Hands-on learning: Studio projects provide a hands-on learning experience, allowing students to apply the knowledge and skills they have acquired in their coursework to real-world design challenges.
- Context-sensitive: Studio projects in Turkey are context-sensitive, which means they take into account the cultural, social and environmental context of the country.
- Problem-solving: Third-year studio projects in Turkey aim to teach students how to solve architectural problems and how to generate alternatives.
- Professional development: Studio projects also aim to prepare students for professional practice by providing experience in project management, teamwork, and communication skills.

(Q5) Author: Can you arrange the architectural program of community center for third year architectural students?

Chat GPT:

1. Multi-Purpose Room: A space of around 200 square meters, with a flexible layout that can be used for a variety of activities such as events, meetings, classes, and performances.
2. Gymnasium: A space of around 150 square meters, with a standard basketball court and equipment for sports and physical activities, such as weightlifting and cardio machines.

3. Kitchen and Dining Area: A space of around 100 square meters, with a commercial kitchen and a dining area for events and gatherings.
4. Library: A space of around 50 square meters, with a collection of books, magazines, and other resources.
5. Arts and Crafts Room: A space of around 40 square meters, with room for creative activities, such as painting, drawing, and pottery.
6. Computer Room: A space of around 40 square meters, with a variety of computer stations and software for use by the community.
7. Meeting Rooms: A variety of smaller rooms of around 25 square meters each, for meetings, classes, and other activities.
8. Childcare Room: A space of around 30 square meters, with age-appropriate activities and toys.
9. Offices: Space of around 50 square meters for staff, volunteers and administration.
10. Reception and lobby: Space of around 20 square meters for welcoming 7h y 77yy visitors and providing information.
11. Outdoor spaces: Outdoor spaces such as a playground, gardens, and terraces can be designed to provide additional space for activities and socializing.
12. Parking and Accessibility: Parking and accessibility should also be considered in the design of the building, to ensure that the community center is easily accessible to all members of the community.

The total area for a third-year architectural studio project for students will depend on the specific project and the requirements of the university or program. However, it is not uncommon for third-year studio projects to have a total area of around 1000-2000 square meters. This allows for a relatively large and complex project that can accommodate a variety of spaces and functions, while still being manageable for students who are still developing their design and technical skills.

(Q6) Author: What are possible concepts for community center project as third year design studio?

Chat GPT:

1. Community engagement and participation: This concept is focused on involving the local community in the design process, and designing a community center that reflects the needs, values, and aspirations of the community. This can include holding workshops, meetings, and surveys to gather feedback and input from community members.
2. Accessibility and inclusivity: This concept is focused on designing a community center that is accessible and inclusive for all members of the community, regardless of age, ability, or socio-economic status. This can include features such as ramps, elevators, and wide doorways to accommodate wheelchairs, as well as a variety of spaces and activities to cater to different needs and interests.
3. Adaptability and flexibility: This concept is focused on designing a community center that is flexible and adaptable to changing needs and uses over time. This can include using modular or prefabricated building systems, and designing spaces that can be easily reconfigured to accommodate different activities and events.
4. Sustainability: This concept is focused on designing a community center that is environmentally friendly, uses resources efficiently, and minimizes its impact on the natural environment. This can include features such as solar panels, rainwater harvesting systems, and green roofs.
5. Community health and well-being: This concept is focused on designing a community center that promotes physical and mental health and well-being. This can include features such as a gym, a library, and a childcare room, as well as green spaces and outdoor areas for recreation and socializing.

6. Cultural identity: This concept is focused on designing a community center that reflects the cultural identity and heritage of the local community. This can include using traditional materials, forms, and motifs in the design, and incorporating art and artifacts from the community in the center.
7. Climate change and resiliency: This concept is focused on designing a community center that is resilient to the impacts of climate change, such as sea-level rise, extreme weather events, and heatwaves.

(Q7) Author: Do you have any real recommendation for the land in Turkey for this project?

Chat GPT: I am sorry, as a language model, I do not have the capability to provide specific recommendations for land in Turkey for a community center project as it would require knowledge of current available land, regulations, and community specific demographics. However, I can suggest that when searching for a suitable land, it would be beneficial to consult with local authorities and community leaders to understand the specific needs and opportunities of the community.

(Q8) Author: Do you have access to maps?

Chat GPT: As a language model, I do not have direct access to maps or the internet to provide you with specific location. However, I can try to provide you with general information on a specific location or address if you provide me with it. Additionally, I can give you suggestions on how to find maps and information on locations

(Q9) Author: How many students are proper for this studio?

Chat GPT: The number of students that would be appropriate for a third-year architectural studio project depends on a variety of factors such as the size and complexity of the project, the resources available to the students, and the teaching style of the instructor. In general, a third-year architectural studio project is usually designed for a small group of students, usually

between 4 to 8 students. This allows for individualized attention and guidance from the instructor, and allows for more in-depth exploration of the design concepts and issues related to the project.

(Q10) Author: Which project is proper to give after this project?

Chat GPT: A common progression for architectural education is to move from smaller scale projects such as single-family homes or small-scale community centers in the early years to larger scale projects such as multi-unit housing, mixed-use buildings or urban design projects in the later years. A fourth-year architectural studio project could be focused on a larger-scale community center, a mixed-use development, or an urban design project. This would allow students to apply the skills and knowledge they have gained in the previous studio in a more complex and challenging context. Another option could be to focus on a different typology, such as a healthcare facility, a hotel, or an office building. This would allow students to explore different design considerations and building systems while applying the skills they gained in the previous studio. Alternatively, the students could be given the opportunity to work on a real-world project, either by participating in a design competition or by working on a project in collaboration with a local community organization or developer. This would provide students with valuable experience in working with real-world constraints and clients and give them an understanding of the practical aspects of the profession.

(Q11) Author: What is schedule of work for third-year architectural studio project focused on a community center?

Chat GPT:

- Initial research and site analysis: This phase would involve researching the community and the site to understand the needs of the community, the context of the site, and any constraints or opportunities that may impact the design.
- Programming and conceptual design: Students would develop a program of

spaces and requirements for the community center, and would begin to explore different design concepts and solutions.

- Schematic design: Students would develop and refine their chosen design concept, and would begin to develop detailed plans, elevations, and sections.
- Design development: Students would continue to refine their design, and would begin to consider building systems and materials, as well as any necessary permits or approvals.
- Construction documents: Students would finalize their plans, elevations, and sections, and would begin to prepare the necessary construction documents.
- Modeling and presentation: Students would create physical or digital models of their design, and would present their design to a panel of faculty members and/or industry professionals.
- Final review and critique: The students would receive feedback and critiques on their designs, and would make any necessary revisions before final submission.

Evaluation with Delphi Technique

The phases for the Delphi process used in this study are shown in Figure 3, and its goal is to have professionals with experience in instructing architectural design studios for

evaluating the interview with chat GPT. Five educators responded to the survey with an experience of seven years on average. At the beginning of the process, they were informed of the survey study, the research goal, and the testing protocol. Each stage was carried out independently, without prior knowledge of the others. The interview, including the question of the author and responses of AI was sent to them and asked for their comments/statements about sections separately. The statements and criticisms were then listed and distributed to experts for evaluation. The response scale is organized in a likert scale commonly used in questionnaires between 1-7 (1-definitely disagree, 2- disagree, 3- partially disagree, 4- indecisive, 5- partially agree, 6- agree, 7- agree). The collected responses were examined through statistical calculations commonly used for descriptive evaluation in Delphi technique. Median (MD) is a value that shows an average of responses, quarter 1(Q1) is value that takes the 25% of responses at the left and 75% of responses, quarter 3(Q3) is value that takes the 75% of responses at the left and 25% of responses the right, and range \mathbb{R} is the distance between quarters (Şahin, 2001). Smaller range value shows the consensus of respondents on objected items; higher values of the range show the opposite. At the last round, experts were informed about the common results of

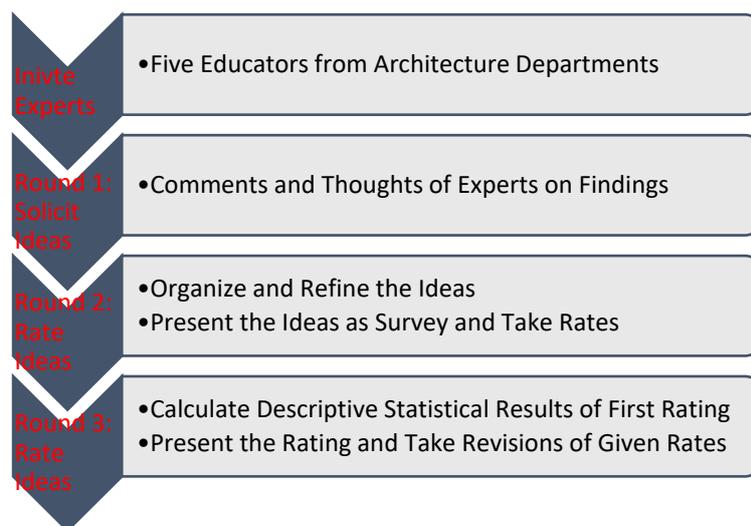


Figure 3: Evaluation via Delphi technique

rates, including the explanation about MD, Q1, Q3, and R. They were asked to examine the results and revise their previous rating if they wanted to. It is possible to continue on rounds in Delphi technique to obtain more consensus or in the situation that the revision of ratings is

high. Three rounds are decided to be adequate for this research. However, the possibility of other rounds stands if the rating revision is high.

Table 1: Results of the evaluation for question 1 (theme 1)

Responses for "What are the possible subjects for a third-year studio project for architectural education?"					
ID	Statement/Comment	Md	Q1	Q2	R
1.1	Transportation hub and infrastructure projects are not suitable for third year	4,00	1,50	7,00	5,50
1.2	Answers are more related to urban design studio than architectural design	5,00	2,50	6,00	3,50
1.3	Third year education differs due to country. Question should be more specific	6,00	4,50	7,00	2,50
1.4	Responses are so general, some topics are not related to architectural design	6,00	4,00	7,00	3,00
1.5	Examination for different studio years should be done for evaluation	4,50	4,00	5,75	1,75
1.6	The proposals starting with designing, creating and developing are related to third year	5,00	3,50	7,00	3,50
1.7	The proposals starting with examining, and investigating are much related to graduates	5,00	3,50	7,00	3,50

Table 2: Results of the evaluation for question 4 (theme 2)

Responses for "What are the properties of 3rd year studio projects of architectural education in Turkey?"					
ID	Statement/Comment	Md	Q1	Q2	R
2.1	Responses are so general, they are also valid for other studios	7,00	6,00	7,00	1,00
2.2	Computer science should also be underlined in responses	5,00	3,00	6,00	3,00
2.3	Responses are mixture of statements applicable for architectural education, but they are not specific for Turkey	7,00	5,50	7,00	1,50
2.4	Reaching this kind of knowledge without endeavor on research is problematic	5,00	4,00	6,75	2,75
2.5	Question should have some specific statement for methods, outcomes or planned objectives	6,00	5,00	6,50	1,50

Table 3: Results of the evaluation for question 5 (theme 2)

Responses for "Can you arrange the architectural program of community center for third year architectural students?"					
ID	Statement/Comment	Md	Q1	Q2	R
3.1	The answers are only based on spaces and functional needs	6,00	6,00	7,00	1,00
3.2	The total area of project is not proper for third year studio	6,00	4,50	7,00	2,50
3.3	It is good a have a idea about the program to develop	5,50	4,25	6,75	2,50
3.4	Responses may be generated in more detailed version if the question has some statements	5,00	4,00	6,00	2,00
3.5	This approach can be used by students if the program has not been given	6,00	5,00	6,50	1,50
3.6	Some areas for spaces are not true. For example; for kitchen or dining hall	6,00	6,00	7,00	1,00

Table 4: Results of the evaluation for question 6 (theme 2)

Responses for "What are possible concepts for community center project as third year design studio?"					
ID	Statement/Comment	Md	Q1	Q2	R
4.1	Contemporary popular subjects are offered	7,00	3,50	7,00	3,50
4.2	These are related to important aspects to be considered, not specific for asked question	6,50	6,00	7,00	1,00
4.3	It could be better if a hierarchy between them would be suggested specific for third year	5,50	5,00	6,75	1,75
4.4	It focuses on functional, environmental and technical generic concepts, sustainability, accessibility and inclusiveness are principles which should be followed and achieved in every type of project	6,00	5,50	7,00	1,50
4.5	Philosophical, abstract, symbolic, and even configurative architectural concepts are excluded from the answer	7,00	5,50	7,00	1,50

Table 5: Results of the evaluation for question 9 (theme 3)

Responses for "How many students are proper for this studio?"					
ID	Statement/Comment	Md	Q1	Q2	R
5.1	It seems that still the system can not have this logical and analytical thinking which links the different topics and whole chat together	7,00	5,50	7,00	1,50
5.2	This is the optimum range (which is still general for this less number) for individualized attention and guidance, which is concluded from general group works independent from architectural education or 3rd year design studio	6,00	5,00	6,50	1,50
5.3	Answer of Chat GPT may be for optimal studios but not reflecting Turkey specific facts	6,00	6,00	7,00	1,00

Table 6: Results of the evaluation for question 10 (theme 4)

Responses for "Which project is proper to give after this project?"					
ID	Statement/Comment	Md	Q1	Q2	R
6.1	Since AI bots are still weak in education management and control, it will be better to give some hints to lead the suggestions	6,50	6,00	7,00	1,00
6.2	For someone who has no idea about architectural education this can be helpful	6,00	4,00	7,00	3,00
6.3	The answers show some valuable recommendations	6,00	5,00	7,00	2,00
6.4	The approach of Chat CPT is acceptable	6,00	2,50	7,00	4,50

Table 7: Results of the evaluation for question 11 (theme 4)

Responses for "What is schedule of work for third-year architectural studio project focused on a community center?"					
ID	Statement/Comment	Md	Q1	Q2	R
7.1	It is interesting to give schedule with the details of building system, material and construction	7,00	3,50	7,00	3,50
7.2	The work schedule presented by Chat GPT reflects a project delivery process rather than studio project submission	6,00	5,50	7,00	1,50
7.3	Chat GPT is successful in general to arrange the order of work schedule for practitioners	7,00	3,50	7,00	3,50
7.4	This is really too general independent from community center project and 3rd year	6,00	5,50	7,00	1,50
7.5	It should also be criticized to constitute a base for a studio design work regarding ethic and academic/professional knowledge as a method	6,00	3,50	7,00	3,50
7.6	It should also introduce and suggest durations of every task and the relation between them to create the sequence and final total time	7,00	5,00	7,00	2,00
7.7	Jury after final submission should be considered as part of the schedule, and it is missing in the answer here	6,00	5,50	7,00	1,50

The findings section presents eleven questions and their responses to 4 different themes. These are revealing records of the interview. Some questions are to make the interview in continuity, and some have no responses to be evaluated by the experts in terms of contents, such as having no access to real map data. Thus, the relevant questions are used for Delphi sessions, and the rest are evaluated in the discussion section. The results of Delphi session are presented in Table 1-7. The questions are expressed in the heading, Id numbers are assigned, and rate calculations are presented in the tables.

Discussions on Evaluations

The interview recordings are accurately presented in the time sequence of the

conversion with chat GPT. It can be stated that the knowledge and explanations for the author's questions are valuable to evaluate. It is hard to understand this issue with any basic web survey or literature survey at a baseline level. However, some approaches and responses of AI have so general perspectives and conflicts. Experts' evaluations are significant for exploring the possibilities, conflicts, limits, and utilization of chat GPT.

Some issues must be underlined for the possibilities and benefits of capturing knowledge and elaborating the third-year architectural design studio work. Chat GPT offers many projects, including mixed-use development to community centers, which should be further examined in detail. Looking

at Id 1.3 and 1.4, it could be stated that responses are too general and not specified for Turkey. Detail explanation should be added to the question to have intended answers. Besides, for the comparison, it is better to try getting answers for other design studio levels (1.5). The properties of a third-year studio are listed as design-oriented, site-specific, research-oriented, teamwork, critique and feedback, hands-on learning, context-sensitive, problem-solving, and professional development. These are valid articles for defining a third-year studio but are also important for other design studios and other countries. It seems that the statements are not specific enough and are generic (2.1, 2.3). Besides, experts stated that reaching this knowledge without endeavor research is problematic at a level (2.4). However, by asking specified questions, outcomes will benefit from planned objectives (2.5). AI generates an architectural program for a community center project for a third-year studio, which needs more detail and explanation. Besides, the scale and context are proper for the studio level (3.3, 3.5). The architectural program is based on spaces and functional needs, some of which are not true (3.1, 3.6).

The possible concepts that may be embedded in the project subject are asked. The opportunities with detailed explanations are listed as Community engagement and participation, accessibility and inclusivity, adaptability and flexibility, sustainability, community health and well-being, cultural identity, and climate change. Chat GPT is more successful in generating concepts for studio subjects than design education properties to address general contemporary issues (4.1, 4.4). However, the responses do not express the concept for only third year studio and need improvement (4.2, 4.3). The team number of the studio is also asked for AI, it recommends 4 to 8 students with some general statements. The answers do not reflect the Turkey conditions, stating the optimum range independent from third year architectural design studio (5.2, 5.3).

Chat GPT is asked to offer the following studio work, which could be handled after the community center project. The offers are so general; however, it also presents an amount of the possible project subject. This part's significance is evidence that AI could maintain the continuity of the conversation. Since there are no specific words for the community center in the question, the response is related. The offers may not be used directly; however, they have a good value to be used as a hint and research base for defining the next studio (6.1, 6.3). It can be easily understood from the schedule response that it generates and presents a general layout for any architectural design studio rather than a community center in the third year (7.4). Chat GPT successfully shapes the general schedule layout, like project delivery in vocational practice (7.2). Some parts related to time, final jury, and task relations are not stated and needs to ask detailed question to get better answers (7.6, 7.7)

Although it should be noted that chat GPT pays attention to creating conflict for responses, some conflicts related to the surveyed area are noticed. First, the duration explanations for Turkey's architectural education are almost completely wrong. The undergraduate education is not five years, and the studio education start before the third year. Another example is recommending a larger-scale community center project in the fourth studio after the community center project at the third-year studio. Changing only scale is meaningless for arranging studio works. 4-8 students per instructor in an architectural studio is nearly impossible to provide for Turkey and many countries.

From the interview recordings, there are some limitations stated. First, for some questions chat, GPT responds in a generic approach, not context and subject-specific. Users should re-ask by narrowing the issue with details to get the answers in scope. Thus, the questions and conversation's flow always need attention and repetition to ensure the integrity and stay in context. The next issue is being unable to reach map or satellite data. Normal users can

easily reach the data; however, this language model cannot. It seems there needs to be some progress in enriching this level. The AI has no specific separation or evaluation between diverse countries or universities considering the architectural education, except stating Turkey's historical context, like mosques and hammams.

Conclusion

Any process for defining an architectural design studio could not be done only considering the knowledge from one resource. Collaborative workings, web and literature surveys and discussion on design studio works, experience and background of the instructors, curriculum, and department statement shape issues and facts for defining and executing any design studio. Obviously, the experience of instructors, the execution of scientific surveys, and research with framework result in more valuable and validated outcomes for defining an architectural design studio, like capturing and creating any knowledge. However, the contribution of AI cannot be denied in generating and creating any type of knowledge. Over time, scientific research and examinations in practice will improve the methods and frameworks for better interaction with artificial intelligence tools. In the previous sections, the recordings and discussion on the interview are presented and then evaluated with experts from architectural departments by Delphi techniques. The rated statements and comments are valuable to explore the possibilities, conflicts, and limits of the chat GPT at the research date. AI, like Chat GPT, is a new player that develops continuously. By that time, it will participate with different degrees in various areas, disciplines, educational life, research, and commercial business. This study mainly underlines that it can also be an actor in creating knowledge or a framework for a process of education like an architectural design studio. The findings, with evaluation by experts and discussions, are expected to expand the view on using AI with presenting possibilities, conflict, and limits and enable further research and experiments on artificial intelligence as a party

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Design Studio Insights: Anthropometric Considerations for Ergonomic Design of Wet Services

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Abstract: Ergonomics is a vital consideration for space design. In architecture education, ergonomics is usually taught in the design studio with various learning methods such as lecture, demonstration, survey, design exercise etc. This article presents an anthropometric study through a design studio exercise dedicated to learning ergonomic considerations. It presents an anthropometric dataset prepared within the studio exercise for designing lavatory and kitchen spaces. In Bangladesh, there is a scarcity of anthropometric data useful for architecture, therefore some reference standards are consulted in the academic and practical field of architecture to integrate ergonomics in design. The presented dataset can serve as a source data for this purpose. Analysis of the derived dataset also raises questions about the suitability of the commonly practiced reference standards.

Keywords: Ergonomics, Design studio, Architecture, Anthropometry, Reference standards

Introduction

Ergonomics is the scientific discipline concerned with the understanding of the interactions among humans and other elements of a system, it also considers the profession that applies theory, principles, data and methods to design for optimization of human wellbeing and system performance (International Ergonomics Association, 2000). In this vein, the importance and necessity of ergonomics in the built environment is widely acclaimed for building performance, users comfort and sustainable development (Attaianese, 2012, 2017; Attaianese & Duca, 2012; Biswas et al., 2021; Charytonowicz, n.d.; Costa et al., 2012; Eilouti, 2021; Garneau & Parkinson, 2016; Hendrick, 2008; Klamklay et al., 2008; Mokdad, 2002; Olguntürk & Demirkan, 2009; Pentikis et al., 2002; Pheasant & Haslegrave, 2018; Radjiyev et al., 2015; Sanders & McCormick, 1993).

Study of ergonomics in architecture education primarily focuses on the understanding of human activities and spatial requirement for comfortable accommodation and simultaneously generate elaborate analysis of the users and their living/working environment (Biswas, 2022; Biswas et al., 2021; Villeneuve, 2000). Scholars agree that integrating ergonomics in design schools have proven success in improving performance, functional efficiency, productivity, financial efficiency, workability safety, comfort and health in the built environment (Attaianese, 2017; Attaianese & Duca, 2012; Garneau & Parkinson, 2016, Charytonowicz, 2000; Olguntürk & Demirkan, 2009; Remijn, 2006). In architecture education, human factors and ergonomics are typically taught within the design studio courses, which is the core of architecture education. Sometimes separate lecture courses are offered. Biswas et al.

(2021) suggest that studio exercise of ergonomics improves the learning capabilities of students regarding preparation of architecture program and spatial efficiency in other design exercise. With several examples, in architecture and other discipline, Moody (2011) argues in favor of the studio approach for teaching ergonomics, pointing that the studio environment is the core strength that facilitates effective learning. The studio environment facilitates formal and informal interaction between the teachers and students, lateral learning, formal and informal critiques, feedback, open and group discussion etc. Such studio environment is very much intrinsic to architecture education, and often considered a culture. However, despite the recognized significance, scholars often consider that yet there is lack of ergonomic approaches in the academic field (Attaianese & Duca, 2012; Costa et al., 2012; Fross, 2014).

In Bangladesh, ergonomics is usually taught in the design studio format (Biswas, 2022; Biswas et al., 2021). Design studios usually employ different techniques for learning along with design project exercise. Students often receive hands on training with learning from the context through workshop, site visit, site survey, survey of specific functions, precedents study, standards study etc. In this way, studio exercise produce knowledge that is useful not only for the students, but also for practical field. This article presents knowledge generated in a studio project, dedicated for learning ergonomic considerations for designing wet service spaces, at the Department of Architecture, Military Institute of Science and Technology (MIST), Bangladesh. It presents an anthropometric dataset derived under the studio exercise. Following the dearth of anthropometric data for architectural design purpose in Bangladesh, the presented dataset in this article can be utilized as a basic source for designing wet service spaces and/or similar functions. Comparison between the dataset and reference standards, commonly consulted in practice and education of architecture, indicates that there is mismatch between the standards and local context.

Data for Ergonomic Design in Bangladesh

in Bangladesh, there is a vacuum in the field of anthropometric data for architecture. Building design is regulated by the national building code (GoB, 2020) and the regulations for building construction in the Dhaka Metropolitan area (Ministry of Housing and Public Works, 2008). These guidelines may have some ergonomic consideration, but they do not mention any reference or standards.

There are studies in the health sector that have anthropometric data, but they mostly contain stature, weight, and body mass index (BMI) (Flora et al., 2009). Some studies have covered detail anthropometry of body parts, like hand, ear, face, head etc. and/or focused on specific tribal people in Bangladesh. (Akhter et al., 2010; Asadujjaman et al., 2019, 2019; Hossain, 2015; Tania et al., 2020).

Some studies covered anthropometry for furniture such as classroom and library furniture (Hoque et al., 2014; M. Parvez et al., 2022; M. S. Parvez et al., 2021; S. Parvez et al., 2022; Shah et al., 2013), hospital bed (Chakraborty et al., 2014; Islam et al., 2013)etc. These provide better dataset; however, they are not designed for architecture. Following the severe deficiency of anthropometric data for architects, architecture schools tend to rely on reference standards (Biswas, 2022; Biswas et al., 2021).

Methods and Materials

This study is primarily derived from a design studio course, namely ARCH 2101: Design Studio III in the Spring 2022 semester dedicated for learning anthropometry to integrate ergonomics in design. The author was in lead of the studio along with two other colleagues. This article focuses on the knowledge generated from an anthropometric survey within the studio exercise and further analysis of the survey results.

Project Design

The project was exercised with a series of lectures, study, demonstration, and a survey aimed to develop an understanding of anthropometric determinants of design for

specific functions, which was wet service in this case. Following lectures and literature study, demonstrations were made in the studio with live activity of the studio instructors and students with dummy fixtures and scale models to develop an understanding of the relation of human body dimensions and different postures for comfortably performing a particular task. Afterwards, an anthropometric survey was conducted.

Anthropometric Survey

The survey was conducted by the students. Participants were selected according to convenience. Body measurements were taken from 144 adult individuals 72 male and 72 female. The participants included all the students of the class, their family members, and students of other departments in MIST. All the participants participated in the survey voluntarily and with informed consent that the data would be used for academic purposes. The participants received no compensation or incentive for their participation. The age range of the participants was 18 to 67 years for female and 18 to 74 years for male.

Selection of Body Dimensions

All the dimensions considered in this study were static dimension. Dynamic dimensions are usually more applicable for designing equipment, tools workstations etc. In this study, dynamic dimensions were not essential for kitchen and lavatory function. Considering the reach related dimensions as dynamic might have brought better design consideration for reaching upper cabinets, but due to the resource constraints of dynamic dimension measurement system, reach dimensions were considered as static and measured at specific positions.

The postures were selected based on the relevance for kitchen (primarily sink) and lavatory (primarily wash basin) and based on review of three reference books that are commonly consulted in the practice and education of architecture. The books consulted are:

1. Time-Saver Standards for Building Types (De Chiara & Callender, 1990)

2. Human Dimension and Interior Space: A source Book of Design Reference Standards (Panero & Zelnik, 1979)
3. Neufert Architects Data (Neufert & Neufert, 2012)

Along with age and weight, 13 body dimensions were selected for the survey based on relevance. The dimensions are selected following the reference standards for convenient comparison. These dimensions are as follows.

Stature: It is the vertical distance from the floor to the top of the head measured while the subject stands upright and looking straight ahead (Panero & Zelnik, 1979). This data is required to determine the minimum distance of overhead obstructions from the floor.

Eye Height: It is the vertical distance from the floor to the corner of the eye measured while the subject looking straight ahead (Panero & Zelnik, 1979). This data is useful for considering the height of upper cabinet in kitchen and mirror/medicine cabinet in the lavatory.

Shoulder Height: It is the vertical distance from the floor to the top of the shoulder (acromion) measured while the subject stands upright and looking straight ahead. This data is data is useful for considering the height of elements like upper cabinet/shelf/towel rack etc. in the kitchen and lavatory (Neufert & Neufert, 2012).

Elbow Height: It is the vertical distance from the floor to the depression formed at the elbow, where the forearm meets the upper arm (Panero & Zelnik, 1979). This is required to determine the height of work counter/sink and wash basin.

Navel Height: It is the vertical distance from the floor to the navel of the subject standing upright. This measurement is considered as a substitution of waist height following the difficulty of measuring waist height. This data is associated with the comfort in bending forward which is considered to determine the height of the work counter/lower cabinet and wash basin (De Chiara & Callender, 1990; Neufert & Neufert, 2012).

Maximum Body Depth: It is the horizontal distance between the most anterior point on the

body (usually chest or abdomen) to the most posterior point (usually buttock or shoulder) (Panero & Zelnik, 1979). This body dimension must be considered to determine adequate interior space and the clearance between counters/appliances/fixtures.

Maximum Body Breadth: It is the maximum distance across the body including arms (Panero & Zelnik, 1979). The implication is similar to the maximum body depth.

Elbow Span: It is the distance between the tips of two elbows of the horizontally outstretched upper arms flexed so that the fingertips of the hands meet in front of the body while the subject stands upright. This data is required to determine adequate interior space in front of and from the side walls to use kitchen and lavatory fixtures (De Chiara & Callender, 1990; Neufert & Neufert, 2012; Panero & Zelnik, 1979).

Forward Arm Reach: The horizontal distance from the back of the shoulder to the fingertip while the subject standing upright and extending the arm forward. This distance is useful to determine adequate interior space in front of and from the front wall/furniture/fixture (De Chiara & Callender, 1990; Neufert & Neufert, 2012; Panero & Zelnik, 1979).

Forward Grip Reach: The horizontal distance from the back of the shoulder to the thumb tip measured while the subject standing upright, extending the arm forward and the index finger touching the thumb tip (Panero & Zelnik, 1979). The implication is similar to the forward arm reach.

Overhead Reach: It is the vertical distance from the floor to the fingertip measured while the subject stands upright and extends the arm at an angle of approximate 60°. This data is useful to determine the height of upper cabinet/shelf for comfortable use (De Chiara & Callender, 1990; Neufert & Neufert, 2012; Panero & Zelnik, 1979).

Squatting Position Width: this is the width of squatting position measured from the back to the fingertip while the subject is sitting in a squatting position with one arm extended and one knee bended. This dimension is required to decide adequate interior space in front of a furniture/fixture required for maneuvering and cleaning (De Chiara & Callender, 1990; Neufert & Neufert, 2012; Panero & Zelnik, 1979).

Squatting Position Height: This is the height of squatting position measured from the floor to the top of the head while the subject is seated in a squatting position with one arm

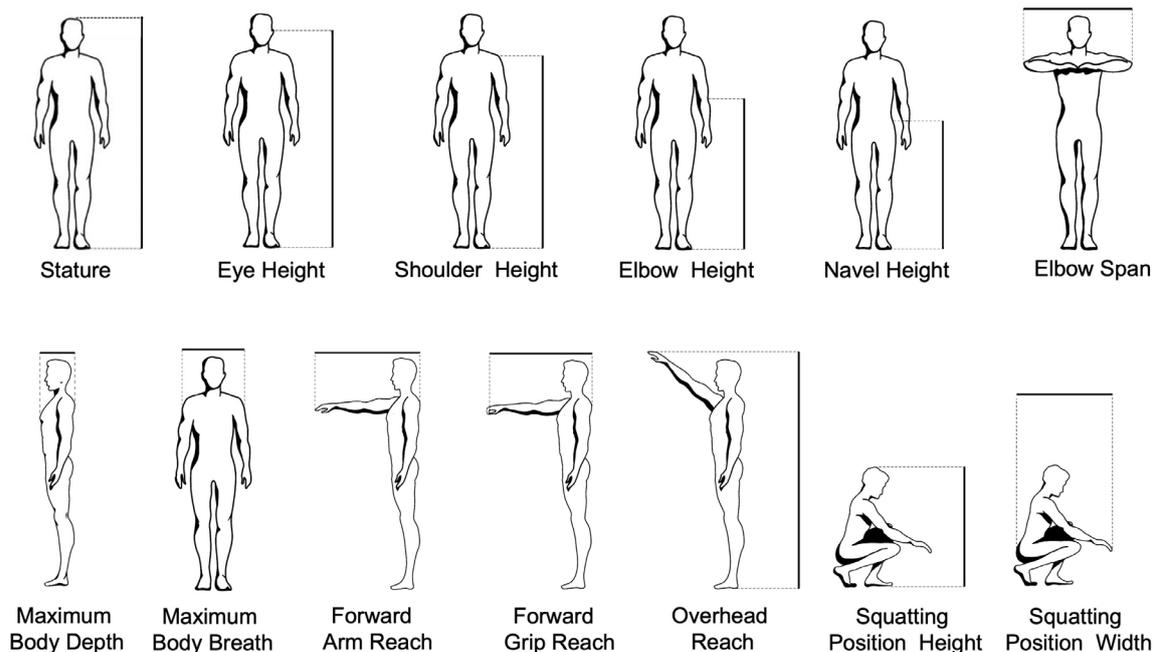


Figure 1: Body dimensions measured in the study.

extended and one knee bended. The implication is like the squatting position width.

These dimensions are shown graphically in the Figure 1.

Taking Measurements

For this survey state-of-the-art anthropometric tools were not available. Therefore, measurements were taken with conventional measurement tools. The students took measurements at the studio, at the hostel, and at their home. The students prepared a measuring corner in their studio, students from the other departments came to the studio and measurements were taken. All measurements were taken with the subject wearing regular summer clothing and without shoes or with socks only.

As precision measurement tools was not available, therefore each of the measurement was taken three times and the average was considered. Due to the lack of calipers, cardboards/rulers/any stiff material were used as substitution to improve the accuracy of measurements. The students worked in groups, and they assisted each other in taking measurements. This procedure is shown in the Figure 2.

Data Analysis

Statistical analysis involved simple examination of the data set through descriptive

statistics. This included the mean, mode, range, standard deviation, and selected percentiles. Comparison between male and female dimensions was done with t test.

Both male and female dimensions were compared with the references. For comparison, Human Dimension and Interior Space: A source Book of Design Reference Standards (Panero & Zelnik, 1979), mentioned as HD, was preferred, because of its elaborate data for both male and female. The other references, Time-Saver Standards for Building Types (De Chiara & Callender, 1990), mentioned as TSS, and Neufert Architects Data (Neufert & Neufert, 2012), mentioned as NAD, mostly provide dimensions with gender-neutral drawings. Often, in these two references, it is possible to determine gender in the illustration with features like such as clothing, body shape, hair style etc.

Limitations

The study limitations include small sample size, lack of high-quality measuring instruments, specific reference to service function etc. As the study was carried in the design studio, therefore it was not possible to conduct a random survey of a large sample size representing the national population, and in this case, convenience sampling was the rational choice. It was a student exercise, therefore, there could be human error in precision and accuracy in taking each



Figure 2: Students taking body measurements.

measurement. This study particularly focused on the use of kitchen sink and wash basin, therefore, the results may be generally applicable for similar functions that require moderate forward bending, hand movement, and reach in standing position.

Result and Discussion

The survey results are shown in the Tables 1-6. The results contain statistical description of the

survey data, selected percentile values, comparison between male and female dimensions and comparison of the survey data with the reference standards. All the measurements are expressed in cm.

Table 1 and Table 2 shows survey results male and female along with the reference dimensions.

Table 1: Male anthropometric dimensions and reference standards (unit cm)

Sl.	Anthropometric features	Male (n=72)				Reference		
		Maximum	Minimum	Mean	Std. Dev.	Male HD	Unisex NAD	Unisex TSS
1	Age	74.00	18.00	29.42	13.70	-	-	-
2	Weight	89.00	54.00	70.81	8.66	96.20	-	-
3	BMI	32.63	16.95	24.25	3.49	-	-	-
4	Stature	193.75	154.60	171.29	7.60	188.60	175.00	175.26
5	Eye Height	183.00	144.00	160.47	7.63	174.20	-	-
6	Shoulder Height	165.00	125.60	143.08	7.63	155.70	150.00	-
7	Elbow Height	120.00	95.00	108.55	5.11	120.10	-	-
8	Navel Height	114.00	87.00	100.38	6.35	-	-	-
9	Maximum Body Depth	38.00	15.24	25.48	4.14	33.00	30.00	24.13
10	Maximum Body Breadth	57.50	38.00	47.31	4.10	57.90	50.00	50.80
11	Elbow Span	101.00	80.30	90.34	4.90	-	100.00	-
12	Forward Arm Reach	107.00	76.80	85.77	5.44	-	87.50	86.36
13	Forward Grip Reach	98.00	68.00	80.18	5.96	88.90	-	-
14	Overhead Reach	230.70	183.80	201.99	10.16	-	200.00	190.50
15	Squatting Position Height	112.80	72.00	92.69	9.89	-	112.50	109.22
16	Squatting Position Width	107.00	67.90	87.67	7.87	-	70.00	55.80

Table 2: Female anthropometric dimensions and reference standards (unit cm)

Sl.	Anthropometric features	Female (n=72)				Reference		
		Maximum	Minimum	Mean	Std. Dev.	Female HD	Unisex NAD	Unisex TSS
1	Age	67.00	18.00	27.51	11.83	-	-	-
2	Weight	86.80	38.70	59.80	9.82	90.30	-	-
3	BMI	34.24	15.70	24.22	3.94	-	-	-
4	Stature	176.50	144.00	157.22	6.38	172.70	175.00	175.26
5	Eye Height	168.00	133.00	146.66	6.34	162.80	-	-
6	Shoulder Height	148.00	117.00	130.65	5.86	141.40	150.00	-
7	Elbow Height	116.00	89.00	99.18	4.41	110.70	-	-
8	Navel Height	108.00	77.50	93.75	5.58	-	-	-
9	Maximum Body Depth	36.00	18.00	24.96	4.08	-	30.00	24.13
10	Maximum Body Breadth	54.00	30.00	43.29	4.79	46.80	50.00	50.80
11	Elbow Span	91.50	68.40	82.19	4.78	-	100.00	-
12	Forward Arm Reach	88.00	71.12	78.80	3.82	-	87.50	86.36
13	Forward Grip Reach	81.00	63.00	73.28	3.71	80.50	-	-
14	Overhead Reach	214.00	166.80	185.60	9.25	-	200.00	190.50
15	Squatting Position Height	105.00	68.00	86.74	9.26	-	112.50	109.22
16	Squatting Position Width	103.00	60.00	80.60	9.03	-	70.00	55.80

The Table 3 and Table 4 presents mean, mode, maximum, minimum, standard deviation and selected percentile values that can be helpful for practical purpose.

Male body size is generally larger than the female. The derived dataset for male and

female are compared which confirms this difference. Statistical test (2 tailed paired t test for each category of male and female samples, $\alpha = .01$) shows that all the male body dimensions are significantly larger than the female with only one exception, the maximum body depth. The Table 5 shows the result.

Table 3: Male anthropometric dimensions (unit cm)

Sl.	Anthropometric features	Male (n=72)					Percentile		
		Max	Min	Mode	Mean	Std Dev	90th	50th	10th
1	Age	74.00	18.00	21.00	29.42	13.70	-	-	-
2	Weight	89.00	54.00	80.00	70.81	8.66	-	-	-
3	BMI	32.63	16.95	-	24.25	3.49	-	-	-
4	Stature	193.75	154.60	172.00	171.29	7.60	181.90	171.25	162.36
5	Eye Height	183.00	144.00	160.00	160.47	7.63	170.77	160.00	150.18
6	Shoulder Height	165.00	125.60	145.00	143.08	7.63	153.75	143.20	134.03
7	Elbow Height	120.00	95.00	109.00	108.55	5.11	114.95	108.95	101.60
8	Navel Height	114.00	87.00	102.00	100.38	6.35	107.00	101.00	91.61
9	Maximum Body Depth	38.00	15.24	22.00	25.48	4.14	31.08	25.10	21.36
10	Maximum Body Breadth	57.50	38.00	47.00	47.31	4.10	52.27	47.15	42.01
11	Elbow Span	101.00	80.30	93.00	90.34	4.90	96.52	90.00	84.73
12	Forward Arm Reach	107.00	76.80	83.00	85.77	5.44	92.92	84.50	80.10
13	Forward Grip Reach	98.00	68.00	79.00	80.18	5.96	88.50	79.05	74.63
14	Overhead Reach	230.70	183.80	210.00	201.99	10.16	215.80	201.25	189.03
15	Squatting Position Height	112.80	72.00	95.00	92.69	9.89	104.00	93.50	78.07
16	Squatting Position Width	107.00	67.90	89.00	87.67	7.87	97.54	88.30	79.10

Table 4: Female anthropometric dimensions (unit cm)

Sl.	Anthropometric features	Female (n=72)					Percentile		
		Max	Min	Mode	Mean	Std Dev	90th	50th	10th
1	Age	67.00	18.00	21.00	27.51	11.83	-	-	-
2	Weight	86.80	38.70	59.00	59.80	9.82	-	-	-
3	BMI	34.24	15.70	20.16	24.22	3.94	-	-	-
4	Stature	176.50	144.00	154.00	157.22	6.38	165.00	157.00	149.00
5	Eye Height	168.00	133.00	150.00	146.66	6.34	153.68	145.70	139.39
6	Shoulder Height	148.00	117.00	127.00	130.65	5.86	137.92	130.50	122.97
7	Elbow Height	116.00	89.00	101.00	99.18	4.41	104.00	99.00	94.00
8	Navel Height	108.00	77.50	94.00	93.75	5.58	99.27	94.00	87.27
9	Maximum Body Depth	36.00	18.00	21.00	24.96	4.08	30.00	24.00	20.45
10	Maximum Body Breadth	54.00	30.00	43.00	43.29	4.79	49.95	43.00	37.95
11	Elbow Span	91.50	68.40	80.00	82.19	4.78	88.00	82.00	76.91
12	Forward Arm Reach	88.00	71.12	80.00	78.80	3.82	83.93	79.00	73.59
13	Forward Grip Reach	81.00	63.00	73.00	73.28	3.71	78.00	73.00	68.87
14	Overhead Reach	214.00	166.80	180.00	185.60	9.25	197.00	186.00	172.90
15	Squatting Position Height	105.00	68.00	94.00	86.74	9.26	98.00	86.36	75.70
16	Squatting Position Width	103.00	60.00	80.00	80.60	9.03	92.80	80.00	69.96

Table 5: Male anthropometric dimensions compared with female dimensions (unit cm)

Sl.	Anthropometric features	Male (n=72)		Female (n=72)		Difference Male - Female	P Value
		Survey Mean	Std. Dev	Survey Mean	Std. Dev		
1	Stature	176.50	7.60	157.22	6.38	14.07	3.13066E-20
2	Eye Height	168.00	7.63	146.66	6.34	13.81	1.5564E-18
3	Shoulder Height	148.00	7.63	130.65	5.86	12.43	7.29613E-19
4	Elbow Height	116.00	5.11	99.18	4.41	9.37	1.19674E-19
5	Navel Height	108.00	6.35	93.75	5.58	6.63	2.66491E-10
6	Maximum Body Depth	36.00	4.14	24.96	4.08	0.52	0.402667536
7	Maximum Body Breadth	54.00	4.10	43.29	4.79	4.02	2.7902E-08
8	Elbow Span	91.50	4.90	82.19	4.78	8.14	5.23241E-16
9	Forward Arm Reach	88.00	5.44	78.80	3.82	6.97	3.83982E-13
10	Forward Grip Reach	81.00	5.96	73.28	3.71	6.90	2.19338E-12
11	Overhead Reach	214.00	10.16	185.60	9.25	16.39	1.13334E-16
12	Squatting Position Height	105.00	9.89	86.74	9.26	5.95	2.56327E-05
13	Squatting Position Width	103.00	7.87	80.60	9.03	7.07	1.94227E-07

Table 6: Male and female anthropometric dimensions compared with reference standards (unit cm)

Sl.	Anthropometric features	Male			Female		
		Survey Mean	Survey Mean- Ref. Male	Survey Mean- Ref. Unisex	Survey Mean	Survey Mean- Ref. Female	Survey Mean- Ref. Unisex
1	Age	67.00	-	-	27.51	-	-
2	Weight	86.80	-25.39	-	59.80	-30.50	-
3	BMI	34.24	-	-	24.22	-	-
4	Stature	176.50	-17.31	-3.97	157.22	-15.48	-18.04
5	Eye Height	168.00	-13.73	-	146.66	-16.14	-
6	Shoulder Height	148.00	-12.62	-6.92	130.65	-10.75	-19.35
7	Elbow Height	116.00	-11.55	-	99.18	-11.52	-
8	Navel Height	108.00	-	-	93.75	-	-
9	Maximum Body Depth	36.00	-7.52	-4.52	24.96	-	-5.04
10	Maximum Body Breadth	54.00	-10.59	-3.49	43.29	-3.51	-7.51
11	Elbow Span	91.50	-	-9.66	82.19	-	-17.81
12	Forward Arm Reach	88.00	-	-1.73	78.80	-	-8.70
13	Forward Grip Reach	81.00	-8.72	-	73.28	-7.22	-
14	Overhead Reach	214.00	-	1.99	185.60	-	-14.40
15	Squatting Position Height	105.00	-	-19.81	86.74	-	-25.76
16	Squatting Position Width	103.00	-	17.67	80.60	-	10.60

As mentioned earlier, in Bangladesh some reference standards are followed for ergonomic considerations in architecture, it is quite logical to question the suitability of such standards for the local context.

Table 6 presents the difference between the survey mean and reference standards for both male and female. In case of unisex difference, the larger dimension is considered. The differences clearly indicate that the

Bangladeshi people are smaller in size than the references.

This study suggests two important considerations. First, dimensions of male body are considerably different from the female which must be considered for the users' comfort. Although perfect design for the users is impossible, however careful consideration of the anthropometric determinants is expected to ensure comfort and safety. The male-female considerations are vital for designing both

private and public spaces. Secondly, the body dimensions of Bangladeshi male and female are smaller than the common reference standards. Therefore, blind application of such standards may result in inefficiency and discomfort. This also indicate that there is need for further research in this area and the necessity of national database.

Conclusion

Anthropometric data is very important for the architects to design space that optimize building performance and users concern for comfort, safety, and health. Unfortunately, there is a sever paucity of anthropometric data that can be directly utilized in the field of architecture in Bangladesh, which lead to following reference standards that may not be applicable for the local people. In this dearth, this study presents an anthropometric dataset which is explicitly designed for architecture.

This dataset was derived from a design studio exercise, and thus the purpose and fit is appropriate. A total of 13 body dimensions were measured from 144 male and female. The dataset was compared between male and female, as well with the widely consulted reference standards. The results led in two directions. First, the difference between male and female body dimensions were significant, which must be considered in relation to the user profile of the space to be designed. Such difference is aligned with the finding of other anthropometric studies in different field (for example M. S. Parvez et al., 2021; S. Parvez et al., 2022). Second, the dataset, for both male and female, showed a considerable difference from the reference standards. Some other studies in different fields, have indicated that the Bangladeshi population are generally somewhat smaller, in comparison of a few dimensions like stature, hand length etc. (for example Imrhan et al., 2009; Khadem & Islam, 2014; M. S. Parvez et al., 2022; Shahriar et al., 2020), but none of them are applicable for architecture. This study clearly showed the comparison enumerating each dimension with gender specific and unisex references. This finding certainty questions blunt application of references and urges for the obligation of a

national reference standard, as well as widescale research in this field.

The presented dataset offers all necessary values and can be directly applied in Bangladesh. It is also expected that, it might be helpful for some other South Asian countries if the anthropometric features are close to Bangladeshi population.

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Plasticity Imaginaries as Sustainable Design Pedagogy

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Abstract: The sustainable approach in design education is ubiquitous, yet too many barriers exist to its application in the real world. Plastic waste, for example, has been a potential architectural building element for years. Still, its application is uncommon because of the gap between waste processing and consumers' demand and knowledge as the main contributors to the waste volume. The paper aims to discuss the possibility of design class pedagogy with the reflection from the class "Architecture and Waste: Plastic by UMN." How the sustainable approach could affect students towards the actual act daily became the intention of the course? The method uses a practiced-based methodology by dividing the class into two balance sessions of theory and practice, thus creating loops of the design process. They were ignited by the discussion on sustainable design approaches in design, architecture and construction, and plastic waste, both potential and problems, and projecting the issue into everyday life. Plastic is used due to its abundance and can be recycled in small units. The result shows that focusing on the process and relating what the class and workshop are doing to everyday life could effectively impact students' thinking about sustainability. Furthermore, by doing deep research on certain materials, the student has a broader illustration of how the networks of sustainability work that will affect more significant decision-making, especially in architecture.

Keywords: Plastic waste, Design pedagogy, Sustainable design, Recycle, Material.

1. Introduction

Plastics are the silent terror of today's society. We meet them in everyday life and expect them to be harmless things because they can be found in almost all products, such as mineral water, technologies, food containers, and the packaging of daily supplies. The exponential production and consumption of plastic nowadays are caused mainly by human lifestyle and broadly normalized by industry and retail.

Some countries developed regulations and facilities for plastic waste, yet some other efforts left many problems. For example, the Indian government forbids 19 single-use plastic items, Austria also limits their plastic consumption by targeting to reuse 25% of plastic waste, while Portugal sets a 30% by 2030 goal (Redjo, 2022). On the other hand, several developed countries want to reduce their plastic waste but fail to reach the reuse percentage, so they are exporting it to other countries, especially those in the Global South (Papanek, 2021).

Indonesia is known as the second biggest plastic waste producer after China. This country produces around 7,8 million tons of plastic waste annually (World Bank, 2021). The dependence on plastic bottled mineral drinks instead of tap water in everyday life is one main factor that increases the abundance of plastic waste (Data Tempo, 2022). It is worsened because only a few of the plastic waste can be recycled; the rest end up in garbage piles or incinerators, also being pollutants on earth. Over half of the total number, around 4.9 million, is mishandled. Another worrying fact is that Indonesia has become the world's most prominent plastic waste importer (Redjo, 2022). In 2020 around 138 tons of plastic waste came from several countries (Figure 1). Plastics are taken for granted, yet the public must inevitably deal with material afterlife problems. The user is close to the material but distanced from the waste's final destination (Parker, 2021; OECD.org, 2022).

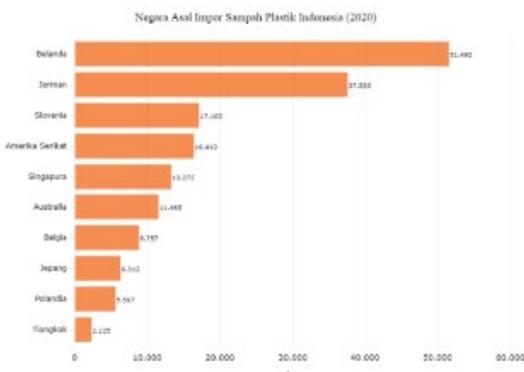


Figure 1: Plastic Waste Exporter to Indonesia.
Source: Redjo, 2022.

Since the industrial revolution, plastic has become a significant material of designed objects and has impacted living standards through mass production. It is generally divided into seven types, PP, PET, PS, HDPE, LDPE, PVC, and others, making it more complicated to manage (Calkins, 2009). Plastic is known for its effectiveness in daily activities such as packaging, food, chemical storage, animal husbandry, and especially medical needs. It results in its volume being uncontrollable since they need between two hundred to four hundred years to degrade (Papanek, 2021).

Manufacturers' desires and customers' expectations for the design are central in waste production since all waste produced results from outdated and unintelligent design (Braungart & McDonough, 2009). Not only the final result but even between the process of the artifact of the design manufacturer also, a process that might harm our ecology (Papanek, 2021). Furthermore, Braungart & McDonough (2009) stated that such artifacts not considered ecology are called crude products. The gap between materials and waste opens up the potential of critical design pedagogy through reflective-practice methods. The design can reverse its current practice by critically reflecting upon its method. Specifically, design pedagogy focuses on the process rather than the final product.

This paper aims to explain and discuss the process and the result from the course "Architecture and Waste: Plastic" by the Department of Architecture of the University of Multimedia Nusantara in 2022. The class intends to focus on something other than the result of the final product but on how the method might affect students in everyday life towards plastic waste. The class used the methodology of the sustainable design approach, which is based on ecology, by igniting the design inquiry, understanding plastic waste, and architectural contribution. It is divided into two main activities: the class and the workshop as a practice-based methodology class. Therefore, students not only know the theory but also understand the one real experience of dealing with waste recycling as an architectural product.

1.1 Design Matters

Design thinking has been expanded in our everyday life, as it is applied in many disciplines, such as education, business, politics, and economy, on a planetary scale. Design accommodates our future projection by reflecting on its possibility and creating new artifacts as its reflections which clearly shows our interdependency on it (Colomina & Wigley, 2016). Design continuously produces artifacts as the human desire to create and build something new is unstoppable. The paradigm shift in design practice is inevitably needed to

make designers more conscious of the process instead of orienting to the end product, which produces more wasted artifacts.

The impact of design should be understood as part of a more extensive system, not only limited to practical, profitable, efficient, and linear, as our current industry, designers, and engineers did (Braungart & McDonough, 2009). Instead, it potentially affects ecology through six cycles, including the choice of materials, the manufacturing processes, packaging, the finished product, transporting the product, and waste (Papanek, 2021). In many cases, the artifacts of undegradable design artifact filled our surrounding landfills since it is excluded from the conventional logic of design production. The accumulation of design artifacts becomes “anthropogenic mass,” which is believed to surpass biological mass in 2020, showing the occupation of the natural world (Elhacem et al., 2020) (see Figure 2).

1.2 Designing Waste Pedagogy

The nature of design activities, from education to professional level, intertwined between problem-seeking and problem-solving processes (Nigel Cross, 2006). However, over decades, design practices have become more driven by the seek of progressivity, such as innovation of form findings, construction techniques, or materials, instead of re-use, modification, or transformation (Stockhammer, 2020; Waite, 2022). Meanwhile, the ability of design to inquire into the problem through practice enables the designers to question the impact of the design process itself, exemplified

by some questions about the consequences of design on the surrounding ecology. The consciousness of the design process might lead the designers to investigate each consequence of their decision, including material choices, the footprints, and how to manage the wasted artifact of their design.

The term reuse waste is ubiquitous today, making industries and customers feel good for the environment due to ‘minimizing’ the volume of waste. In reality, they are transferred to another place (Braungart & McDonough, 2009). Recycling, on the other hand, is problematic. Most recycling is downcycling, reducing the quality of the material compared to its virgin material. Hild (Koralek et al., 2020) wrote between downcycling, which shows the inferior option, and upcycling, which is energy dependent; therefore, questioning the significance of upcycling is also considered, especially for artifact makers.

Architecture and construction play a significant role in anthropogenic mass, contributing 40% of the world's total carbon emission, with 11% being the carbon oxide from manufactured material (IEA, 2019). Concrete is an enormous mass after water and rapidly increases within decades, followed by other construction materials such as aggregates and bricks. However, many precedents intended to minimize the usage of such materials. For instance, Diener (Koralek et al., 2020) discussed the Garbage housing by Martin Paley in 1975 to Entrance Hall of the 'Italia' by Alejandro Aravena at Venice Biennale 2016.

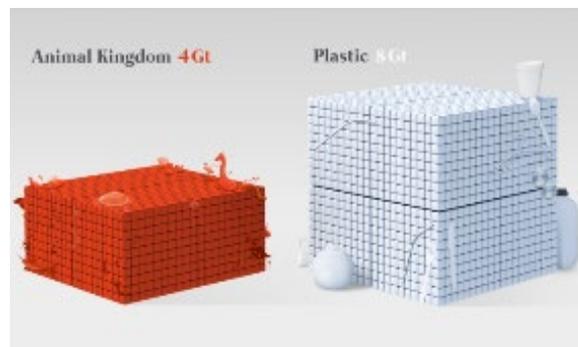


Figure 2: Comparison between mass of animal kingdom and plastic. Source: (Venditti Graphics/Design., Visualizing the accumulation of human-made mass on Earth 2022)

Nevertheless, Diener (Koralek et al., 2020) stated that the motive behind recycling and reuse in the exemplary case studies is fear rather than ecological based. We could also see it in Braungart & McDonough's Cradle to Cradle: Remaking the way we make things (2009), which also started with fear in the first chapter. These depict "fear" could be the starting point of awareness. However, understanding the ecological condition is even more critical by expanding the plasticity of design methods as pedagogy over thousands of possibilities.

In Building From Waste, Hebel et al. (2014) portrayed waste as the possibility of building materials such as agricultural waste, paper, aluminum, and especially plastic waste. Together with ETH Zurich, Hebel et al. (2014) created courses to develop and document the exemplars of how the waste can be processed as ongoing prototypes by using methods starting from sorting and categorizing waste based on the type of process, which are densified, reconfigured, transformed, designed, cultivated. Then the inventory shows prototypes as potential development in the future (Figure 3). Using specific projects (for example, plastic) would make teaching environmental thinking easier (Taylor, cited from Waite, 2022). Taylor stated that teaching environmental thinking is problematic if the object is abstract. Precisely what most design schools do by distinguishing the environmental theory or thinking from design. Furthermore, having both research and practice would create a reflective attitude for both the students and architectural community

as critical evaluation (Wyckmans, 2008; Schiano-Phan et al., 2022).

2. Methodology and Data

The method uses practice-based workshops, combining problem-seeking and inquiry by design research (Nigel Cross, 2006; John Zeisel, 2006). Using practice as research, the student could critically reflect on their environment-behavior relation, including every step of the design process, and change the habit of waste production and design paradigms. Creating a loop of practice based on reflection, acting, and thinking would focus on the critical content of the work (Lucas, 2016) and create comprehensive practical activities.

The approach is divided into:

1. Intervention and provocation
Testing the development of material (plastic) by using ecology as a background
2. Experimentation
It also records the process of success and failure of the making.

The application of sustainable thinking throughout the class is divided into four main activities, which are background and intention, collect and sorting of waste, loop of research - design - making, reflection, thus creating a loop of practice and research. The method also mixed between individual and group works.



Figure 3: *Airless: plastic waste prototype by ETH Zurich. Source: (Hebel et al., 2014)*

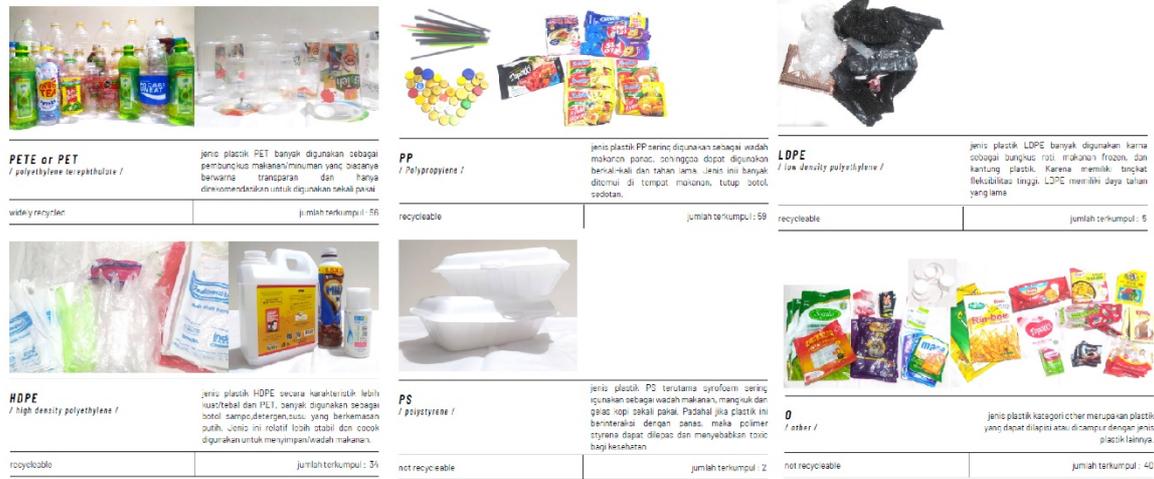


Figure 4: Sorting and analyzing plastic waste
 Source: (Documentation of student: Fathihah Az-Zahra, 2022)

2.1 Background and intention

class is designed by first telling the class's urgency and intention by showing humans' impact on ecology, architecture and construction activities, and plastic waste. Therefore, students can critically question their role as humans, students, and future designers or architects. The first class is opened by questioning the impact of the design, an explanation of the urgency of the class of awareness towards ecology, especially plastic waste, and the possibility of plastic as a building material. To have the same perspectives, the student must read and discuss Braungart & McDonough's Cradle to Cradle: Remaking the way we make things (2009) and creating a mind map.

2.2 Collect and sorting

Due to plastic abundance in the city, being used and produced daily starting on the individual scale, urban plastic mining is possible as a primary material to be developed. Try to see the waste journey comprehensively against the modern waste system by collecting, cleaning, and sorting plastic waste. Which later on will be analyzed further. This process should show facts on student consumption patterns and reflect on its alternatives.

2.3 Loop of research-design-making

This stage is conducted as a workshop based

both in class and workshop. The class is divided into groups of seven categories of waste. Therefore, each individual will exchange plastic waste based on the selected categories. Sampling data: An example of the process by one group of students who handles LDPE waste and turns it into a prototype called Bubble Block.

2.3.1 Material sorting based on plastic type

One of the core activities in this class is the collecting phase. The student must collect all the plastic waste produced from their daily consumption. This activity is used for the technical goal of collecting the primary material and for the self-education process. By the time the collecting phase ends, the student can reflect on how significant and massive the number of products made by plastic is around them in everyday life. Besides, they also see that it transforms into many kinds of product types, not only a single product but many different products. In this phase, they also have to choose one plastic shape product after getting one of the seven types of plastic (Figure 5). For example, the LDPE group (plastic number 4) chooses bubble wrap products while sorting them later from the whole classroom plastic waste production. The reason for the chosen product has to be followed by an analysis of the material's volume and potential recycling aspect.

One of the LDPE groups chose bubble wrap, while the other chose plastic bag waste. The option for bubble wrap is rising because of a specific issue. Based on Statista (Published by Hanadian Nurhayati-Wolff & 20, 2020), The number of online shoppers in Indonesia is projected to grow from 20 million in 2017 to 65 million in 2022. With a total population of over 265 million, Indonesia is one of the world's largest online markets. One of the biggest problems is the waste from product wrapping. Plastic bubbles are used mainly to secure the goods or products in shipping. Sometimes it was overused since the seller wanted to avoid gambling with the risk of damaging the product. Other more sustainable options are pricey and take more time to prepare the package. These reasons make bubble wrap plastic popular to be used. Plastic bubble wrap is categorized as LDPE. With this background story, the group chose bubble wrap as their primary LDPE material and started collecting plastic waste. All the materials of the designed product will mainly use bubble wrap as the base. However, small numbers of LDPE from plastic bags waste only for giving variation and aesthetic pattern to the primary material.

2.3.2 Material research based on selected plastic type

There is a whole semester of exploration and research, which are divided into two. The 1st half-semester is used for collecting plastic waste while searching for secondary data research from literature and journals about the type of plastic and their characteristics. With that data, they have to design a draft, choose the products, and make the initial design based on the research (Figure 6).

All the group starts research to understand the material wholly. From the research, they will gain some essential data that can be used for making initial architectural element design. For example, sampling one of the groups that have researched LDPE finds that LDPE has the simplest chemical structure, making it the easiest and cheapest one to be recycled. LDPE is also categorized as plastic-type four, indicating that it can be used several times. LDPE is one of the polymers with a cradle-to-cradle cycle; it can be recycled many times and has the same quality as plastic. From the chemical characteristic, LDPE is categorized as thermoplastic that can be soft when heated and hard when cold. This character makes it easy to be formed and process. Besides, LDPE is also



Figure 5: Example of plastic waste sorting from daily consumption of the student. Source: Documentation of student: Fathihah Az-Zahra, 2022



Figure 6: Prototype examples based on plastic categories. Source: (Author, based on student's work, 2022)

waterproof, damp proof, and has impact and chemical resistance. LDPE is also flexible and open to many explorations of design. The characteristic of LDPE that can be found explicitly in bubble wrap materials is its unique texture and heat durability, and it is more rigid than other types of LDPE. This characteristic is the potential as an architectural element (Figure 7).

2.3.3 Product development and method

The student can start designing the architectural element from the literature study based on the initial data from the previous research. In this phase, they must be critical to match the potential value of the particular type of plastic waste and the requirement of the architectural element they want to design. The student must also write down the production process steps to create the final prototype. In this production process, they need to calculate the prediction of material volume, time of the prototyping production, the tools used, and how to install the final product in the building (Figure 7).

2.3.4 Product making

The second half of the semester is the making process of the initial design. In this process, much trial and error happen. Some groups have changed the initial product they first intended to make. The other changes are the design of the products, whether the shape, the dimensions, the arrangement, or the way it will be installed in the building. This result happened because, after the student hands on the plastic materials, there are a lot of unpredict factors rising, e.g.:

1. The characteristics of the plastic waste material itself probably have a gap with the current research that has already been done.
2. The process or the method is still based on trial and error. It depends on the data of the chemical ingredients and how toxic they will be.
3. Limited access to the workshop equipment and the technology for processing the materials (Figure 7).

In this phase, the student has to make an independent decision after trying several methods to process the plastic waste, which one

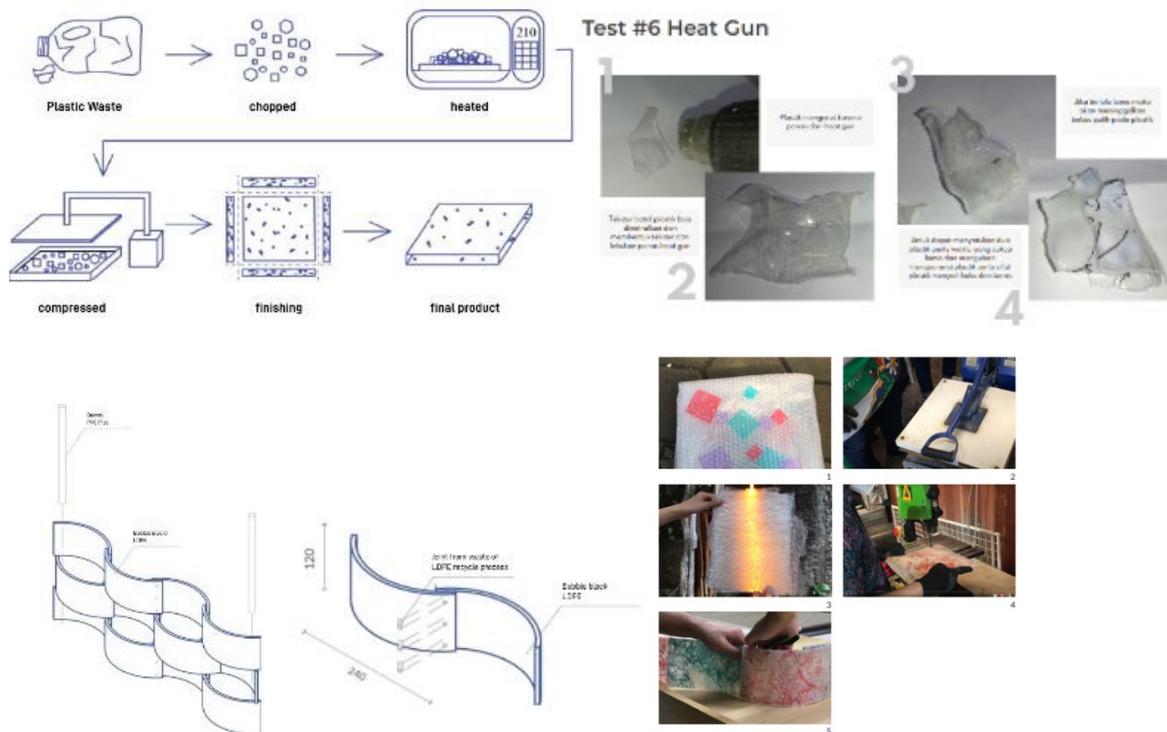


Figure 7: Processing diagram from literature study, experimentation example using heat gun on the materials, Sketch of the process and product development, and prototyping design. Source: (Documentation of student: PP, PET and LDPE Group, 2022)

is the most suitable depending on work time, the energy used for the processing, the characteristics of materials before and after the recycling process, the self-observation of the changing form. For example, The LDPE group chose the press methods with a temperature of around 195oC. This decision is coming after trying several times with documentation of data; The data consist of how many layers of the bubble wrap and how long it takes for the pressing time and temperature to have a particular texture that has both durability quality and visual quality, which meets the expectation of the architecture element products, in this case, is Bubble- Block room separator (Figure 7).

The making process is when the student can reflect on the long process of processing plastic waste. Is the amount of time and energy (electricity and human resources) worth the product? Which one is better, reducing the use of plastic or recycling it? Is the process of recycling plastic also considered sustainable and safe?

2.4 Reflection

At the end of the class, students reflect on their process of recycling plastic waste and the final product in the report. Afterward, this reflection was exposed to the public to create another discussion since the method used in the class is something the public can do. Also, the public has a significant impact on plastic waste daily. An exhibition and crits, therefore, became the end of the class. The student arranged and curated the exhibition. Interviews were also conducted with some students as samples to give a review and further elaboration on the class and how it affects their daily lives (Table 1).

The exhibition is titled "Rethinking the way we use things" in the university's main lobby for a month, from 10 June to 10 July 2022 (Figure 8). Based on students' curatorial notes, this exhibition intends to explore public addiction to plastic, also questioning both impacts on ecology. Besides exhibiting the exploration of plastic waste as the result of the "Architecture and Waste: Plastic" class, this exhibition also became an auto critic of plastic consumption on a massive scale and students' perception of daily waste management. Understanding the



Figure 8: Crits during the Exhibition by student. Source: (Author, 2022)

Table 1: Overview Impact of The Class Methodology on Student Everyday Life. Source: (Author, 2022)

	Sorting plastic waste experience in the past	The impact after try to sorting waste	The continuity of the class on daily life on plastic waste	The last time consumed single-use plastic
Student 1	Always sorting waste (plastic, cardboard, etc) due to part of waste bank in the neighborhood Table content	Understand the type of plastic Understand the method of plastic recycling	Ended choosing product with PP material since it is the chosen material for the group experiment Not for the time being. It is hard to reduce plastic waste due to dependency on food delivery and living in student dorm	Last night, water bottle
Student 2	Never (only during the class)	Understand the type of plastic Understand the output of plastic recycling	More aware of the impact of plastic by minimize the usage of plastic 1. Daily shopping with only one big plastic than many (reduce) 2. Avoid product with plastic packaging (drinks, etc) 3. Brings multiple use water bottle everywhere 4. Bring water from home or refill station	-
Student 3	Never (only during the class)	Fact of household plastic waste is too much than what is expected	Have intention to sorting plastic waste in the future <u>Reuse microwaveable plastic packaging</u> Shift from food delivery (single-use plastic) into catering with its own container	-
Student 4	Yes, several times. Only collecting	Understand the process of plastic recycling	Shift from single-use water bottle into multiple use water bottle	-
Student 5	Never (only during the class)	Understand the type of plastic	Shift from single-use water bottle into multiple use water bottle using tote bag / paper bag while shopping (current condition rely on single-use water bottle, food delivery and online shopping)	-
Student 6	Never (only during the class). Yet already aware by minimizing single-use plastic, no longer using straw or single-use plastic.	Understand the type of plastic Understand the process of plastic recycling Understand the output of plastic recycling	Being more consistent on minimizing single-use plastic waste. 1. Bring water bottle and food container 2. Not using plastic straw Sorting plastic waste based on their type	-
Student 7	Yes, especially the type needed for the assignment	Supposedly becoming self-awareness and responsibility to minimize plastic waste	Chose tote bag vs plastic bag, especially offer in commercial area Try to minimize plastic waste by re-use plastic waste such as food container	-
Student 8	Never (only during the class)	Understand high volume of household plastic waste Online service had more plastic waste than cooking	On using online service try to minimize plastic packaging Prefer to do more self-cooking rather to rely on online service or food delivery Shift from plastic bag to fabric-based shopping bag	Yesterday, online package
Student 9	Never (only during the class)	Fact that plastic bag is the most abundance type of plastic	Shift from plastic bag to fabric-based shopping bag	Yesterday, food delivery
Student 10	Never (only during the class)	Understand high volume of household plastic waste Understand the inconsistency of processing waste HDPE and PET are the most collected materials	Shift from plastic bag to fabric-based shopping bag Shift from single-use water bottle into multiple use water bottle	
Student 11	Yes, based on household culture especially PET due to lifestyle	Understand the types of plastic Understand the method of plastic recycling	Shift from rely on single-use plastic bottles into drinking gallon and multiple use water bottle	-

complex and energy-intensive process of waste recycling, in this exhibition, the students ask the audience to rethink the way we use things that should contribute to waste reduction.

3. Results and Discussions

3.1 Process

During the class and workshops, we slowly banned producing plastic waste. Thus, resulting in alternative acts on students upon food or

drink as their majority plastic waste consumption. For example, one of the groups brought a gallon of water. This alternative thinking is needed to break out from the current consumptive lifestyle. Furthermore, on the waste collecting and sorting, the student started criticizing their consumption pattern, shown in their logbook (Figure 4).

Next, the workshop activities take time to achieve connectivity between the student, the material, and the issue. Several classes and discussions occurred to build students' argumentation on plastic recycling, which later will follow with joint and element development of architecture. The student's technical skill needs to be considered, such as their level of studies.

In terms of material, the most student still treats primary material (plastic waste) as something regular. Waste should be irregular in form, color, and type. Also, some groups tried to add outsourced 'waste' based on their type, affecting the prototype module development. Using waste means the designed module should be smaller.

3.2 Final product

The plastic processing methods students use are diverse, from reused, modified, and recycled—the reused method for PET bottles (raw, transparent panel). Seeing the potential of plastic bottles as translucent wall preserves the PET bottle's shape. Since the student understands the energy extensive of plastic processing, using reuse would make the second life of waste efficient. On the other hand, the modification method tries to minimize energy usage, although not as radical as the previous prototype. The intervention is minimum, by cutting the PET bottles into sheets and heating them until it is flat and able to stitch between one another (PET ocean ceiling). Lastly, turning plastic waste into another object also creates another waste. For example, the LDPE bubble block could reuse the waste and develop it as a joint between the modules. Other prototypes, such as the Polystyrene wall, use other types of plastic waste as the panel joint.

Some of the groups showed another

environmental issue based on their prototype. PET ocean ceiling, for instance, depicts the ocean as one of the most affected ecosystems; also, the color of existing PET plastic bottle waste rendered the color of the ocean.

The exhibition's creation as a final project shows the reflection of each group up to the whole class. Showing students criticism of their work potentially be developed further

3.3 Daily practice

Student's logbook and inventory show that the seven categories of plastic could be found daily, although categories such as PVC or others, specific polycarbonate, are limited. However, indeed they are available to the public. The excess type of plastic, such as PET, PP, and LDPE, is food related. It shows the current lifestyle of food takeaway or delivery (dependency on online food service).

There is also an intention to minimize plastic waste products seen in Table 1 that provoked with impact on ecology and plastic waste processing. These acts, such as minimizing (reducing) plastic packaging from type to quantities, bringing bottled water or reusable food container, reusing plastic waste until it is broken, and changing lifestyles, significantly impact plastic dependency.

The pedagogy of design could be expanded and contract such plastic. Particularly in workshops and discussions, the quality of plasticity is the potential to present critical ideas by examining the student's primary common grounds, learning achievement, and class progress. Furthermore, the current issues are essential to be engaged in activities to make the student shows their act upon sustainability approach.

4. Conclusion

The class learning process demonstrated the gap between sustainable theory and practice. Student expectations of the result instead of the process sometimes make the problem-seeking and inquiry process overshadowed by the imagination of the final form. As shown in the product making, some students need more plastic waste or specific colors; some buy another plastic packaged water bottle rather

than using any existing waste.

Several times re-emphasizing the intention of the class are needed to make the students able to communicate specific design proposal based on the inquiry of selected materials. The form of drawings, mock-ups, and process-diagram gives an overview of the artifact and precise details (Cross, 2006). It is necessary to make full-scale mock-ups of the investigation so that the students can be communicated sufficiently accurately and reflect the consequences of the design decisions. Therefore, once the students understand the basic ideas about sustainability, it can also be seen in daily activities.

Consistent, sustainable thinking should be in any session to maintain their knowledge. As shown, recycling plastic needs additional treatment (such as energy, cost, and environmental impacts), which is hard to do effectively on a small scale. Showing the recycling impact does help develop the student paradigm of practicing sustainability daily, although the thinking supposedly occurs in all subjects. Thus, the class's design pedagogy can be used to minimize or even prevent the consumption of plastic.

The mix of class (theory-based) and workshop (practice-based) is also essential in design pedagogy. As the class ended, the student showed an attempt to contribute to minimizing plastic waste from small actions to bigger ones daily. As seen from the interview results, the process makes them aware of recycling plastic and how they pattern consumption over plastic. However, the quality and effectiveness of daily behavior are diverse and need to be studied more. Plastic as a material is only an example; thus, the paradigm should have plasticity quality, be adaptable to any condition and situation (such as material, technique, output, and even the student), and be flexible.

As stated by Colomina & Wigley (2016), firstly, we saw plastic waste as our imagination of thousands of possibilities by creating new artifacts from it that would contribute to a better ecology. By the time classes passed, we had realized that the process and reflection of design are supposed to be the core of the

pedagogy on design sustainability. Since our first assumption could be wrong, using the loop process should give students reflection on their attempts.

This workshop demonstrates the design pedagogy to make plastic problems as close to the students as possible. Instead of reimagining something new in the design, this attempt also demonstrated the possibilities of utilizing the pre-existed artifacts to reimagine the reverse process. Plastic is used not as a matter of materials but also as a tool to reflect critically on the habit of plastic. Instead of wasting imagination to create new artifacts, we attempted to imagine the existing artifacts to learn critical ecological design practices.

This practice-based method is undoubtedly more effective on the longer hours course such as studio, as the current case is three credits. Therefore, the looping design method might occur repeatedly to create a particular pattern or behavior.

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Evaluation of Distance Education and Formal Education on Architectural Design Studio Practices and Student Perception with Comparative Analysis: Antalya Bilim University

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Abstract: Due to the worldwide Covid pandemic in 2020, it has undergone compulsory in universities, including distance education architectural education. Universities in Turkey were affected by Covid too, with the decrease of the pandemic effect, even though it has been back to formal education, an earthquake occurred and affected 10 cities in Turkey, causing to passed of distance education again. In the 2023 period, the process; continued as a hybrid, both remotely and face-to-face. Also, the design studio culture, which is the backbone of architectural education, evolved with the changes in the distance education process of components such as drawing, sketches, and the desk critiques tradition of architectural practice.

In this sense, the study aims to create a base for a provision for the future of architectural education with student-centered assessments. The research comparatively evaluates the effects of distance education and formal education on architectural studio practices through course evaluation questionnaires applied to students and student comments. In this study, the questionnaires and comments filled by approximately a total of 120 students for each term between 2018-2022 within the Department of Architecture of ABU were analyzed. To determine the points where students get the most efficiency and feel inefficient; Both positive and negative outcomes were observed, including difficulties with the concepts of proportion and scale, the benefit of being able to view other students' projects online, and the chance to continue learning additional modeling and drawing software until graduation. This example shows how hybrid education for the architectural design studio can be evaluated when weighing the benefits and drawbacks of online learning versus face-to-face teaching.

Keywords: Architectural design studio, Education, ISO quality, Distance education.

1. Introduction

Online education has been forcibly applied for approximately 1,5 years in Turkey due to the decision to online education for the whole country contains universities and higher

design courses which count as one practical course, students' drawings, sketches, maquet, and similar assignment activities have been held via digital programs and far from the instructor, causing some disabilities but at the

same time bringing some advantages. And in the year 2023, because of the earthquake disasters that occurred and affected 10 different cities, again the decision to online education shows us online education will be applied in the future as an alternative approach to be not affected by the negative circumstances. In this frame, it is important for architectural education to note the evaluation of assignments in the studio environment. Many courses in architectural education held in the studio environment require tracking the class. For this reason, critiques via digital programs or platforms are one of the cautions that makes it harder. Without touching or being eye to eye, living through a screen has destroyed the touching surfaces in architectural education. And it may be caused to a loose definition/concept of scale/proportion in spatial or void masses for the students. According to the results of the surveys filled by the students in the 2022 term, shows that distanced education allows students can watch each other's critiques or shared ideas such as Zoom, mic. Teams; from the freshman's level; instead of working on a maquet; through 3D modeling programs students can share Project details that have affected their creativity in a good way. The same situation when observed for the sketching phase, Uçar and Sağsöz pointed out that students have recorded some level of sketching in formal education; directly starting to design by using digital programs without initial sketching in distanced education caused some missings according to formal education. According to Ahmad (2020), while interior design education tends to demand o one interactive communication between the instructor and student; he argued how difficulty in distance education transformed into an opportunity according to the desired project topic in the studio course (Ahmad et al., 2020). Saving time in the lessons, accelerating the exchange of information, and facilitating the digital connection to the instructors in various ways can also be considered positive situations in distance education. Besides communication of the students with their instructors, the sharing of knowledge and transferring the information among students themselves increase creativity and efficiency in applied courses. (Kılınç vd., 2021; Erzen, 1976). According to Eceoğlu, periodic sessional meeting for knowledge

exchange in traditional systems in which computers are not used is eliminated, and a digital synchronized communication environment is provided between the people working in the design team, regardless of time and place. hus, the opportunity to use time more efficiently arises, since information exchange is provided at every stage of the design, it increases the speed of decision-making, and group/common work becomes more efficient (Eceoğlu, 2012). This shows that it is efficient among students as well. It has been observed that this change in the education system is easier and more practical for the generation born in the age of technology, and they prefer technology-based learning (Oktay et al., 2021). The fact that applied courses are not like theoretical courses shows that the student depends on concentration, environment, communication, and some other factors that trigger creativity. Within the scope of studio design courses, creative thinking and application practices are assisted by the instructor for students to reveal their creativity and develop it through lessons. Geyyas Gören and Şenyurt (2021) argue that incorporating digital tools and virtual environments into traditional design education is crucial in our current era. They also suggest the creation of new hybrid design education models and curriculum options. With the recent implementation of compulsory design courses with distance education in Turkish universities, students are now exposed to three different education systems: formal education (the traditional method), compulsory distance education, and hybrid education. The 2021-2022 academic year saw the emergence of a new situation, where students transitioned to a hybrid system and continued to participate in both online and formal systems simultaneously. However, there is a gap in the literature regarding the evaluation of this process, including a comparative analysis of the efficiency of students in project courses across formal education, distance education, and hybrid education. This study aims to address this gap by evaluating the student's performance in design studio courses between 2018-2019 (fall and spring formal education), 2019-2020 (fall formal and spring semester distance education), 2020-2021 (fall and spring distance education), and 2021-2022 (fall post distance education).

The course evaluations of the students in the design studio courses, including formal education, will be compared. Survey data from students in the architecture department will be analyzed to evaluate the effectiveness of the different education systems.

This study focuses on the remote management of design studios, which form the foundation of architectural discipline education, in the Department of Architecture, at Antalya Bilim University, in response to the Covid-19 pandemic. The study identifies the benefits and drawbacks of the learning environment that fosters design studio culture and the process of conducting online distance communication between students and instructors through v

The fundamental purpose of design studios is to establish a learning environment that enables students to understand the multidimensional nature of design practice, despite the complexity of the design problem at hand. However, learning tendencies may differ significantly among individuals due to various factors. In this study, we aim to evaluate and compare the face-to-face, hybrid, and distance education processes by analyzing questionnaires distributed to students enrolled in project design studios. These questionnaires are a mandatory requirement of the ISO Quality System and were administered at the end of each semester. Through this comparative analysis, we hope to gain insights into the effectiveness of each education process for the design studio context discussed within the scope of this study.

The study comprised all students enrolled in the Department of Architecture, ranging from the first to the fourth year of their program. Before the onset of the pandemic, satisfaction surveys were conducted among students starting from the 2018-2019 academic year. Throughout the pandemic period, including the 2019-2020 academic year (fall formal spring term distance education) and the 2020-2021 academic year (fall and spring distance education), students continued to participate in satisfaction surveys regarding their courses. Subsequently, based on the survey results obtained during the 2021-2022 academic year, which commenced after the pandemic period, the satisfaction rates of

students enrolled in courses offered between 2018-2022 were evaluated, taking into consideration the data for both distance and formal systems. A total of 120 students participated in the survey for each semester, encompassing students from both education systems. The study included 10 multiple-choice questions, which prompted students to provide their opinion on various statements, with options such as "strongly agree", "agree", "neither agree nor disagree", "disagree" and "strongly disagree". The survey questions were formed according to the following assumptions for the research:

- Studio courses are used more effectively in distance education than formal education due to class times being appropriate with planned time in the syllabus and creating a comfortable environment.
- Studio course materials, necessary equipment, and new technology were used effectively by the instructor in distance education, thanks to online programs.
- In distance education studio courses that are recorded and can be listened to again; Instructors' method of expression in session critiques, were impressive easy to understand, and tempting.
- The studio course was as stimulating, thought-provoking, intriguing and encouraging for active participation in distance education as it was in formal education.
- In formal education, research-supporting, rote-free, analytical thinking, and problem-solving skills were developed together with the critiques given face to face that provide focus in the studio courses.
- Studio courses held with formal education gained the ability to analyze and interpret information and critical perspective.
- Personal and vocational skills, producing alternative solutions when faced with complex problems, and innovative and creative thinking skills developed both in formal and distance education.
- Academic literacy skills were further developed in formal education in terms of directing more time and avoiding distractions.
- Oral-written communication and

presentation skills in the mid-term and end-of-term juries of the studio course were both more encouraging and improving in formal education than in distance education.

Formal education has enabled the students to provide to grasp the lesson and learn permanently, and it has a positive effect on succession.

2. Architectural Design Studio Culture and Changing Communication Forms in the Distance Education Process

Architectural education follows a process in line with the presentation of the forms of design, construction, and representation in the process of transferring the design idea into the physical space. Starting from the first year of their education, students try to find solutions to design problem that is becoming more and more complex and to convey their design ideas. This process, in which the theoretical and applied courses of the versatile components that make up the design are added to the design practice, takes place in architectural design studios. In this sense, architectural design studios constitute the backbone of architectural education with the highest duration and high evaluation rate in architectural education.

To understand the way architectural education is handled today, it is necessary to examine its development in the historical process. As Karamaz and Ciravoğlu stated, architecture has been defined by building production activities until recently, and the knowledge of the architectural discipline has been constructed as a master-apprentice relationship focusing on the field of construction. (Karamaz and Ciravoğlu, 2017). In this sense, in the periods when architecture was applied as a practice, the apprentice learned the necessary technical knowledge through the transfer of experience and knowledge from the master-apprentice relationship. With a one-way transfer of information flow from master to apprentice, it is possible to say that although architecture does not have a theoretical and conceptual field, there is no school of architecture. (Celik and Arabacioglu, 2022)

The French Royal Academy was the first place

where architecture was not just an act of building products, but the discipline was placed on a theoretical basis, and the architect's state of being a thinker other than craftsmanship was mentioned. (Karamaz and Ciravoğlu, 2017).

Architecture students enrolled in the Paris school were placed in different ateliers or studios managed by an architect or master in their design studies. The primary tool of teaching starts with the first draft solution shaped around the design problem and continues with the other stages of project development. Students progress by winning design competitions, and after earning certain points in competitions for graduation, they had to win additional competitions, complete a thesis, and gain one year of work experience. (Anthony, 2012) The tradition of the studio was started in 1819 at the Ecole des Beaux-Arts (under the French name workshop) in France; It was the first formal architectural education framework adopted in the Western world, which later spread to other European countries and North America. (Goldschmidt et al., 2010)

However, towards the end of the 1920s, criticism against Beaux Arts culture began to rise. Many educators view student and practitioner methods as archaic and view evaluations of students' work as unhelpful. (Anthony, 2012)

Ecole des Beaux-Arts, which is a continuation of the French Royal Academy and has dominated architectural education for a long time, weakened with the spread of the Modernist Movement, and in the first half of the 20th century, education models were greatly influenced by the Bauhaus, and design schools replaced the academic tradition (Balamir, 1985). Founded by Walter Gropius in 1919, the Bauhaus created a new kind of educational culture rooted in Europe as an alternative to Beaux-Arts. The internationally influential German design school had its heyday in the mid-1920s and moved to a private building in Dessau. Its curriculum is built around workshops and laboratories where students conduct collaborative, hands-on construction projects, some on real construction sites. (Anthony, 2012)

The influence of the Bauhaus began to wane in the 1960s when populist tendencies spread and new trends in art, culture, and politics advanced towards pluralism. Changes in technology, urbanization, and cultural environment have liberalized with wider target audiences and caused the schools of architecture to be affected in many areas. First of all, the competence area of the architect has expanded and this situation is also reflected in the education curriculum. While it is stated that the multi-paradigms seen in the 1970s were reflected in education with terms such as problem-solving, decision-making, and environmental design, and then it turned to traditional design methods, it can be said that the established paradigms began to be questioned in the 1980s. (Balamir, 1985)

The design studio, on which Beaux Arts education is based, is a learning environment that progresses on the axis of executive and student about design practices in today's architectural education. The design-oriented nature of architectural education has made project studios, the place where design is learned and done, the focal point of education. (Uluoglu, 1988)

As Akyıldız stated, various research on the design studio, along with definitions from different aspects, basically referred to two definitions: a physical learning environment and the basic pedagogical unit and management of design education. (Akyıldız, 2020)

Considering design studios as a physical learning environment, according to Ledewitz, the studio treats design education as a new skill such as visualization and representation, as well as a place where students learn a new language. Also, all aspects of design education refer to the realization of experiencing with indirect thinking rather than being thought through direct explanation. Accordingly, architectural design studios are environments where design language, representation, and way of thinking are handled (Ledewitz, 1985).

Considering design studios as a basic educational pedagogy in architectural education, architectural design studios, as quoted from

Aslan; rather than a learning environment that directly trains staff for architectural offices, is a situation where knowledge, culture, language, and technique are combined with the energy of space, which directs and teaches candidate architects who enter the practical life course (Aslan, 2016). Design knowledge is communicated to the student through the criticisms made in the studio. The analysis of the criticism shows that design knowledge can be best understood by considering both its general and personal qualities as a whole (Uluoğlu, 2000). In this sense, the studio aims to create an awareness arising from the individuality of the relationship to be established with practice. However, the fact that the executive in the studio is the person who knows destroys the studio environment and it can only be mentioned that the paradigm of learners exists (Aslan, 2016). Many features such as students' learning styles, speeds, abilities, expectations, and experiences, motivations can contribute to the essence of the process in personalized learning environments. Rather than transferring information one-to-one, it is learned by living; accordingly, the goal of being internalized shapes contemporary learning environments (Yurtsever & Polatoğlu, 2020). As stated by Paker Kahvecioğlu, the main purpose of design education is to offer different design experiences, to take an active role in different areas of design, and to gain knowledge. "The active components in the studio are "design studio as a communication medium", "design task or problem", "design knowledge" and "different communication tools" and individuals are "student-designers and studio trainers" to establish and realize strong communication in the studio (Kahvecioğlu, 2007). Aydınli considers architectural design studios as a place where students produce their design knowledge by experimenting, discussing, and doing. In this sense, as a creative paradigm in design education for architectural design studios, it makes the studio culture rethink within the scope of "learning to learn". The studio aims to create a learning environment that will enable knowledge to be structured (Aydınli, 2015). Uluoğlu, on the other hand, argues that learning to design can be realized not only by knowing the relationship between objects and phenomena, but also by applying it to producing

a solution in the context of a determined or selected topic and problem, and states that the transformation of the existing knowledge in the memory of the person based on all the experiences of the design studios into design knowledge takes place in the project studios. (Uluoglu, 1988).

Studio practices are a process in which design practices, in which a determined subject and a certain design problem are discussed in each period and a solution is sought for this problem, are represented by considering all the components of the discipline of architecture. In this process, the student progresses in the form of drafting the project and consultations with the executive about the design. For this reason, as Uluoğlu stated, design is learned in the studio and includes mutual communication between the coordinator and the student (Uluoğlu, 1988). This form of communication is the critique taken in the studio environment.

On the learning models discussed within the framework of architectural design pedagogy, it can be said that there are different orientations and fields open to experimentation in architectural design studios. Among these, conceptual expansions such as learning to learn, flipped studios and active studio experiences are included in the literature. The current pursuits in the architectural design studio workshop also diversify the forms of communication between the studio instructor and the student. The "active learning environment" suggested by Polatoğlu in his study is an initiative that can suggest to students a free-thinking environment and provide an opportunity for them to express their thoughts (Yurtsever & Polatoğlu, 2020). As mentioned in Kahvecioğlu's works, the studio transforms from a place that uses traditional analog systems and their presentation tools (sketches, drawings, reproduction models, 2D-3D graphics...) to a place that opens itself to various media (such as photography, cinematography) in the individual transfer of the student's own design thoughts. (Kahvecioğlu,2007).

Process of Design information, from the point of view, is a process supported by active studio participation; students interiorize the studio and

use the space apart from the course is subtract the studio from just being a workshop and in Cuff's terms transform it to both a home and workspace. (Akyıldız, 2020; Cuff,1992: 63-65).

The Covid 19 pandemic process has brought many restrictions in daily life practices; these restrictions have also changed and transformed the forms and spaces of communication in the triangle of student-trainer-acquisition of knowledge in the field of education. In the process where the conceptual basis of architectural education and architectural production practices is still questioned and discussed, a different expansion of education and training has been encountered. In this sense, the formation of the above-mentioned design knowledge with studio culture and the form of communication used in studio dynamics have also changed. Starting with the master-apprentice relationship of the studio culture; While talking about the existence of different approaches until today; The transfer of studio communication to the virtual environment along with the pandemic process has also raised awareness of the existence of different resource groups in the student's learning by experience. In the process of structuring design knowledge in the traditional studio culture, the executive's criticisms of the student's design practices were also realized through different virtual tools.

Analyzing how the change or diversification of communication styles and tools in transferring and acquiring architectural design knowledge is reflected in architectural design studio evaluations gains importance in terms of shedding light on the future of architectural education.

3. Handling Iso 9001-10002 Process In Educational Practices And Its Reflection On Studio Evaluations

The primary purpose of teaching and education is for the student to acquire certain gains and outputs for the field. Evaluation of the outputs of the process followed in the education curriculum, which includes the studios, which are the most important and predominant in architectural education, has seen accepted as a necessity today

Hesapçioğlu mentioned two approaches to ensure quality assurance in the realization of the functions of the educational institutions regarding the acquisition of knowledge and qualifications of the students: the first is the accreditation of educational institutions, and the second is the evaluation of the outputs. (Hesapçioğlu, 2006). Although the existence of national quality assurance systems in higher education institutions does not have a very old historical background, the establishment of national agencies in England and various European countries dates back to the early 1990s. In the United States, however, there is a long history of institutional accreditation with the establishment of a state-sponsored quality assurance mechanism in the 1960s. In this sense, the quality assurance systems question/answer (Q/A) method has played an important role in institutional feedback in recent years (Yorke and Vidovic, 2016).

In Turkey, YÖK, the Higher Education Institution, has established a quality evaluation process according to the standards as a means of supervision and monitoring universities. As stated in the relevant legislation, evaluation of training, implementation, monitoring, etc. are subject to internal and external evaluation processes. According to this;

“Internal evaluations consist of periodic review

phases as well as continuous monitoring. The periodic review is conducted by the organization's internal supervisors or individuals with expertise in the Standards and practices within the organization, under the responsibility of the head supervisor. External evaluations, internal audit activities; Full external evaluation or periodic review by a team of qualified and independent external evaluation experts to be determined by the Internal Audit Coordination Board (Board) to determine its compliance with the definition of internal audit, the Standards and Code of Ethics, the level of use of successful practice examples, and its effectiveness and efficiency. These are studies that should be carried out at least once every five years in the form of verification.

Internal and external evaluation activities contribute to the assurance and development of quality by completing each other in the quality assurance and development process. This ensures that activities to enlist quality have an impact on the entire internal audit, including audit management. For the quality assurance and development process to function fully and in the intended direction, internal and external evaluation activities should not be considered independently of each other. (Yök public internal audit quality and assurance development legislation, 2011). Increasing the awareness of students and lecturers about

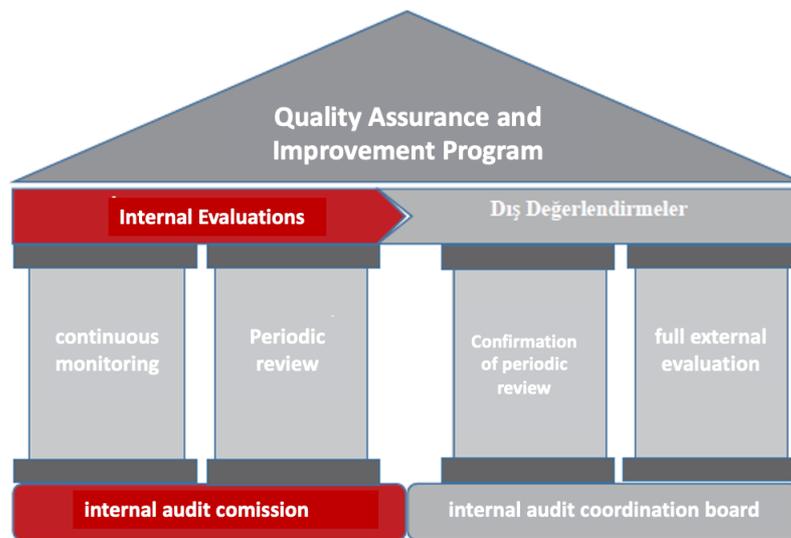


Figure 1: Quality assurance and development process

quality assurance in higher education, which is one of the principles of internal and external quality assurance systems, is one of the basic principles of quality, which is important to evaluate in the quality process (Ayvaz et al., 2016).

Thanks to quality management, planning actions according to the activities and survey measurements and reporting the situations that need attention in the next period will show its difference from other institutions. According to Aydın (2013), "The implementation of the Quality Assurance and Improvement Program, which also includes the audit of the auditors, by the internal audit managers, by giving the necessary importance, will be an indication that internal audit is an audit system with international references, unlike classical auditing." (Aydın, 2013). In this context, the aim is to create a system that gets better every period with the data obtained.

Antalya Bilim University was included in the ISO Quality Assessment process within the scope of YÖKAK in 2018 and gained the ISO certificate from Türk Loydu in 2018. Another part of the Quality Management System that concerns the delivery of education and the evaluation of its outputs is the student satisfaction questionnaires, which consist of the "Course content" and "Evaluation of the instructor of the course" parts applied for each course.

The aforementioned satisfaction surveys are sent to the students on the portal where the related course is announced, and the students indicate their satisfaction with a score ranging from 0 to 5, and if they wish, they can write comments about the progress of the course.

4. Methodology

In the study, questionnaires applied throughout the ISO quality process were used in order to measure the efficiency of studio lessons in the distance and formal education process of students. In this context, the research includes two different methods of embedded theory. In the first step, the common question patterns covering the method and content of the studio lessons were determined by comparing the data on the questions updated between 2018-2022 with the content analysis method. Content analysis is simply summary based; It takes and analyzes, reduces, and interrogates texts using emerging themes in pre-existing categories to construct or test a theory. It uses systematic, repeatable, observable, and rule-based forms of analysis. (Cohen et. Al., 2007) Content analysis; provides measurable statements about research activities in a particular field. (Falkingham & Reeves,1998)

Based the content analysis method, it is aimed to define keywords as concepts containing repeated common words with summarizing the updated survey questions. The survey questions are updated by the changes in the process and the benefit and development of the institution, within the framework of the goals of continuous improvement as the need of policy of the Quality Process each year including the distance education process along with the pandemic. Keywords were used and marked in the attached table to compare the updated question pattern and content with student satisfaction in formal and distance education and hybrid education processes. Accordingly, although the current question pattern has changed, the student responses to the items whose content and purpose of the question have not changed have been compared and the active parameters have been mainly included in the studio education.

Table 1: Fall and Spring Semester course satisfaction survey questions comparison table

Q.1:improving the student's ability to analyze, interpret, and access new information through the course.	Q.2: skills of students in public speaking and making presentations.	Q.3:investigating the positive effect of the way of teaching on the student's interest in the subject.
<p>18-19 FALL&SPRING (FORMAL EDUCATION) survey questions: Thanks to the course, my ability to <i>analyze and interpret information, and obtain new information</i> has improved. Thanks to the course, my ability to <i>produce alternative solutions for complex problems</i> has improved. 19-20 FALL-FORMAL EDUCATION: Thanks to the course, my reading, writing and <i>analysis skills</i> have improved. The lecturer used methods and techniques that encourage <i>critical thinking and research</i>. 19-20 SPRING DISTANCED-ONLINE EDUCATION: Thanks to the course, my ability to <i>analyze and interpret information, and obtain new information</i> has improved. 20-21 fall (online education) survey questions:: Thanks to the course, my ability to <i>produce solutions for problems</i> has improved. The lecturer used methods and techniques that <i>encourage critical thinking and research</i> . 20-21 spring-21-22 fall survey questions:: She/he provided a <i>critical perspective</i> She/he improved my <i>analytical thinking and problem solving skills</i> he/he improved my <i>research skills</i>. She/he improved my innovative and <i>creative thinking skills</i>.</p>	<p>18-19 FALL&SPRING (FORMAL EDUCATION) survey questions: Thanks to the course, my ability to <i>talk and make presentations</i> in front of people has improved. 19-20 fall formal education-20-21 fall survey: Thanks to the course, my ability to <i>talk and make presentations</i> s in front of people has improved. 20-21 spring- 21-22 fall survey questions:: Thanks to the course, my ability to <i>talk and make presentations</i> in front of people has improved.</p>	<p>18-19 FALL&SPRING (FORMAL EDUCATION) survey questions: His/her <i>teaching style aroused my interest</i> in the course. 24-The course content was thought-<i>provoking and intriguing</i>. 19-20 FALL-FORMAL EDUCATION-20-21 fall survey question: The course content was <i>informing and tempting</i>. 20-21 spring- 21-22 fall survey questions: Lecture method was effective, easy to understand and <i>interesting</i>.</p>
<p>Q.4: effective lessons are taught for the effective use of technological lesson equipment to be used in courses</p>	<p>Q.5:positive effect of using methods and techniques that enable active participation of students in lessons, away from memorization, and support creativity and research.</p>	<p>Q.6: assignments and projects given by the instructor to the students will contribute to the understanding of the course and the student's self-development.</p>
<p>18-19 fall &spring formal education survey question: 6-He/she used <i>technological course equipment</i> effectively. 30-New equipment (projector etc.) is available to be used in courses. 19-20 fall formal education survey question: The lecturer used <i>teaching equipment</i> effectively (white board, visual equipment etc.) 19-20 spring online education survey questions: The <i>course materials</i> were sufficiently shared on LMS (or via e-mail) The synchron Synchronous lessons (on LMS, Microsoft Team, BigBlueButton, ZOOM etc.) were carried out effectively and sufficiently. 20-21 fall survey question: The lecturer used teaching and <i>technical equipment</i> related to the lessons effectively. 20-21 spring-21-22 fall survey question: She/he used <i>course materials, appurtenances and technology</i> effectively</p>	<p>18-19 fall &spring formal education survey question: He/she used creative methods and techniques that <i>encourage creativity and research and ensure the active participation</i> of students. 20-21 fallsurvey questions::The lecturer used methods and techniques that <i>ensure active participation</i> of students. 20-21 spring 21-22 fall survey questions:: She/he was promotive and <i>encouraging active participation</i>. It provided me to grasp the lesson and <i>learn permanently</i>.</p>	<p>18-19 fall &spring survey questions: His/her homework and projects contributed to the comprehension of the lessons and helped me <i>improve myself</i>. 19-20 fall: The lecturer's teaching style contributed to <i>my learning</i>. The homework, exams and projects given by the lecturer contributed to the comprehension of the lessons and helped me <i>improve myself</i>. 20-21 fall survey questions:: The lecturer's teaching methods contributed to my learning. Thanks to the course, <i>my personal and occupational skills</i> has improved. The homework, exams and projects given by the lecturer contributed to the comprehension of the lessons and helped me <i>improve myself</i>.</p>

The student satisfaction survey questions directed to the students by the Antalya Bilim University ISO Quality Coordinator for the education and training periods between 2018-2022 and in which the student evaluates the course content with the instructor of the course are compared in the table above. As a result, the results of the common question patterns and contents in the survey of each term were tabulated according to the student's answers as percentages. Evaluated questions:

- Thanks to this course, my abilities to analyze, interpret and access new information have improved.

- Thanks to the course, my ability to talk and make presentations in front of people has improved.
- The way of lectures made me very interested in the subject.
- There is new technological equipment (projection, etc.) to be used in the lessons. He used technological lesson equipment effectively.
- Some methods and techniques enable active participation of students in the lessons, away from memorization, and support creativity and research.
- The lecturer's teaching style contributed

to my learning, and my personal and occupational skills have improved. The homework, exams, and projects given by the lecturer contributed to my comprehension of the lessons and helped me improve myself.

In the second step, the comparative analysis method was used by taking the percentages of the Likert scale answers between 0-5 given by the students over a total of 6 questions. According to Collier, comparison is a fundamental tool of analysis (Collier, 1993) and It means the constant comparison of different pieces of data with each other to facilitate the derivation of abstract categories. (Ilgar & Ilgar 2013) Comparative analysis, like experimental and statistical methods, is a general method and is based on the logic of benchmarking. Also, it is aimed to reveal new conceptual categories and to prove their validity through continuous comparisons. In addition, comparative analysis is used to reach empirical generalizations. Empirical generalization does not merely set limits on the applicability of accessing an embedded theory. More importantly, it also offers assistance in terms of greater general applicability and greater explanatory and predictive power. (Bulduklu, 2019)

At this point, it is aimed to compare the questions posed to the students in the formal and distance education process and to reveal which parameters vary or is continuous in the positive

and negative effects of the student's learning.

5. Findings

Within the scope of the study, the averages of the Architectural Design Studios and the Basic design studio courses were taken based on questions during the face-to-face and online education process between 2018-2022, and the comparison was made and interpreted graphically.

• Analysis 1

The first analysis is based on research aimed at improving the student's ability to analyze, interpret, and access new information through the course.

In the face-to-face education process, ARC 4001 Architectural Design Studio 7; While it has the highest average of 89.57%; ARC 2001 Architectural Design 3 Studio has the lowest average of 76.54%. The most different result regarding the question for face-to-face and distance education periods was observed in the ARC 1000 basic design lesson with a difference of about 9%, in opposite way more positive in distance education 8% differences were observed in the ARC 1002 Architectural Design Studio 2. ARC 3001 Architectural Design Studio 5 has the same satisfaction level of 77% in Architectural Design 5 courses, both face-to-face and distance education.

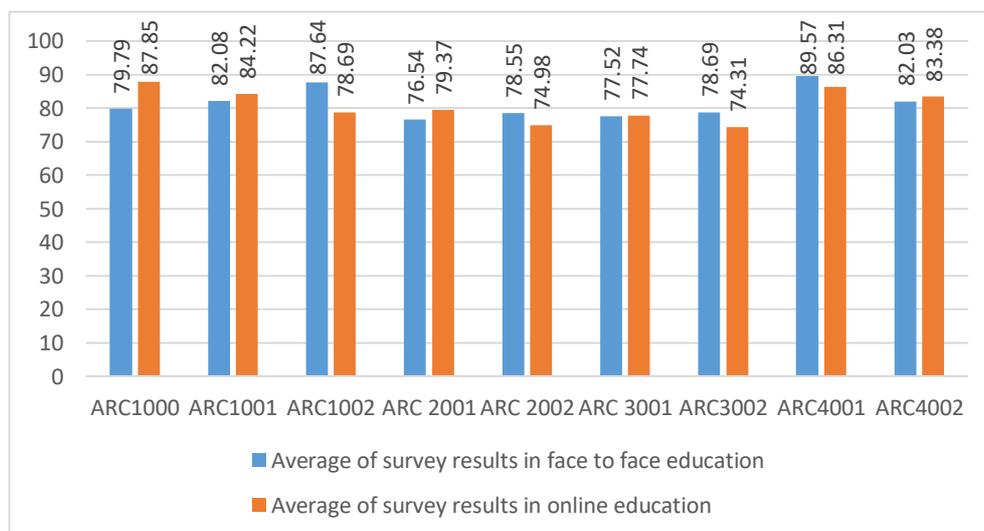


Chart 1: Graphical representation of analysis 1 results

It is examined in terms of helping students to develop their ability to analyze, interpret, and access new information and to improve their problem/problem-solving skills thanks to the course. According to the results of the survey, they stated that these skills the freshmen of the basic design course, which is one of the practice courses, can be more efficient and develop themselves in online education compared to face-to-face education. In the results of the project courses, which are all studio courses, except for the 1st year spring semester, the results of online education and face-to-face education are close to each other, it is indicated in Chart 1. The students were mostly satisfied with the results of the first-year basic design course ARC 1000 and the architectural studio course ARC 1001, although by a small amount. A remarkable point is that the ARC 1002 course, which is the second term project compared to the Basic Design and first project course, can be interpreted as more inefficient than the face-to-face education for the solution of the problems they encounter for the first time in architectural studying practices with online communication.

• **Analysis 2**

The second analysis is aimed at measuring the skills of students in public speaking and making presentations. Especially in architectural studio classes, students' posters and project

presentations gain importance. The face-to-face jury environment in the face-to-face education was carried out in the same format on the virtual platform.

The highest satisfaction rate with 91.33% was obtained in the ARC 4001 course during the distance education period. In the face-to-face education period, the ARC 1002 course is seen as the most efficient with 88.68%. The satisfaction rate of the ARC 3002 course for this question decreased to 83.12% in face-to-face education and 62.86% in distance education; The highest difference in face-to-face and distance education (21%) was observed in this course. Another interesting result of the ARC 1000 basic design course is; In the face-to-face education process, the satisfaction rate of 78% increased by 9% in distance education and reached 87%. The same situation was experienced in the ARC 4001 lesson: the satisfaction rate of 84% increased by 7% and reached 91% in distance education. In the ARC 1002 and ARC 2001 course, the satisfaction rate in face-to-face and distance education is very close to each other.

According to the results of the survey, it was found that the students, who stated that these skills were more in the basic design and first project courses, negatively affected these skills with distance education in the second semester

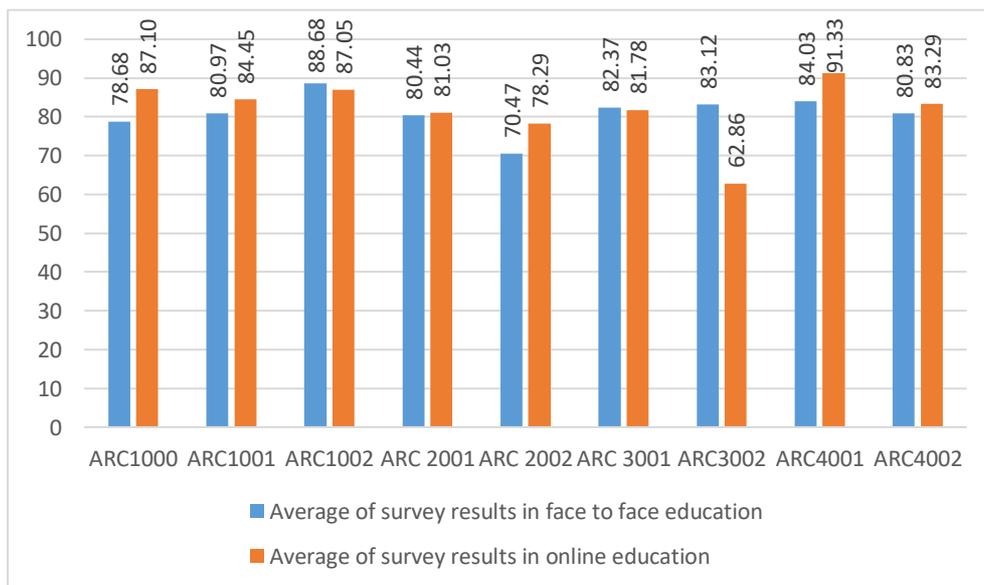


Chart 2: Graphical representation of analysis 2 results

of the 3rd year and that formal education could be more beneficial. Accordingly, it shows that students are better able to express their projects face-to-face, rather than through distance communication, due to the content's complexity and the design area's growth, especially in the ARC 3002 architectural design studio course compared to the projects in the previous semester. It can be thought that it provides a more comfortable environment for freshmen students who have just started school, due to factors such as setting up the jury in a virtual environment and not having to open a camera. However, it should be stated that the establishment of a jury, which is specific to design courses, does not allow for an open exhibition and open jury environment that takes place throughout the faculty.

• Analysis 3

The third analysis is aimed at investigating the positive effect of the way of teaching on the student's interest in the subject.

It has been observed that students' interest in the distance education process is intense in 5 of the architectural studio courses, except for ARC 1002, ARC 2002, and ARC 3002. Although the highest satisfaction rate was observed in the ARC 4001 course with 86.56%, the same course

was found to be similarly high in distance education. This shows that it can be specific to the course. In the ARC 3001 course, the satisfaction rate, which was 70.92% in face-to-face education, reached 84.71% in distance education with an increase of 14%; in the same way, the satisfaction rate in face-to-face education in the ARC 4002 graduation project course increased from 69.81% to 83.29%; the biggest difference in face-to-face and distance education processes was observed in these courses. In the ARC 4001 course previous course from the graduation project; in both face-to-face and distance education, a satisfaction rate of 86% is observed.

Since architectural design studios are given face-to-face criticism, keeping the course groups in a certain number, and each group teaching separately in the virtual environment, the communication between the groups in the studio environment causes some disconnections in the virtual environment. While it is important that the studio critics in the group are watched by other students, sharing on the screen has replaced desk critiques in online education. Although desk critiques are generally handled based on output, the fact that drawing and modeling programs are intervened quickly and easily at different phases of the production

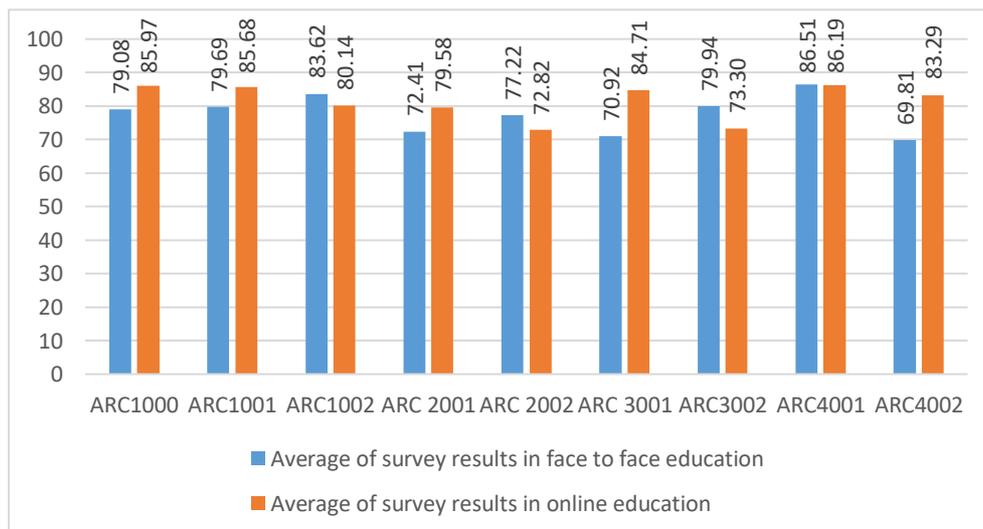


Chart 3: Graphical representation of analysis 3 results

process of projects has increased efficiency. When the results of the survey are examined, it is understood that the interest of the students towards the courses continues even online and it is productive.

As a result of the application of the project courses with online education, it can be beneficial to show the theoretical parts or to allow other student groups to listen to each other's critiques on the screen. In response to the questions asked in the surveys that the course is impressive, facilitating, and interesting, it is seen that the students can provide more efficiency in online education than in face-to-face education.

• Analysis 4

The fourth analysis is based on the research on whether effective lessons are taught for the effective use of technological lesson equipment to be used in courses.

According to chart 4 below In distance and face-to-face education, an equal satisfaction rate was achieved as 76% in ARC 2002 and 79.50% in Arc 3002. The biggest difference between face-to-face and distance education was observed in

ARC 1002 and ARC 3001 courses, with 9%.

Due to the global epidemic, earthquakes, and natural disasters on a national scale, online education has brought along some infrastructure and technological requirements. Face-to-face critiques reflecting the relationship between hand drawing and master apprentice as a classical method in architectural education and professional architectural production practices are especially prevalent in the first two years of the education period. It is widely believed that hand and drawing are related to mind and perception. With online education being carried out, this situation has led to the use of technological opportunities in the fields such as presentation, etc. in the first years of the education period. The most important stage that architectural design studios are affected by in the online education process is the replacement of model-making with 3D modeling programs. According to the results of the survey, it was seen that the use of infrastructure, equipment, and programs required by online education in other studios other than ARC 1002 and 4001 courses was effective. It should be reminded that students have the chance to repeat them retrospectively, especially in recorded courses.

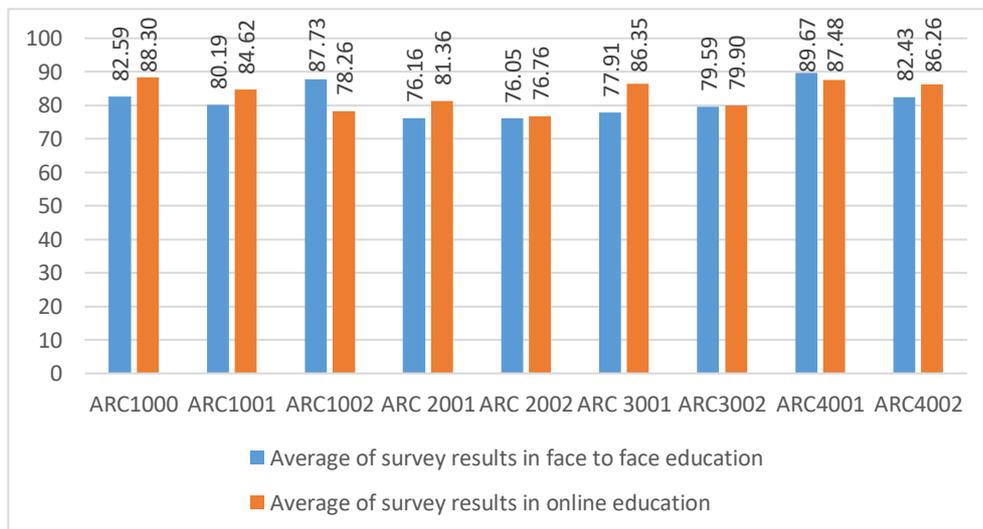


Chart 4: Graphical representation of analysis 4 results

• **Analyse 5**

In the fifth analysis, there is research on the positive effect of using methods and techniques that enable active participation of students in lessons, away from memorization, and support creativity and research.

The highest satisfaction rate for this question was observed in ARC 1000 basic design with 86.95% and ARC 4001 with 86.51% during the distance education process. In the face-to-face education process, the highest rate was observed in ARC 4001 with 87.02%, and ARC 1002 with 85.21%. These high rates observed in 1st and 4th-grade classes indicate the importance of practices that encourage student participation in the beginning and maturation stages of architectural education. The biggest difference in face-to-face and distance education processes was observed in the ARC 1002 course, with a satisfaction rate of 85% in face-to-face education and 77.97% in distance education. A similar satisfaction rate is observed in the ARC 3001 course, 82-83% in face-to-face and distance education.

It is possible to conclude that online education is efficient, except for Arc 1002 and 3002 courses and 4001 courses. The highest difference in the results of the evaluation of the methods supporting the research to ensure active participation in the online and face-to-face education period was observed in the answers of the freshmen students in the ARC 1000 and 1001 courses. In particular, the fact that it is difficult to access campuses like Antalya Bilim University, outside of the city can be perceived as a factor that decreases class participation for students. It is undeniable that it is simple for students to access classes from a distance without coming to the campus or the education building. However, being away from the social environments of university education that includes campus life, sharing, and intersections is a great loss in disciplines that feed from every field such as architecture.

• **Analyse 6**

The sixth analysis examines whether the assignments and projects given by the instructor to the students will contribute to the understanding of the course and the student's self-development.

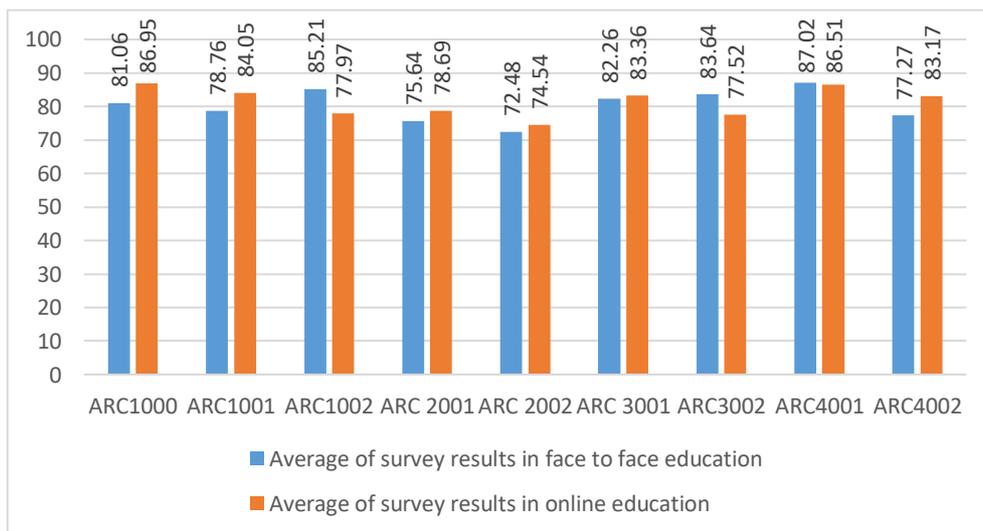


Chart 5: Graphical representation of analysis 5 results

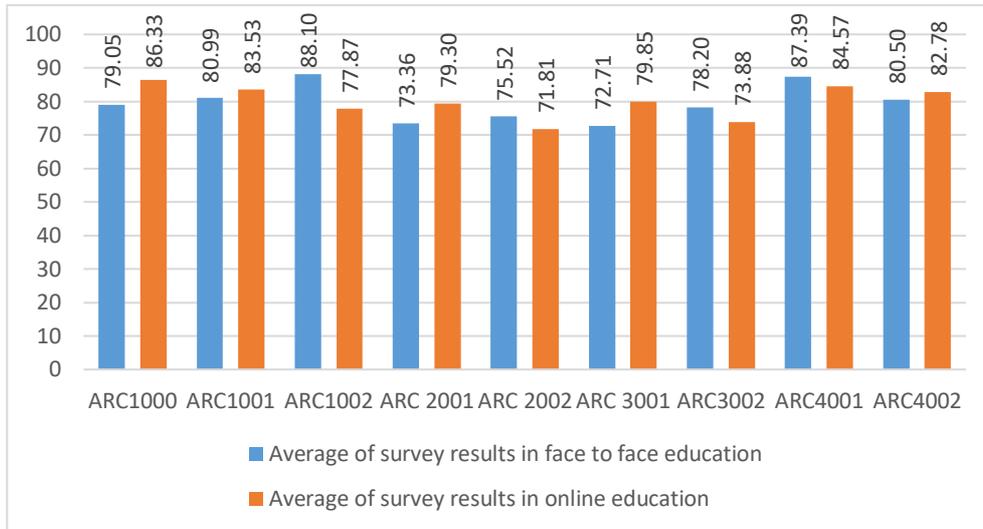


Chart 6: Graphical representation of analysis 6 results

According to the students' answers to the 6th question, the highest satisfaction rate in the face-to-face education process was observed in the ARC 1002 course with 88.10%, followed by the ARC 4001 course with 87.39%. In the distance education process, it was seen in ARC 1000 with 86.33% and ARC 4001 with 84.50%. In the face-to-face and distance education process, the difference in the highest satisfaction rate was observed in the ARC 1002 course with 11%.

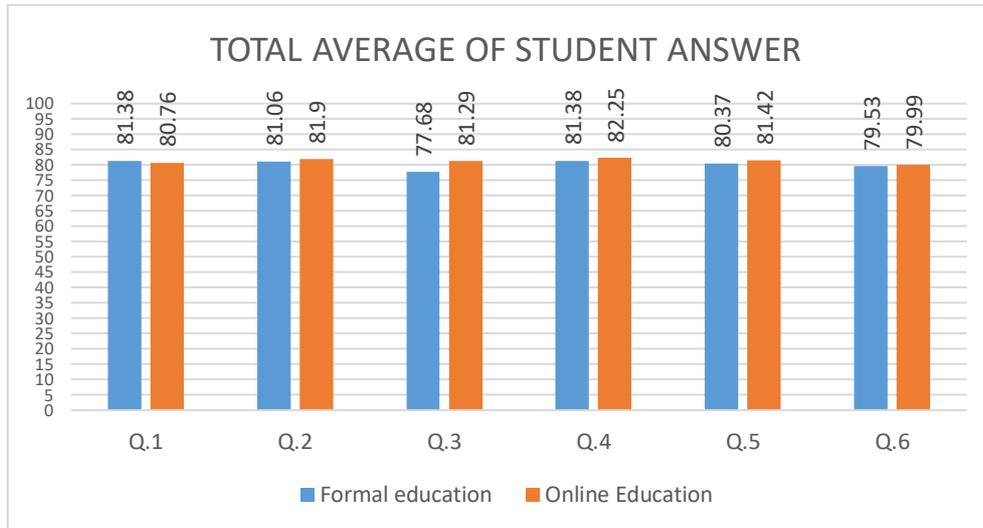
It can be said that the contribution of the homework given in face-to-face education in ARC 1002, 2002, 3002, 4001 courses is more efficient as a result of frequent consultation with the supervisor in the studio environment. However, in other courses, it is also revealed that satisfaction with the follow-up and feedback of the critiques and assignments given during online education is provided. It can be said that virtual classroom environments such as the Learning Management system used during distance education are easy to monitor students' activities and homework. However, in the evaluation of the homework and in-class applications submitted online, other than the jury, for the development of the project, it may cause miscommunication from time to time

when it is sent to the student in writing as a comment during the extracurricular times.

• Total Analysis

As it can be seen from the chart.7 below; when the survey results applied in the face-to-face and distance education processes are compared, the highest satisfaction rate in the face-to-face education total is 81.38% in Q.1 (at improving the student's ability to analyze, interpret, and access new information through the course.) and Q. 4 (effective lessons are taught for the effective use of technological lesson equipment to be used in courses.). In distance education, Q.4 has the highest rate with 82.25%. The highest difference between satisfaction rates of 4% during distance education and face-to-face education is observed in Q.3 (positive effect of the way of teaching on the student's interest in the subject.) the satisfaction rate increased from 77.68% in face-to-face education to 81.29% in distance education.

Directed to students for online courses in the 2020-2021 academic year, "Did you encounter any problems while taking this course with online education?" The students' statements regarding the question are given in the acknowledgment part.



*Chart. 7: Total average in the distanced and formal education of the students' answers
Survey Comments*

The comments they wanted to make about the course were specifically directed at improving distance education in the distance education process or understanding the issues they experienced, aside from the questions in the student satisfaction surveys, in which the content of the course and the course instructor was evaluated. As a result, especially in design studio courses, the most common online education; There are statements that design courses are not suitable for online education, cannot continue online, online education is not efficient, and does not provide success in studio courses. On the other hand, the feedback that the project lessons were interpreted as "must be face to face" was the second highest statement among the comments made among the students. In the beginning, the problems encountered during the online education period, while being described as "difficult" by the students; problems of focusing, lack of communication, and active participation are seen as other problems, respectively. In addition, one of the students who commented on the questionnaire stated that they understood the importance of communication on the model and criticism on paper.

On the other hand, among the survey comments, there are also statements stating that online education is as effective and efficient as face-to-

face education, although it is few. Apart from this, there are demands to increase the accessibility of the instructors by planning interactive courses and recording the courses to improve distance education.

5. Conclusion

The practical education model for the discipline of architecture includes a process that began with the master-apprentice relationship and includes a variety of studio approaches. As a result of the decisions taken in the field of education due to the unexpected and sudden changes experienced around the world and in Turkey, it was carried out in an online way. The role of online education in architectural design practices is still a topic of discussion and is expected to have a long-lasting impact on educational models at this time when working opportunities and distance learning opportunities are being pushed to their limits.

Through surveys and comments, the study examines how students' perceptions have changed as a result of the face-to-face, online, and hybrid project courses that are the basis of architectural education. Communication is the main part, particularly in the project development phases of architectural design studios that are disrupted online learning. There is barely any interaction between the students

during class, little cross-pollination between the various learning environments brought by the studio culture, and limited student-to-student conversation. On the other side, a change in the location for the design idea's discussion opened up new possibilities and flexibility. Model making, which is essential for creating the perception of 3D space, had to disregard, although the instructor's ability to interfere with his line in the projects that the student reflects on and beyond the screen is a significant advantage.

Considering both the comments and the results of the survey, it was concluded that project courses, which are practice courses, are more difficult for students especially for freshmen to get used to the profession and express students' selves in online education. In the project training received after the first project experience, the expectations and load of the course increased until the last year. And the students who have come to the graduation period, and who have received the graduation project, have stated that taking online project courses is more inefficient than face-to-face education.

As a result, online education and face-to-face education may have advantages or disadvantages depending on the intended use of students in training that include practice such as project lessons. Here, face-to-face education comes to the fore to communicate that they feel lacking, to express themselves in front of the community, and to prevent possible problems in the concept of proportion/scale depending on the handmade model. It is also among the results that the ideas reflected on the screen can be more useful in online education thanks to the digitally taught programs, while it stands out in terms of listening to the recorded critiques again in online education. However, since the model made in coordination with the drawing will improve the student's perception of space in both education systems, the student is guided by intervening more quickly with the critiques in face-to-face education.

This study, it has made essential for Turkey to continue providing online courses since 2020, just like other countries. Some courses,

particularly theoretical ones, have chosen to continue online learning with online education. Additionally, it has been identified that the most interactive solution, which will benefit students studying in the department that requires application, such as architecture, should be sought for a common solution in which they should use both systems together, for the years 2023 and after, when the hybrid system is also tried. The Z generation, who grew up in the age of technology, have different perceptions and focuses. They are curious about the innovations brought by technology and are more active in improving themselves than the previous generation. Because of this, it is possible to alter the curriculum in the educational system so that it can be included in the traditional educational system with hybrid education and architectural education as well as be adapted to other required online education, which will improve the effectiveness of project courses with practical+theoretical education.

Acknowledgments: Directed to students for online courses in the 2020-2021 academic year, "Did you encounter any problems while taking this course with online education?" The students' statements regarding the question are given below.

ARC 1000:

- Since we were in the first year and we did not know each other, we had difficulty actively participating in the lesson.
- Sitting in front of the screen for 7 hours caused focus problems because the lesson was too long.
- I did not encounter any problems, it was a really enjoyable lesson like face-to-face training.
- I believe that face-to-face architectural education will be more productive.
- Face-to-face is better

ARC 1001 – Architectural Design I

- At the beginning, we had problems with active participation in the lessons, since we were far away and we had never seen each other before, we had trouble attending the lessons. I also think it would be much more effective if we had the critics face-to-face. but that doesn't change the fact of how good this course is.
- Being the first semester and being done remotely made it hard for me.

ARC 1002 – Architectural Design II

- Since this is a project course, I would like it to be face-to-face. Because of the model, the lecturer can give the students a critique of the design more easily and descriptively.
- the project course is challenging for distance education. while taking criticism, sharing ideas, etc. I had a hard time

ARC 2002 – Architectural Design IV

- This course is already difficult online. I say it independently of the teacher. The Internet connection cannot share the screen.
- This course should be face-to-face, we saw the importance of a single line our teacher would take during this period. It was a little difficult to explain ourselves and our project online, to the students, I'm sure it was also difficult for our teacher.
- I have not had a problem that would cause me extreme distress.

However, I do not agree with the idea that this course can be continued online.

- It was the most productive design course I have ever taken.
- ARC 3001 – Architectural Design V
- I had the opportunity to watch many people on the jury, apart from the grade I will get, I can see that I am improving.
 - It was quite difficult to draw even a line since it was a design class. I don't think it's a course to be taken remotely. Although architecture is abstract, I think we need to communicate concretely.
 - Design courses are not successful with distance education.
 - Again, we have come to the end of an inefficient online design course...
 - Since the course is practice-based, I think it is not suitable for the distance education system.
 - It was difficult to take a design course remotely

ARC 3002 – Architectural Design VI

- Although it is a difficult course for distance education, it was very useful because we were able to communicate a lot. I did not encounter any problems.

ARC 4001 – Architectural Design VII

- Taking a pen in your hand and showing it digitally are very different things, but of course, this is not something we can prevent.
- Being a hands-on course is not suitable for distance education, even though the student or instructor puts in the necessary effort.
- I think that design lessons are more productive with face-to-face training.
- They explained the lesson to us as much as possible with distance education.
- I had problems with my personal computer, there were moments when I was inadequate for the lesson. Even though I had technical difficulties, it was a very good time.
- Face-to-face (formal education) could have been better.
- Distance education projects developed much faster than face-to-face education.
- We sometimes had a hard time understanding each other in terms of communication.

2020-2021 SPRING SEMESTER: DISTANCE EDUCATION

What do you think can be done to make it more effective when teaching with distance education methods?

ARC 2002 – Architectural Design IV

- Especially for this semester, the distance education design course has had a very bad effect.
- We know that distance education in design class is difficult, but this term was much more difficult for me. I don't think I had a very productive period because I think our teachers and we did not fully understand each other. maybe there were disagreements because we didn't see our gestures on the screen.
- I think distance education is more beneficial than formal education. But for the architectural design course, the course duration (while giving the critiques) should be more understandable and a little longer. However, distance education was more beneficial for both training and being more creative because we had the opportunity to work more on design at home since there was no commute.

ARC 3001 – Architectural Design V

- It would be better if course records were taken.
- ARC 3002 – Architectural Design VI
- It should be accessible by e-mail outside of the classroom. In such a process, the only place we can communicate outside of the classroom is via e-mail.
 - I could not provide transportation outside of the classroom in any way.

ARC 4001 – Architectural Design VII

- Interactive lessons can be increased.
- ARC 4002 – Architectural Design VIII
- The first thing to do with the distance education method is the motivation of the students, we have been studying at home for 3 semesters. During this period, I could only see my family for breakfasts and dinners. While working without leaving the

computer...

- I think this course should not be given by distance education.

21-22 FALL SEMESTER

What do you think can be done to make it more effective when teaching with distance education methods? / What can be done to make it more effective when teaching with distance education methods?

ARC 1000:

- Face-to-face training is much better

ARC 4001:

- the project course is also more efficient with distance education.

21-22 SPRING TERM

What do you think can be done to make it more effective when teaching with distance education methods? / What can be done to make it more effective when teaching with distance education methods?

ARC 1002:

- I think we should be critical of the on-demand online as well as 2 face-to-face

- can be by giving distance education

ARC 2002

- Applications must be face-to-face

- This course must be online

ARC 3002:

- I did not have any problems with distance education and I did not feel any deficiency. I prefer our juries to be remote.

Conflict of Interest: The authors stated that there are no conflicts of interest regarding the publication of this article

Ethics Committee Approval: N/A.

Author Contributions: Study conception and design: S.B.E., S.U.; data collection: S.B.E., S.U.; analysis and interpretation of results: S.B.E., S.U.; draft manuscript preparation: S.B.E., S.U. All authors reviewed the results and approved the final version of the manuscript.

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Tracing Hegel's Philosophy and Thoughts in Educational Styles of Architecture Design Studios

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Abstract: This paper aims to trace the influences of Hegel's philosophical thoughts and ideas on the architecture design studios' activities. Hegel is a key figure in the modern history of philosophy that lived in the time of establishing Beaux Art on the skeleton of Academie d'Architecture. Despite the many developments in different areas of education, seemingly, there are still some common grounds between Hegelian philosophy and architecture design studio activities that need to be highlighted and criticized. Content analysis and storytelling based on the structured observation applied in this research to compare two foundations. The results reveal four connections between Hegelian philosophy and architecture design studio activities, including precedents studies and historical dialectic, learning by doing and self-consciousness, crits (critiques) and idealism, and master-apprentice and master-slave theories, respectively. The findings highlight that activities in architecture design studios regenerate through studios, which run based on traditions, disciplines, and styles under the influences of Hegel's philosophy. In conclusion, while Hegelian thoughts spread through successor philosophers in phenomenology, hermeneutics, existentialism, Marxism, and structuralism, education in architecture design studios has continued without the regeneration of ideas.

Keywords: Architecture, Design Studio, Hegel, Philosophy, Education

Introduction

Hegel mentioned that architecture is the most complete form of expression in art that not only represents art as itself such as buildings but also it compasses all arts by providing buildings, such as museums, galleries, and theatres for the presentation and performance of arts (Fields, 2000; Karatani, 1995). Karatani (1995) explained "will to architecture" as a message from Hegel to demonstrate his impressions on the history of art, architecture, and philosophy. Briefly, we know, Georg Wilhelm Friedrich Hegel (1770-1831) is one of the key figures in Western philosophy after the Enlightenment movement in Europe (Dupre, 2004; Eddy, 2013) and his philosophy affected the whole of the world deeply. His lifetime

coincided with some great events in the world such as France's Revelation, the establishment of Beaux-Arts based on the skeleton of "Académie d'Architecture" (Griffin, 2022), and the raising the power of the empire Napoleon (Fritzman, 2014). Hegel deeply was affected by the historical events in his life, thoughts, and philosophy. Hegel's works were classified into different categories by researchers including phenomenology, consciousness, history, logic, aesthetics, and political and social rights (Pippin, 2010). Hegel was a professional academician that inherited the Enlightenment era legacy. However, to know Hegel's philosophy first needs to review on the Enlightenment era and the birth of the first school of architecture in the world.

Enlightenment was the result of the Renaissance era that boosted new movements. This movement in philosophy and science resulted in the discovery of new laws, knowledge, and ideas to explain the world. This era included great philosophers such as Edmond Bacon (1561-1626), René Descartes (1596-1650), Baruch de Spinoza (1632-1677), John Locke (1632-1704), Isaac Newton (1642-1726), Emmanuel Kant (1724-180), and other philosophers who revolutionized the history of science and believed in common sets of principles. Those values constructed 1) empiricism such as experimental activities to discover natural laws, 2) rationalism, such as the application of methods in science, reasons, facts, evidence, and data, 3) skepticism to criticize all aspects of knowledge, and 4) humanism to acknowledge relationships between the individuals and the state through contract, institutionalization, and legitimacy (Schmidt, 1996; Dupre, 2004; Fleischacker, 2013).

Enlightenment movements also resulted in open discussions widely on academia, scholar, and the teaching process in northern parts of Europe universities based on the ideas of Locke, importantly was led by Edinburgh, and Jean-Jacques Rousseau's (1712-1778) ideas in Switzerland (Eddy, 2013). The main objective was to change the process of learning and teaching in schools that was organized based on memorizing theory and fact through oral style, and graphical methods to represent lessons grounded in the Renaissance period thoughts (Hotson, 2007).

Through the Enlightenment movement for institutionalization, the Academy of Science (Académie des Sciences) was established in Paris in 1635 by order of Louis XIV (1638-1715), who was the person to order to establish officially the first school of architecture "Académie d'Architecture on 3rd December

1671" in Paris, France (Griffin, 2022, p. 1). However, the states' academies accepted just aristocratic, noble people, bourgeois, and Parisian scholars (Crosland, 1992). It was a belief among bureaucratic scholars that they were the main source of knowledge to translate and interpret for people and the public (Roche, 2000).

Through the movements, Hegel absorbed deeply the progress of philosophy in the era. Hegel's points on education were classified into four major components, including the philosophy of education, the structure of courses, the pedagogy of teaching, and the paradoxical position of teachers (Tubbs, 1996) that apparently was a self-attempt to draw his educational matters through some personal letters (Tubbs, 2015). Nonetheless, the focal point of Hegel's ideas that connected philosophy to architecture and art locates in the processes of understanding and evaluating of aesthetics through self-consciousness. In fact, the understating of aesthetics is the joint point between art, architecture, and philosophy to discuss, apply, and criticize by each profession, respectively.

Aesthetics have been the common ground in the history of art, architecture, and philosophy to be created, evaluated, and commoditized. For this reason, aesthetics was one of the key items in Vitruvius's perspective to evaluate the quality of architectural projects (Proudfoot, 2000; Tafahomi, 2022a). To achieve aesthetics, both art and architecture schools applied philosophical concepts to educate students directly and indirectly. In a direct way, the course was part of the curricula, and in an indirect way, the philosophical themes and matters have been part of the course to discuss and learn, and apply. Diagram 1 illustrates this relationship.

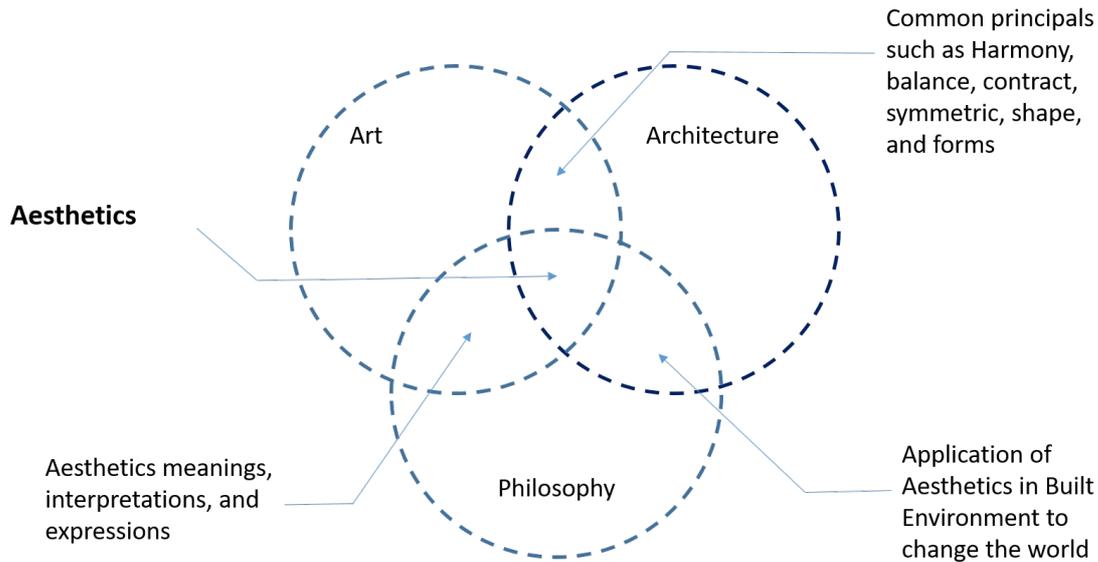


Figure 1: Aesthetics as a key point in art, architecture, and philosophy

Apparently, not only Hegel's philosophy and thoughts did a great effect on the philosophy and education in the world, but also deep analysis and imagination of Hegel about art, perception, architecture, and aesthetics designed a system of thinking among intelligentsia groups of educated people. Architects, historically, have been engaged with art, literature, history, science, and philosophy. This interaction between influencers and influenced people by Hegelian philosophy and thoughts resulted in changes in education, activities, and expected results in many fields of education, particularly architecture. Therefore, architects borrowed some ideas from philosophy to apply in architecture design studios to teach students that even sometimes we (as instructors) never know it. These unknown aspects lead us to the current condition of philosophy and ideology in the mind of people in the world that was formulated by Zizek below (Zizek, 2006):

"There are things we know that we know".
"There are things we know that we do not know".
"There are things we do not know that we do not know".
"There are things we do not know that we know".

According to the interpretation of Zizek, the last part of the quotation is referred to the ideology

that we do not have awareness of it; however, we do some behaviors, attitudes, and activities based on beliefs through history, context, and culture. The problem locates in the norms that have been constructed based on ideology rather than knowledge. Despite the existence of norms as a common form of activity, when a belief become part of the educational system (Williams & Robert, 1997) such as architecture, it could create a style of teaching and learning in studios (Tafahomi, 2021a) even instructors do not aware about that.

Therefore, the motivation of this paper is to bring to the attention of architects, architecture instructors, and students to understand the activities we do in design studios in relation to Hegelian thoughts even if they are celebrated or rejected, regenerated or outdated, and transformed or criticized (Borchert, 2005). However, this style of teaching in architecture design studios was spread out mainly through the tradition of Beaux Art with both positive (Craven, 2019; Armstrong, 2016) and negative effects (Littmann, 2000; Madanovic, 2018). It is significant to know that Hegel's philosophy and thoughts were a great foundation for successor philosophies, such as phenomenology and hermeneutics, existentialism, Marxism, critical theory, and deconstructionism (Sinnerbrink, 2007). In this logic, the main objective of this

paper is oriented toward comparing the key aspects of Hegel's philosophy and the activities in design studios to highlight specifications, attitudes, and styles of education, teaching, learning, and activities in architecture training to discover the root, logic, and philosophy of what we do in architecture design studios.

Methods and Materials

Methodology

Studies applied content analysis for historical and comparative studies (Drisko & Maschi, 2016; Given, 2008) such as the biographic and historic books on architecture buildings and design (Benevolo, 1980; French, 1983; Kostof, 1995; Morris, 1979). The content analysis technique referred to documented evidence (Mayring, 2000; Silverman, 2010) through writing, mapping, or drawing, based on themes, topics, and meanings (Krippendorff, 2003; Schreier, 2012). The content analysis technique always was interlocked by some level of interpretation (Krippendorff, 2003) and three styles of interpretation were mentioned, including structuralism, de-constructivism, and hermeneutics (Mugerauer, 1995). However, Foucault criticized this method as an unclear process in the history of knowledge that included a tendency to generalize ideas without concrete evidence (Foucault, 1972). Nonetheless, content analysis with different approaches still applies in research such as architectural history and theory (Groat & Wang, 2002; Wang & Ilhan, 2009).

As an example, Lang (Lang, 2005) analyzed urban design projects to discover the similarities and dissimilarities to formulate a proper logic for the design process in urban design projects. The study applied content analysis to evaluate the contents of the projects through texts and graphics. Another study (Carmona, 2001), analyzed the quality of the housing projects through documents of the projects and observations. In addition, some of the historical studies applied content analysis through hermeneutic (Gomez, 2003; Hancock, 1995; Seamon, 2015) and phenomenology (Norberg-Schulz, 2019; Proudfoot, 2000), ethnographic (Tafahomi & Nadi, 2020; 2021) techniques to discover the ideas, themes, and the meanings (Krippendorff, 2003).

There are also sets of methods and techniques to study educational processes such as used focus groups, structured observation (Borden & Ray, 2006; Evans et al., 2014), interviews, and questionnaires (Creswell, 2012; Denzin & Lincoln, 2018; Neuman, 2006). For example, studies applied different techniques such as focus groups for class and education (Given, 2008), storytelling and description (Denzin & Lincoln, 2018; LeCompte et al., 2012; Schon, 1987; Schon, 1984), and logical arguments to explain activities (Groat & Wang, 2002; Wang, 2009), content analysis for documents (Langford & McDonagh, 2003). In fact, each educational school applied different methods and techniques based on curricula, methods, and approaches to deliver educational materials (Williams & Robert, 1997). While in architecture research methodology, historical research was classified as an independent strategy in research (Groat & Wang, 2002); current research recommended a multidisciplinary approach to architecture (Tafahomi, 2022a).

Despite the debate on the application of project-based design or problem-based design, there is a tendency to apply project-based design in design studios (Tafahomi, 2022a). In addition, there is a differentiation between the architecture design studios on a big scale of design and engineering, graphic, and industrial design that work based on the client's request, user's interview, and prototypes tests (Cross, 2005; Ertas & Jones, 1996). In fact, in other design studios, the request and order of clients provide a linear system for design to be ended at the prototypes stage for the either products or for critics. Prince and Felder called this process as a specific task for the final output (Prince & Felder, 2006). This differentiation in the architecture design process takes place in the survey and site analysis that includes interactions with users and client (Niezabitowska, 2018). Nonetheless, to draw a proper research design on the effects of Hegel's philosophy and thoughts on design studios, particularly in architecture, the content analysis was recognized as more appropriate way to discover Hegel's theories, biography, and critics. Moreover, observation of activities in design studios was one of the techniques to document and explain it through documentation, reporting, and storytelling.

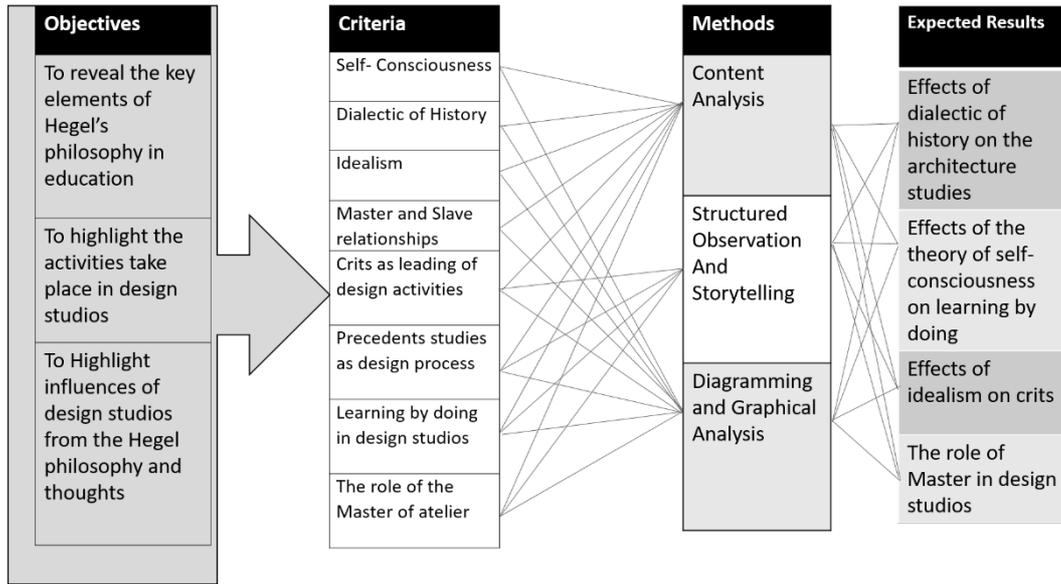


Figure 2: Methodology and research design

Research design

This research applied content analysis (Drisko & Maschi, 2016; Krippendorff, 2003; Schreier, 2012) to examine Hegel's theory and storytelling about activities in design studios based on structured observation (Creswell, 2012; Denzin & Lincoln, 2018) with a qualitative method approach (Given, 2008; Neuman, 2006; Silverman, 2010). The qualitative methods were used to get the information in the situated context of the research and deal with the phenomena in the real setting (Groat & Wang, 2002). This research attempted to draw some links between activities in design studios and the theories of Hegel (Krippendorff, 2003). In detail, on one hand, the content analysis technique was applied to discover the logic of theories and thoughts of Hegel in his works or other researchers,

biographer, or critical texts (Given, 2008; Gomez, 2003). On the other hand, systematic activities in architecture design studios were explained based on the observation of the researcher in the design studios (Neuman, 2006; Niezabitowska, 2018). The storytelling technique was a way to formulate the structured observations in design studios including the position of the master of atelier, the crits, learning by doing in design studios, and precedents studies as models of design projects. Figure 2 illustrates these factors.

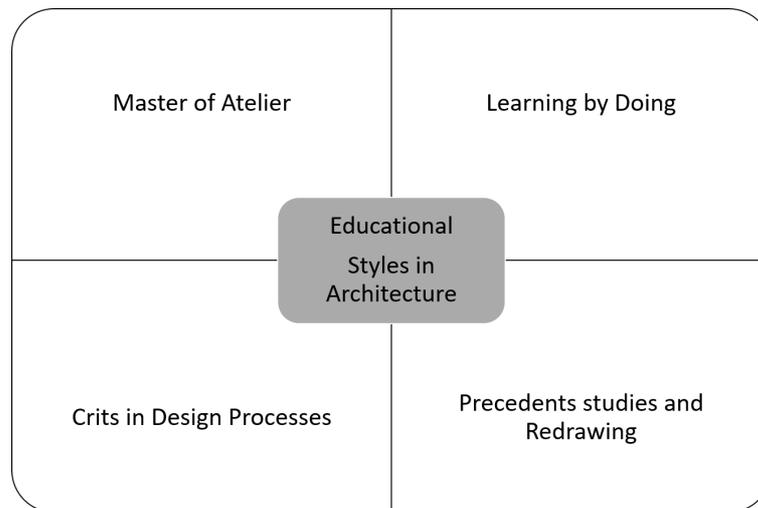


Figure 3: Educational elements and styles in design studios

To design this research, four critical steps in design studios were explained including precedents studies, design process, crits (desk crits, pinup crits, and final exam crits), and relationships between studios leader and students. On another side, Hegel's thoughts were recognized particularly and paralleled including the dialectic of the history of self-consciousness, idealism, and progress, and master-slave relationships (Figure 3).

Research process

This research drew a comparative study on the activities in the design studios and the related logic and thoughts in Hegel's philosophy to discover the logic behind the activities in design

studios. These stages included four steps, including precedents studies and the dialectic of the history, the design process as learning by doing and self-consciousness, crits (desk crits, pinup crits, and final exam crits) and idealism and progress, and relationships between design studio leaders and students and master-slave relationships in the philosophy of Hegel. This research attempted to explain the similarity of activities in design studios with Hegel's thoughts either his writings or other authors who criticized Hegel's ideas. For the writing documents, the address of the ideas and thoughts were explained through citations and references. Figure 3 attempts to illustrate this comparative study.

Context of the Research

Architecture design studios (similar to other design studios in landscape architecture, urban planning, and design, interior and industrial) included a wide-open area with drawing tables, chairs, shelves for archive materials, black-white boards for notes, and nowadays projection area for PowerPoint slides presentation. Some of the design studios included partitions to allocate individual space for each student, particularly in the final year or thesis studios. All the design studios have included a studio leader that in French tradition is called Master of Atelier (Atelier-master), in Italy as “Docente Responsabile del Laboratorio” and in other countries calls as studio coordinator, leader, or instructor. There are two or three assistants to help the studio coordinator dependent on the structure of the department and the budget of each university. Students are the key elements of design studios that all of them are in the same year and semesters although sometimes there are other students who repeat the year or the

studio, or other students from other programs have to pass the design studio.

Analysis of design studios activities with Hegel’s thoughts

The analysis of the activities in the design studios and tracing of the logic in the philosophy of Hegel included four sections as illustrated in Figure 4:

Architecture precedent studies and dialectic of history in Hegel’s philosophy

The design activities in many design studios are started either with site analysis or precedents studies. The studio’s coordinator takes the decision based on the themes and topics of the project for each year (Schon, 1984). Despite the tendency to work on real projects on real sites by many studios nowadays, it is common to observe that studios have an inclination to work inside of design studios and work on conceptual projects. In this respect, one of the important activities in design studios is to study analogous

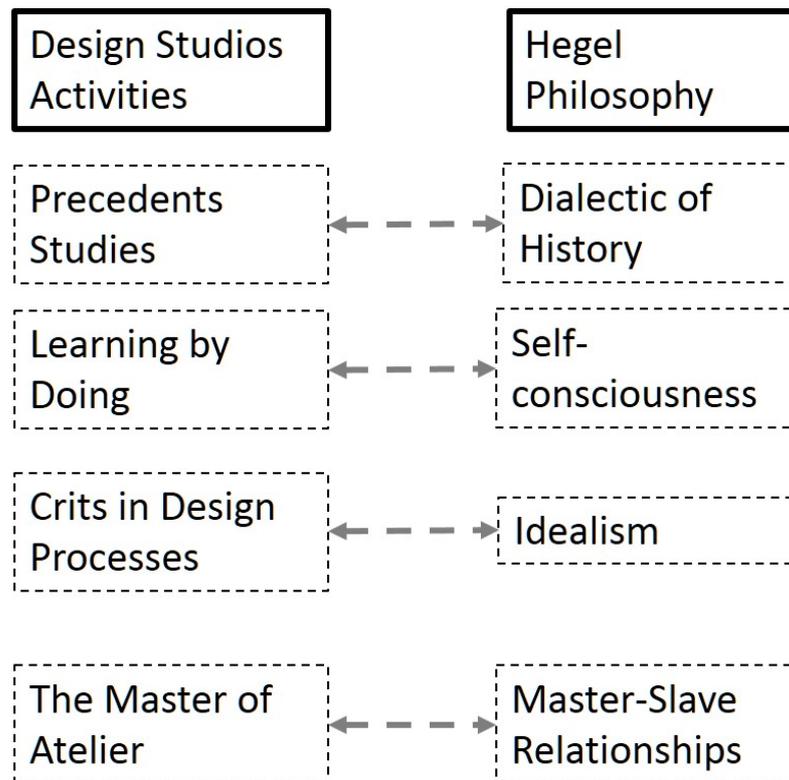


Figure 4: the parallel connections between studios and Hegel’s philosophy

projects by the students either to learn lessons from previous projects or to be inspired by the design ideas (Tafahomi, 2021a). The logic was constructed in this way that there is something in the previous projects that could be learned, assimilated, accumulated, conceptualized, vitalized, or criticized (Clark & Pause, 1996). For example, Garric (Garric, 2017) mentioned that students in Beaux Art should spend some years in Rome to draw architecture projects as their portfolio to present to juries, alongside the findings of (Draper, 1977; Drexler, 1975). The key point of this activity was located in the reason that there are some aspects of history that could learn, inspire, and thrive. Despite the nostalgic sense of this approach, the advocators believed that history was so rich to be repeated through design. This rationale could be observed in the traditional styles of education in the history of architecture importantly Beaux Art, Polytechniques, and Bauhaus (Tafahomi, 2021a; 2022a) although the level of both application and modification of this approach was different in each school (Lupton & Miller, 1993; Mindrup, 2014). Even, there is a trend in some architecture departments to lead the students just with the projects that were recommended by studio leaders rather than students' selection or search (Tafahomi, 2021a). This process specifically in the first year is highlighted through redrawing the other projects in courses such as visual studies, drawing techniques, and buildings technology modules. Even, in other programs also such kind of redrawing of the projects is recommended particularly in painting due to the similarity in art and architecture.

For Hegel, history is a retrospective topic with a trichotomy character (Fritzman, 2014). It means everything has started from the past, has been related to the past, or has a root in the past with three stages, phases, or compartments (Hegel, 2011). These three components work together as an engine of history to move forwards. For Hegel, history is a movement of progress for the freedom of humans through events. Despite the common understanding of "thesis, antithesis, and synthesis" as the main source of the Hegelian dialectic, Hegel never used this terminology for the dialectic of history. Johann Gottlieb Fichte (1726-1814) innovated the terminology (Fichte, 1993) to demonstrate the meaning of dialectical processes in his works

that were celebrated by successors, such as Marx to revise the dialectical foundations in history. For Hegel history is divided into three categorical themes, times, and names including "Symbolic, Classical, and Romantic" which referred to the history of three locations, including first, Mesopotamia, Persia, and Egypt, second, Greece and Roman, and third European countries, respectively. This classification was not based on time and chronological logic, but rather on a geographical preference (Hegel, 2011).

Hegel advocated that all historical elements and events are transformed into new forms through regenerations based on a transcendental process (Magee, 2010). In this logic, symbolic elements were transformed into classical forms, and classical elements were transformed into romantic forms. This logic explained relationships between predecessors and successors through the dialectic of history. Hegel categorized history into "original history, reflective history, and philosophical history" which represented a direct observation of events by the author, a general explanation of the world through logic, and explanations of humanity and thoughts through reasoning, respectively (Inwood, 1999). Hegel believed history is an encounter between contradictive elements and the result is a new version of a phenomenon. Therefore, the phenomenon is not very new, rather than a hybrid phenomenon that included some aspects of both contradictive compartments. In this logic, for the study of a phenomenon, we should return to its origin and history to find the detailed aspects of components. All phenomena have a strong foundation in the past and the results appear in new phenomena through the dialectic of history.

For Hegel, history moves through historical figures importantly individuals who lead the army, philosophy, and religion. It is quite alike what we do in design studios to select projects from key figure architects. History through these figures changed the periodical eras toward a new form of human life that headed for ideal forms (Magee, 2010). He mentioned three eras in history in terms concrete, abstract, and absolute. The concrete referred to the Kantian real that represents the objectivity and reality of the world. The abstract referred to the human

mind, subjectivity, and creativity (Fleischacker, 2013). The results of the reflection of the real in the mind of the observer will result in a new form of the world through self-consciousness. It is a process of progress and the creation of new ideas in the minds of individuals to change the world into an ideal form.

The Hegelian retrospective thoughts were reflected deeply in architecture education in terms of learning through precedents projects importantly from elite architects as figurative samples of picks of history in architecture (Clark & Pause, 1996). Particularly, those precedent projects should be selected from Europe and North America (even when you teach in Africa) to inspire the students to produce something in the same alignment with the precedents projects as a new form of Hegelian idealism. Figure 5 illustrates my interpretation of those connections.

Learning by doing in architecture and self-consciousness theory by Hegel

Design studios in architecture have followed a clear process through Beaux Art (France), Polytechnique (Italy), and Bauhaus (German) traditions based on art, science, and craft, respectively (Tafahomi, 2022a). Despite traces of apprenticeships in all schools of architecture, some of them were more conservative to continue apprenticeships styles, such as Beaux Art and Polytechniques. However, Bauhaus and “Vkhutemas (Higher Artistic and Technical Workshops in the Soviet Union)” both were under the influence of Marxist and socialist

theorists to make a revolution in art, architecture, and aesthetics education based on reciprocal methods of learning between instructors and students (Adaskina, 1992; Bokov, 2021). However, one of them was closed under the pressure of Nazi Fascism, and another one was disoriented under communist Fascism. Based on three traditions, somehow, three styles of architecture education were spread around the world differently based on time and location (Armstrong, 2016; Craven, 2019; Draper, 1977; Drexler, 1975; Garric, 2017; Littmann, 2000; Madanovic, 2018; Tafahomi, 2022a).

The skeleton of the education in the design studios was constructed on curricula that give responsibility to a studio’s coordinator to draft the syllabi. Either the curricula recommended topic-based studios, such as housing, school, hospital, and so on, or thematic-based studios, such as environmental design, social design, ecological design, and so on. The common stages of the studios are based on tasks and activities as a road map for design processes, such as precedents studies, analysis, site visiting, conceptualization, and design development. This process could be summarized in study, concept, and design (Tafahomi, 2021a) or analysis, programming, and design (Tafahomi, 2022b) that have roots in the Vitruvian trichotomy of design. However, the trichotomy of Vitruvius was based on aspects of design including firmness, commodity, and delight (Proudfoot, 2000) than processes (Fields, 2000). It is supposed students in studios

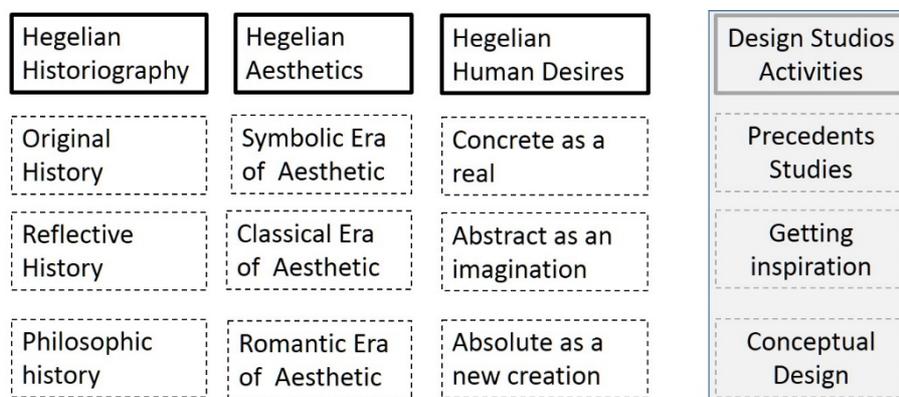


Figure 5: Hegelian retrospective thoughts and design studios

understand the design process activities to start studying, analyzing, drawing, conceptualizing, and mapping their own ideas, assumptions, and concepts through textual, visual, and graphical outputs (Tafahomi & Nadi, 2021b) in terms of conceptual, figurative, and diagrammatic design (Goldschmidt, 1991; Laseau, 2000; Trancik, 1986; Tschumi, 2014).

As a concrete example, some of the masters of ateliers are happy with topic-based projects such as single-family housing or kinder gardens. The project is started by introducing some great projects, from fashionista architects (normally big firms), to redraw the structure, and modify some elements and spaces, to fit into the given site as a new style of design that normally they call composition style in design (Taura & Nagai, 2013). It is supposed that this process of redrawing creates a self-exploration for the students. Schon (Schon, 1984; 1987) explained the processes of design studios in terms of reflection of “learning by doing” through a continuous dialogue between instructors and students in daily activities gradually to achieve the results. It means that students draw their ideas, show them to the studio’s leader, get feedback, and go for revision on sketches, drawing, and redrawing (Ching, 2015; Laseau, 2000). This process sometimes includes juries, and visiting lectures to lead students. This process of drawing, editing, and redrawing continue to the end of the design studio that it was supposed students produced the final outputs of the projects as final boards design (Tafahomi, 2021b). In some of the studios, the students work as a group or peer which is resulted in criticizing other groups’ projects (Tafahomi, 2021b; 2021c). In addition, in design studios are asked students to make physical models, which students should assemble, disassemble, and re-assemble architectural elements based on the comments, evaluations, and processes (Borden & Ray, 2006; Ching, 1996). It is supposed that students assimilate and accumulate architectural lessons through processes of trial and error (Tafahomi, 2022a), to do self-learning (Tafahomi, 2021a), self-experience to develop their own understanding of architectural design (Crowe & Laseau, 2011).

Hegel formulated self-consciousness theory based on Kantian dualism (Solomon, 1983). In

the theory of Hegel, the consciousness of a person takes place through doing activities for knowing phenomena repeatedly (Hegel, 2018). In Hegelian’s thoughts there is no consciousness from a real object in the mind directly in terms of awareness rather than through a self-experience in social context as norms (Pinkard, 2000). From this perspective, the awareness of an individual is formed based on the awareness of others (Rockmore, 1997) importantly nature, state, and other individuals. Nature referred to natural laws in Newtonian mechanics, the state referred to context, particularly government, policy, and power (Foucault, 1980) although an individual referred to others’ self-awareness based on objectivity (Hegel, 2018). This process of self-experience does not achieve the satisfaction of individuals; however, through this process, the action of to know takes place in critical reactions and interactions between subjects and objects (Stern, 2002). The key figure for confidence in the level of consciousness for Hegel is collective ideas through society. Individuals through norms achieve self-consciousness and understand phenomena (Hegel, 1991). Seemingly, if social and contextual conditions do not allow forming awareness about phenomena based on bias, self-consciousness could not freely explore for awareness (Fritzman, 2014). Hegel recommended a reciprocal awareness between individuals through the state that has the rule to facilitate, advocate, and harmonize the awareness of individuals for self-consciousness including others’ consciousness (Hegel, 2018).

For Hegel self-consciousness is a desire to achieve by each individual. Subjects do this achievement not only through self-awareness but also through the lens of others and themselves about this awareness. It means self-awareness could be assumed as an object out of the subject to be evaluated and examined by others. In other words, the self-consciousness of individuals through the lens of others creates satisfaction that referred to the approval of self-consciousness by groups, society, or states, which Hegel called collective knowledge (Hardimon, 1994). In this way, noumena become phenomena through self-experience. In fact, self-consciousness is a result of the immediate experience of the object by the subject that forms the dialectical journey from

self-awareness and self-experience, to self-consciousness. Therefore, the satisfaction of self-consciousness was extracted through others' consciousness to form normativity. Despite the sets of disagreed philosophers with this logic such as Edmund Husserl (1859-1938), Karl Marx (1818-1883), Martin Heidegger (1889-1976), and successor philosophers criticized this idea (Gron, 2009; Borchert, 2005) in terms of facilitation of totalitarianism to shape political powers.

Therefore, learning by doing under the leadership of the master of the atelier in design studios hardly will result in the self-consciousness of individual architects. Rather, it will result in harmonizing the activities based on the norms and styles that are traditional and personal to some extent.

Architecture crits and Hegelian idealism

Crits is a key matter in design studios in terms of backbone and include a long history in architecture education particularly Beaux Art tradition (Borden & Ray, 2006; Draper, 1977; Drexler, 1975; Garric, 2017; Griffin, 2022; Tafahomi, 2021b). However, this tradition was inherited from "Académie d'Architecture" after France's Great Revolution (Griffin, 2022). The ateliers in the Académie d'Architecture were run by the noble architects who provided budgets for the activities (Draper, 1977; Drexler, 1975). Both budgeting and nobility positions authorized the master of the atelier to run the design studio in "Academie" similar to own provide office (Garric, 2017, p. 2). Beaux Art inherited this tradition after French Revolution by restructuring the "Academie" into Beaux Art (Griffin, 2022). The study highlighted that studios in Beaux Art were based on a "personal arrangement of design studios rather than an academic system" for crits, evaluation, and selection of the best project of students (Garric, 2017, p. 6). The crits were based on the personal judgment of the master and his style (please be aware that there was no woman at that time in Beaux Art). This tradition continued in both Beaux Art and Polytechnique in Italy based on technical drawing and construction than design. Just in until 20th century, based on John Davey's theory of pragmatism, and the Marxist theory of social work in both Bauhaus (Germany) and

Vkhutemas (in the Soviet Union) a new approach based on interactions than repetition was applied (Adaskina, 1992; Bokov, 2021; Lerner, 2005; Lupton & Miller, 1993; Mindrup, 2014).

In fact, crits have roots in the reactions of the master of the atelier through comments, evaluations, and developments of the projects. The crits are started by exercises, tasks, and activities of the students to meet the expected results due to studio topics, themes, and scales. From the first step of activities in studios, students receive crits from the master of the atelier, instructors, and juries in different stages and level of progresses. The first cluster of crits normally is received when the students start to draft ideas, concepts, or design elements. This drafting process is under some backward-forwards movements from the first ideas and crits in terms of related comments to improve the ideas of students that we called desk-crits. This set of crits and comments are normally process-based due to the progress of the projects and crits gradually. Traditionally, it took place on the drawing desks in the hand-drawing times. After the improvement, revision, and development of the design ideas, the students go for pinup boards for the presentation of the tasks, ideas, and design activities. While the materials of this stage do not present the final outputs of the students and still the design boards could be improved, the crits are constructed based on the students' productions and task-response in this stage.

Normally, for the pinup stage, the instructors of design studios (master of atelier and assistants) have duties to give comments and criticisms. The numbers of desk-crits and pinup-crits are dependent on the course syllabi, subdivisions of the tasks, activities, and time arraignment, the style of the master of atelier to arrange the assessments, and policy of the institution to regulate the assessment processes. The final exam crits is a place for a meeting between the students, juries, and the design board products. Normally in this stage, the external examiners, professionals, and designers are invited for the final exam and presentation. The crits in this stage are contradictive to some extent based on styles of design, level of understanding of the student's projects, level of detailed presentation,

level of the expectations from the students, and time allocated for both students and juries. Nonetheless, the objectives of crits in all stages are to lead the projects of students to a higher level of quality as something that need to achieve in the next stage.

The study mentioned a long list of benefits for crits such as the process of interchanging knowledge, supporting students in design processes, and motivating the students to follow the right way of design (Doidge et al., 2000). Criticism was part of the Vitruvian criteria to do assessment of the architectural projects (Tafahomi, 2022a). This tradition of daily or weekly crits of atelier-master was started in Beaux Art due to the deadline of the competition (Carlhian, 1979). However, we could still observe crits as a style of education in architecture design studios in terms of dialogue between educators and learners (Schon, 1984) to improve architectural design (Anthony, 2012). It was supposed that students align the design processes with the received crits. Although crits are justified as a process of learning negotiation for students, crits have been a personal view of instructors without any training backgrounds (Goldschmidt, 2002).

It was supposed that crits always judge design outputs as an object to be evaluated based on expected qualities. The comments were expected to lead students to the next phases, stages, or activities in the judgment processes importantly for, a better understanding of the project, idea, or task. Crits were supposed to lead the students to the ideal type of design that either could win the prize of competition (Crosland, 1992; Garric, 2017; Griffin, 2022) or surprise all juries in the final design presentation (Doidge et al., 2000; Evans et al., 2014). However, the entire projects of students normally do not achieve to the expected results, and the ideal type of projects as a well-developed design project has had different meanings in the mind of studio-master and students. Perhaps, for this reason, Lawson (Lawson, 2005) criticized that architecture education has been more prescriptive than descriptive. In this regard, the study revealed that the crits in architecture were involved with stress, anxiety, sweating, and panic experiences (Anthony, 2012).

Hegel did not structure the critiques as a topic in the lectures on history nor in the phenomenology of spirit, rather than critiques were a tool for him to apply and criticize predecessors' philosophers particularly Kant and Descartes (Rockmore, 1997). The application of criticism for Hegel was based on an epistemological approach grounded on skepticism in science (Bristow, 2007). The process of application of the critique was taken place through the examination of the mind, perception, and consciousness to achieve absolute knowledge (Smith, 1987). Self-consciousness was formed based on dialectical relationships between abstract and concrete awareness of individuals to achieve self-consciousness through critiques. The critique was an examination of individuals' understanding of nature. Absolute knowledge always was far away somewhere in the next step that individuals should try to achieve through dialectic and critique examinations (Hegel, 2018).

The critique for Hegel was a way to clarify presuppositions from the mind of individuals in the self-consciousness process (Bristow, 2007). However, the absolute was not achievable due to the fundamental requirement that Hegel drew as equality with the perfectionism in Christianity as God. For this reason, among the successors of Hegel could be observed a long discussion on the problem of the hermeneutic circle (Borchert, 2005). Apparently, the absolute was an objective to achieve, however, the history was formed based on the concrete and abstract dialectic. Seemingly, crits facilitated the processes but the absolute was not a stage or product but rather an ideal type of consciousness in terms of idealism very close to the transcendental idealism of Kant. Apparently, crits were an engine to go forward from unknown stages toward a known stage based on idealism in Hegelian thoughts and perfectionism in design studios. It means the crits never are ended or lead the receiver to the crits for the next stage of progress and development. In the next stage, also there are some crits for the further stages. The idealism aspects of the final projects or expectations are never ended in the mind of critics, rather than other sets of crits appear to design an ideal type of something. For this reason, even many best developed

architectural projects receive crits from professionals, academicians, and students.

Master-apprentice in studios and Hegelian master-slave theory

Studio-master or atelier-master is the key figure in the architecture design studios and in other disciplinary studios, such as landscape, urban design, planning, interior, and industrial design as well. The master of the atelier gets his legitimacy through the position than knowledge. In the tradition of "Academie", the atelier-master was a noble person with the right budget to run the studio, and in Beaux Art, a practitioner who runs the studio in his own style (Garric, 2017) and even all ateliers were named the name of the atelier-master. The master determined architectural projects, scales, concepts, style of drawing, materials, and progress stages (Carlhian, 1979). In the tradition of Beaux Art, all years' students worked together in the same studio and the senior students had the role of supervisors for the junior students. This process was constructed based on the apprenticeship training processes that formed master-apprentice relationships (Garric, 2017; Tafahomi, 2021a). Master of atelier, his assistants (if he had), and the senior students presented crits on design projects. The students worked from morning until afternoon based on apprenticeship activities, and then the master of the atelier came to evaluate the progress and comments for the next step through crits (Draper, 1977; Drexler, 1975; Garric, 2017; Griffin, 2022). The students had different projects based on the years of training, but the process was clear, the master had the right to evaluate, judge, and lead all projects. The students needed the approval of the master to go to Rome, to trip, to start a project, and leave the studio (Draper, 1977; Drexler, 1975).

We can see some elements of the tradition in current design studios. The pedagogy of training the students is designed by the atelier-master who determined the atmosphere, discipline, and culture of the design studio (Griffin, 2022). This common activities process today in architecture studios is called reflective of practice in

education (Schon, 1984). The atelier-master is who to form the structure of thoughts among the students, to develop the skills of drawing, and to recommend them for positions in private or public sectors to practice. This key person is the benchmark, reference, and norm of design in the studio. Students in design studios have the right to ask questions, the answers were supposed to lead of the students to the next stage of design based on their talent, ability, and skills. However, studies criticized this process as a ritual process than an educational one (Neveu, 2009; Owen, 2009), and disciplines to follow than training (Foucault, 1995).

The relationships between master-apprentice in the design studios are so close to the theory of master-servant (Lord and the Bondsman) theory in Hegel's explanations in the Phenomenology of Spirit commonly called the master-slave theory by scholars (Cole, 2014). For Hegel, the conflict between master-slave in the state is inevitable and it is a significant part of the process of self-consciousness (Sekerci, 2017). In the process of self-consciousness, importantly, self-awareness, and self-experience, two independents encounter their desires. Because of freedom comes through a common self-consciousness by others, the master attempts to get acknowledgment and legitimacy from others (Borchert, 2005). It is a struggle between life and death, just calm down in the level of acknowledgment of the power by the obedience of slave (Fritzman, 2014). The master through his power forces the slave to act in the way of the master's desires. The master has everything, the slave nothing. The slave gets his recognition through acknowledgment of the master's power and ability. In this process, the slave also gets his self-consciousness through serving the master's desires (Hardimon, 1994). Hegel expended the umbrella of the master-slave theory to relations between nations, countries, and even God-Man (Hegel, 2018). Just successors such as Marx developed the dialectic of history into the relationships between the master-slave and revealed that this relationship will not be stable over history.

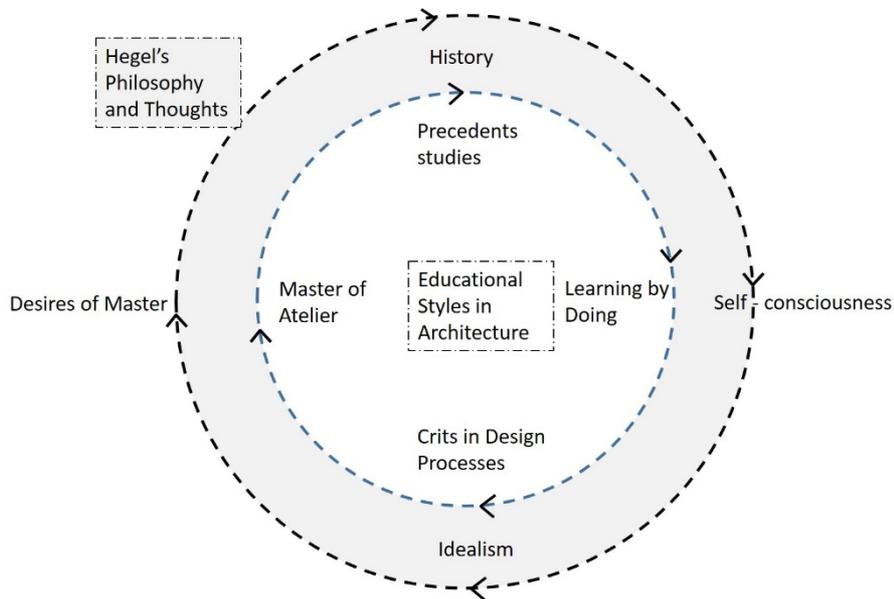


Figure 6: Interweaving of Hegel's Philosophy and architecture design studios

Still, the relationship of master-apprentices could be observed in the many design studios and even in normal classrooms. The relationship still is based on the position of the lecturer or instructor than knowledge. This relationship creates authority over students through institutions, curricula, and masters. Diagram 6 attempts to represent those influences from Hegel's philosophy to architecture design studios.

Discussion

The discussion section was designed based on the analysis section and followed the four components of the studies as below:

Precedents and dialectic of history

Precedents studies and analysis have been a significant part of the design studios to inspire students for the design project (Clark & Pause, 1996; Schon, 1984). While this inspiration resulted in some level of pressure on the students to follow the original projects (Tafahomi, 2021a), the process resulted in the compositional form of the project to draw an either integrated or reformed generation of ideas

and concepts (Laseau, 2000; Taura & Nagai, 2013). This tradition came from Beaux Art. A studio was the location to transfer knowledge and experience to students through examples of well-developed and constructed projects (Draper, 1977; Drexler, 1975). Both the theoretical and practical activities of the students took place in design studios (Garric, 2017; Griffin, 2022). However, this tradition always did not result in the same generation of architectural projects that were called styles of design (Wang, 2009). The architectural styles were not progressive or regeneration, rather, they should be responded to the social, economic, and political factors to represent through proper forms (Gomez, 2003; Hancock, 1995; Mugerauer, 1995; Seamon, 2015).

The results of the movements in the architectural processes, design styles, and technology contradicted the Hegelian dialectic based on the regeneration of the previous ideas in the new format. New enlightenment studies demonstrated non-linear, discontinued, disconnected, and non-transcendental meaning in history (Derrida, 2013; Foucault, 1972; Kuhn,

1962; Wang, 2009). For example, there are many projects that changed ideas of the romantic style of design to integrate symbolic and classical forms with other styles such as eclectic (Jencks, 2011). Apparently, students in design studios looked more for revolutionary ideas to bring in design studios for the projects (Tschumi, 1996). In addition, new movements in architectural design such as vernacular, new urbanism, and green building contradicted the process of the development of history to absolutism and idealism (Jencks, 2002). Retrospection processes have changed into magnificent phenomena such as climate change, global warming, and pollution and are unprecedented phenomena in current history (Habitat III, 2007).

Learning by doing and self-consciousness

Still, learning by doing is one of the significant approaches in architecture education (Ching, 2010; Edwards, 2008; Fawcett, 2003). Redrawing of great architecture projects to assimilate the technique was designed in Beaux Art based on analogs to art such as painting (Garric, 2017). This process of learning by doing is close to the behaviorism theory of education based on the repeating of behaviors due to the same process and learning to do activities with less error to complete the exercises (Krapfl, 2016). Particularly, new sets of achievements in educational psychology took into consideration environmental and interpersonal effects on the student's learning processes. Which, repetitive activities in the design studios based on behaviorism educational theory criticized widely by educational psychologists (Lee, 2005; Santrock, 2011; Woolfolk, 2016).

Foucault argued that institutionalization of education will result in some disciplines that normalize some exercises and experiences as training activities, which should be respected by the followers based on power than knowledge. This form of education formed both body and mind of learners as a tenet (Foucault, 1995). For Foucault, examples of such disciplines were law, medicine, and education in the 19th century to use disciplines to train students. In addition, also Bourdieu criticized that education makes people systematized user to follow the norms (Bourdieu, 1977). The study sets a list of

critiques on learning by doing theory to clarify the failed cases in the education of architecture (Webster, 2008).

Crits and idealism

Crit is the key epistemological approach in architecture education to transfer knowledge and skills to the learners through comment, analysis, and assessment of design products and evaluate the quality of design processes, outputs, and materials (Doidge et al., 2000). While in the Vitruvius's thoughts the criticism applied to the commodity aspects of the design (Proudfoot, 2000), the criticism was celebrated more than analysis and evaluation in architecture education (Tafahomi, 2022a) based on Beaux Art style to explain the ideas of atelier-master about the quality of the design productions (Doidge et al., 2000). This transformation took place in the time of "Académie d'Architecture" when architects and atelier-masters were selected from noble families and aristocratic classes (Garric, 2017). Both traditions of master-apprentice and crits were inherited by Beaux Art as the structure of education (Griffin, 2022) in the context of German idealism (Dupre, 2004; Roche, 2000). In this point of view, ideal types of physical elements, such as architecture projects were located in the next phases, steps, and attempts to achieve as an absolute (Hegel, 2018). The absolute in the Hegelian thoughts is a process of self-consciousness and never it had ended even in freedom. Therefore, crits in architecture never ended due to the next improvement, development, and edition. For this reason, even students received crits in the final exam after all development they have done based on previous crits (Borden & Ray, 2006; Evans et al., 2014). Perhaps, for this reason, the marks of the best students have been always a maximum of 80-85 out of 100 in the design studios, even after all development they have done. It referred to an image that the best product exists in terms of ideal forms or absolute, even if we do not know that it exists.

The crits created a circle that was embedded in a presumption that all crits, critiques, and criticisms will result in progresses in a certain aspect of science and knowledge (Smith, 1987). However, new findings in science and knowledge, such as psychology, sociology, and linguistics revealed that the crits becomes more problematic based

on unclear effects on the progress and development (Hansen, 2009). Still, the level of progress and regress through critique is under question to discover particularly from the methodological lens (Tafahomi, 2022a). In addition, the current knowledge in psychology revealed that many explanations take place based on unconsciousness than consciousness (Mugerauer, 1995; Zizek, 2007). Importantly, the position of the atelier-master established a power to dictate what is right and what is wrong. In this logic, Foucault criticized that power produces knowledge, and power and knowledge regenerate each other's (Foucault, 1980).

Master-apprentice and master-slave relationship

Despite the selection of atelier-master based on social class, experiences, and his own architecture firm in "Academie" and Beaux Art tradition (Garric, 2017; Griffin, 2022), the current process of the recruitment of studio-master is normally based on academic experience and practical activities. However, the power of studio-master, crits on the design outputs, and relationships between students and instructors have been the same as years passed. For this reason, the studies criticized architecture education as an unmodern style (Garric, 2017) and a set of rules that resist to be changed (Griffin, 2022; Littmann, 2000; Madanovic, 2018), and a separated form from the context (Draper, 1977; Drexler, 1975). It reminds again of the motto of atelier-masters "We teach as we have been taught" (Tafahomi, 2022a).

It is necessary to highlight that teaching of teachers was a new concept in education that just took place in the 19th century through apprenticeship approach in some higher institutions (Dennen, 2004; Labaree, 2008). Importantly, the study underlined that the need to teach educators for educational institutions have been a new achievement of modern society (Davey, 2013). However, other studies mentioned that still there are gaps in teacher education in higher education (Murray & Male, 2005; Murray et al., 2008; Struyven & De Meyst, 2010).

In this context, the relationships between

students and studio-master take place based on the lessons learned by instructors in the training process. The self-constructed aspects of education were mentioned by Hegel in terms of self-experience for self-consciousness, which normally in architecture it is called apprenticeship activities through project-based learning (Neveu, 2009; Owen, 2009). However, a new set of studies recommended other styles of training, such as problem-based (Hmelo-Silver, 2004; Seifert & Sutton, 2009), research-based (Groat & Wang, 2002; Neuman, 2006; Tafahomi, 2022a), student-based (Wright, 2011) and more on the constructivism theories (Gamoran et al., 2000).

Hegelian logic in the master-slave relationships was designed in the era of three great revolutions in his time importantly American (1765-1971), French (1789-1799), and Haitian (1791-1802). For example, the study highlighted that Hegel got his inspiration for the "lord-bondsman dialectic" in terms of a common understanding of master-slave relationships in a feudalism context based on the results of the Haitians Revolution in the 18th century (Buck-Morss, 2000). However, Hegel recognized that self-consciousness in the mind of the slaves could not come into recognition. The dialectical and paradoxical point was located in the realization of the subjectivity and selfhood in the slave's character that does not allow self-experience of awareness for self-consciousness to come into achievement (Sinnerbrink, 2007). In the Hegelian theory, the slave learned to survive through self-discipline, limit his desire, learn to work for the master, and become an object for the master (Cole, 2014). It resulted in denying the freedom of slaves by the master. However, according to Hegel's thoughts, the foundation of consciousness is freedom. Therefore, self-consciousness never will be achieved a locked boundary between selfishness and their needs in life. Critical theories in the neo-enlightenment clarified that psychological aspects of human do not allow discourse comes to form (Foucault, 1972), communication takes place (Derrida, 2013), and freedom to be achieved (Bourdieu, 1977; Foucault, 1980).

Conclusion

Hegel is one of the greatest philosophers of his time that affected current philosophy,

epistemology, and methodology deeply. Despite the Hegelian successors being divided into left and right (also called young and old Hegelians), critiques on the philosophy of Hegel resulted in varieties of schools of thought especially in education. Three great influenced schools of thought are Marxism, existentialism, and structuralism which resulted in educational schools such as pragmatism, existentialism, and constructivism. The critiques on Hegel's philosophy and thoughts could not degrade his position and role in the progress of thoughts in the times, rather it will lead the reader to read and know about his relationships with education, art, architecture, and aesthetics. This research attempted to portray an image of Hegel's influences on the architectural education styles in both direct and indirect ways that were arranged into four obvious clusters. Nonetheless, there are other aspects that this paper did not cover, importantly, aesthetics, object forms, and alienation that needs another effort.

Architecture education, processes, outputs, and outcome have been under question in current times that present a great need to change, update, and reform. Despite the ideas to revolutionize architecture education, seemingly, institutes prefer to take orientation toward reform in architecture education than the fundamental change due to Hegelian thoughts. Tracing Hegel's thoughts in architecture education styles, importantly Beaux art, Polytechnique, and Bauhaus reveal that all three styles of architecture teaching absorbed Hegelian influences either critically or uncritically. The task of instructors is to analyze the current activities in the design studios to see how the studio atmosphere and culture are critical or uncritical to the Hegelian philosophy and thoughts.

One of the important aspects of the current design studio activities is the development of psychology and educational psychology achievements that could lead instructors, as an educator, to deal with the different styles of learning among learners, which in the Hegel time was not developed. Apparently, the relationships between the the educators and learners have changed over times. The studio-master could not behave as hundred years ago,

and no longer are students the same as the students of ten years ago. Everything is under transformation that as a studio-leader we should be ready for changes.

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Multilayered and Interacting Course Design Approach in Architecture Education: A Case of Building and Construction Technology Courses and Studios

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Abstract: Building and construction technology education is a crucial component of architecture education, providing knowledge on tools and methods for designing and realizing building designs. While it provides knowledge as an input to other disciplines, it is also supported by the knowledge the other courses offer. On the other hand, these multilayered and interacting relations within the fields of architecture education may not be well-reflected in education curriculums, or implementation problems may occur. However, designing the architecture education curriculum based on these interacting relationships directly affects the education quality and educational outcomes.

Within this respect, the AGU Department of Architecture provides a flexible curriculum design, which aims to provide experience in research and design during undergraduate architecture education and raise responsible team leaders or members. Therefore, building and construction technology courses of the curriculum are designed following the paths of the department's and the university's educational principles to engage all architecture disciplines with a multilayered and interacting approach. This paper explains the course design approach developed for and experienced with building and construction technology courses by aiming to contribute to the architectural design education literature from the technology education perspective. It sets forth the instructional design models and teaching methods used for designing the building and construction technology courses and also explains the course interactions within the curriculum.

Keywords: Architecture education, Technology education, Building technology, Construction technology, Flipped classroom, Active learning.

1. Introduction

Technology-based courses and studios are one of the backbones of architecture education. Therefore, architecture education should aim to foster an understanding and proficiency in designing by merging information about technical design processes and building service systems into a unified entity during the design

phase. Accordingly, technology courses should focus on life safety, building physics, environmental systems, building envelope systems, building service systems, building materials and applications, and the integration of building systems issues (MIAK, 2023). In addition, these subjects should tackle the effects of the physical environment on human health

and safety, ethical considerations in professional practice, and legal requirements. It should also encompass established and emerging building technologies, construction techniques, and the evaluation methods architects use to determine their suitability for meeting the design, financial, and performance goals of projects (NAAB, 2020). Moreover, the design-thinking processes should be engaged when approaching building materials, construction techniques, and technology subjects by empowering the students to expand their knowledge and utilize design skills (Koch, Schwensen, Dutton, & Smith, 2002).

Although the stakeholders of architecture education emphasize the role of technology education, it may not be reflected in education curriculums, or implementation problems may occur. However, the architectural curriculum should be developed concerning the connection between design and technology courses extending beyond theoretical principles. It should also be integrated into all program components to emphasize its essential significance in the field (Smith, 1987).

Within this context, Huang, Lv, and Zou (2013) point out new demands from architectural designers that reveal the inadequacy of traditional building technology education and the need for expanding the scope of building technology education to better nurture students with distinctive qualities. According to the authors, since it is a complex and comprehensive endeavor, it requires streamlining the course structure, managing relationships with related disciplines, and balancing theory with practice. Therefore, adjustments in the structure of building technology courses, interdisciplinary teaching of construction technology, and the incorporation of cross-disciplinary education design are required while updating the curriculum to align with societal advancements. Moreover, according to Smith (1987), integrating technology discussions into the architectural curriculum offers several benefits, including a more comprehensive understanding of theoretical principles and a better grasp of their relevance to effective architectural design.

The author designates the importance of curriculum developments to enhance the effectiveness of architectural education, particularly in strengthening the relationship between design and technical courses. Within this perspective, Enright (2012) states that design and technology are not separate entities in course design but rather are integral pieces in the development of architectural inquiry. According to Enright (2012), technology courses should be designed to bridge the gap between design and technology pedagogy and developed using collaborative tools for students. At this point, using learning activities covering experiential methods come to the forefront. Brainard, Correa, and Brainard (2019) claim that while conventional building science courses typically rely on lecture-style teaching, there is potential for enhancing student engagement and understanding of technical subjects through experiential teaching methods. Within this context, they indicate the importance of integrating hands-on building science investigations into technical architecture courses to maximize the impact on student engagement and learning through cohesive and comprehensive approaches. In addition, Reno (1992) designates that the inclusion of building technology in architectural design education should cover an approach based on hands-on experience that can effectively merge and apply the integration of formal and compositional elements with technical and constructional aspects. Kostopoulos (2022) strengthen this argument, indicating that integrating building technology knowledge into architectural design education through real-life practical applications enhances students' understanding of building processes on a deeper level.

In this regard, the architectural education of AGU Department of Architecture claims to represent an innovative and flexible approach with its curriculum design. The AGU Department of Architecture curriculum includes compulsory and elective department courses under five main topics: Architectural Design Studio, Architectural Design and Criticism, Building and Construction Technology, Architectural History and Cultural

Heritage, and Professional Practice. Alongside the common courses, AGU's signature courses, named Global Courses, focus on sustainable development goals. The main aim of the curriculum design is to provide interdisciplinary and transdisciplinary approaches while providing experience in research and design during undergraduate education, focusing on a local and global scale to enrich the cultural and social environment. Moreover, it aims to raise responsible team leaders or members having theoretical and practical knowledge, skills, and qualifications (AGU Department of Architecture, n.d.).

Within this respect, Building and Construction Technology (BCT) courses and studios of the curriculum are designed with a multilayered and interacting perspective, providing the relationship between not only BCT courses and studios but also courses and studios from other disciplines. While designing the BCT courses and studios, the education principles of the university and the department are followed for defining instructional design models and teaching methods. Therefore, active learning based flipped classroom model is used by integrating appropriate learning activities specific to each course. Furthermore, while defining the learning outcomes, providing accumulated knowledge is aimed within the BCT courses and studios. On the other hand, the knowledge gathered from other architecture disciplines is engaged in BCT courses and studios, and the BCT knowledge also contributes to these courses of the curriculum. Within this framework, this paper explains this course design approach for contributing to the architectural design education literature from the building and construction technology discipline perspective.

2. Elements of Course Design

While designing a course, it is crucial to prioritize the development of the course structure in alignment with the overall objectives and mission of the educational institution. Once this is established, the appropriate instructional design models should be employed. Subsequently, the teaching methods should be carefully chosen to align

with the desired performance of the course design. Finally, the course design should incorporate learning activities compatible with the selected teaching methods.

The “Backward Design” model is mainly used with the revised “Bloom’s Taxonomy of Education Objectives” to design a course aligned with the current discussions and applications in higher education. As a teaching method, the flipped classroom model is another current paradigm that provides a student-centered approach using peer learning-based active learning methods through collaborative and cooperative learning strategies for the learning processes.

2.1 Instructional design models

In a traditional course design approach, content is created or adapted, assignments and tests are planned, grading processes are determined, and instructor-focused objectives are defined (DePaul University, 2023). In contrast, the “Backward Design” model proposes defining the desired results of a course first and then focusing on the content, methods, and activities to reach those results (Wiggins & McTighe, 2005). The model consists of three main stages for a course design: identifying desired results, determining acceptable evidence, and planning learning experiences and instruction (Wiggins & McTighe, 2005, 2011).

Within this approach, first, the knowledge, skills, and abilities that the students should have at the end of a course are defined as part of desired results, which are the “goals” of the course, by analyzing existing content standards and examining the curriculum expectations. In the second stage, evidence that can be used for documenting and assessing students’ learning is determined. This strategy encourages instructors to think about the assessment procedures before designing the learning activities and how they will know if students have attained the desired knowledge. Finally, the activities and instruction methods that should be included to support students’ learning process are planned based on the identified results and appropriate evidence of understanding. While doing so, an instructor

should focus on the knowledge and skills that students need to perform well and achieve desired results, including the appropriate activities that provide the required knowledge and skills to students. The teaching methods, materials, and resources are also defined for meeting performance goals (DePaul University, 2023; Wiggins & McTighe, 2005).

While using the “Backward Design” model for designing a course, learning goals, objectives, and outcomes should be clearly defined. “Learning goals” are typically broad statements written from an instructor's perspective, which show the general content and direction of a learning experience by outlining the instructor’s objectives. On the other hand, “learning objectives” are the declarations of the material an instructor aims to cover or teach in a learning experience, which is usually more precise than learning goals and not always measurably or visibly observable. While defining the learning objectives, the emphasis is on the instructor rather than the students, and therefore it supports the instructor when developing more precise learning objectives (DePaul University, 2023). “Learning outcomes” outline what a student can do as a result of completing a learning experience successfully in observable and quantifiable terms. Learning outcomes support instructors when defining the expectations from the students, designing their teaching methods, resources, and evaluations, making necessary revisions on the curriculum to enhance student learning, and assessing how the outcomes of a single course align with the outcomes of an entire program. On the other hand, they assist students by explaining the benefits of an educational experience, providing to follow their development, and making them aware of the evaluation criteria beforehand. Therefore, learning outcomes should be “student-centered,” “measurable,” “concise,” “meaningful,” “achievable,” and “outcome-based” (DePaul University, 2023).

The “Bloom’s Taxonomy of Education Objectives” is a tool used for defining educational objectives. The main aim of building a taxonomy of educational objectives is communicating in academic research and

curriculum development (Bloom, Engelhart, Furst, Hill, & Krathwohl, 1956). Although an education curriculum is established based on teachers’ and students’ behavior and instructional methods, Bloom’s Taxonomy classifies how students are expected to behave, think, or feel after engaging in a particular instructional unit (Bloom et al., 1956). In the revised taxonomy, the educational objectives are defined based on two dimensions: knowledge and cognitive process (Anderson et al., 2001). The knowledge dimension focuses on “factual,” “conceptual,” “procedural,” and “metacognitive” knowledge (Anderson et al., 2001). While “factual knowledge” focuses on terminology and specific details and elements, “conceptual knowledge” primarily includes classifications, principles, and theories. Moreover, “procedural knowledge” concerns subject-specific skills, techniques, methods, and criteria for using appropriate procedures. Finally, “metacognitive knowledge” deals with strategic knowledge, knowledge of cognitive tasks, and self-knowledge (Anderson et al., 2001; Patricia, 2010). On the other hand, cognitive processes focus on “remembering” to recall facts and basic concepts; “understanding” to explain ideas or concepts; “applying” to use information in new situations; “analyzing” to draw connections among ideas, “evaluating” to justify a stand or decision, and “creating” to produce new or original work (Anderson et al., 2001; Patricia, 2010). When the educational objective of a specific learning process, such as a course, is determined, the appropriate cognitive process is linked with a proper knowledge dimension (Anderson et al., 2001).

2.2 Teaching methods

Teaching is designed based on the expectations from a learning process, which has various components to consider when designing a course. According to Mayer (2008), learning is the transformation of knowledge that results from the learner's experience. It depends on the learner’s cognitive processing, which includes choosing the pertinent incoming material, organizing it into a coherent mental representation, and connecting it with knowledge from long-term memory (Mayer, 2008). Schunk (2012) defines learning as an

ongoing modification of behavior or the capacity to act appropriately in a particular way resulting from any experience. According to Schunk (2012), learning includes change, continues over time, and happens through experiences. Therefore, learning should be planned as a process comprising the changes in knowledge, beliefs, behaviors, or attitudes (Ambrose, Bridges, DiPietro, Lovett, & Norman, 2010). While designing a learning process, students' prior knowledge, motivation, developmental stage, opportunities for practice and feedback, and developing their ability to learn independently should be considered (Ambrose et al., 2010).

Education, in which learning is provided, must evolve as it adapts to new demands, new ways of learning, new ways of managing information and knowledge, and the integration of technology (Alonso de Castro & García-Peñalvo, 2022 in García-Peñalvo, Sein-Echaluze, & Fidalgo-Blanco, 2022). Therefore, there has been a shift from traditional teacher-centered learning to student-centered learning approaches due to the new paradigm that offers active participation of students in their learning (Ambrose et al., 2010; TEAL Center, 2010). In the teacher-centered learning approach, the teacher acts as the recognized role of the classroom and provides information to students who passively obtain the offered knowledge. On the other hand, in student-centered learning, teachers and students play equally active roles in the learning process, where the teacher is still an authority figure in the classroom by taking more of a facilitator or coaching role, while students take a more active and collaborative role in the learning (edX, n.d.; Lathan, 2023). Within this context, the flipped classroom model with active learning methods, supported by peer learning, becomes the core of student-centered learning.

“Flipped classroom” or “flipped learning” is an innovative student-centered active learning approach supported by technology-based learning environments (Campillo-Ferrer & Miralles-Martínez, 2021; Elrayies, 2017; Michigan State University, n.d.; The Derek Bok Center for Teaching and Learning, n.d.). It

combines online and on-campus learning by flipping the traditional model of using class time for lectures and assigning homework, also called “reverse teaching” (Nouri, 2016; Reidsema et al., 2017; Roehling & Bredow, 2021). Instead of attending lectures in class and completing homework afterward, students watch digital or online lecture videos and read course materials as preparation before class to learn the material, and then use their in-class time to participate in teacher-led hands-on learning activities like group discussions, presentations, problem-solving activities, and projects that are aligned with the online material (Nouri, 2016; Reidsema et al., 2017; Roehling & Bredow, 2021). Therefore, flipped learning provides a flexible environment for learning by changing the learning culture. It allows students to take ownership of their learning and progress at their own pace and enhances their motivation, engagement, learning outcomes, and learning effectiveness by fostering a collaborative learning environment (Michigan State University, n.d.; The Derek Bok Center for Teaching and Learning, n.d.).

“Active learning” refers to any teaching method in which students work independently or in small groups to increase student engagement in lectures or class discussions by enhancing the learning environment (Bean & Melzer, 2021; Berry, 2008; Keyser, 2000; Mabrouk, 2007). Within this context, the active learning methods aim to increase students' interest in learning and enthusiasm for learning. They also provide strategies for strong thinking and rational reasoning for maximizing their intellectual development (Bean & Melzer, 2021; Bonwell & Eison, 1991). Active learning methods share some common characteristics as encouraging independent and critical thinking in students; holding students accountable for their learning; engaging students in a variety of activities to enable them to take a more active and less passive role; and considering the role of educators in providing appropriate learning activities in which students can explore and develop their knowledge base and mindset (Kane, 2004). The mostly used active learning approaches include collaborative and cooperative learning methods in which

problem-based, case study, and experiential learning approaches are widely used (Bean & Melzer, 2021; Berry, 2008; García-Peñalvo et al., 2022; Mabrouk, 2007; Prince, 2004; Vince & Reynolds, 2007).

“Collaborative learning” approach focuses on social and intellectual engagement and shared responsibility by promoting collaboration, which holds significant potential for enhancing student learning (Leigh Smith & MacGregor, 1992). The fundamental principle of collaborative learning is rooted in the idea of achieving consensus by working together cooperatively as a group, which values and emphasizes the capabilities and contributions of each group member (Hogarth, 2010). In most collaborative learning activities, students work in groups of two or more, searching for understanding, solutions, or meanings or collectively creating a project by actively engaging in the process (Leigh Smith & MacGregor, 1992). Collaborative learning experiences promote positive student interdependence, facilitate their integration into the learning process, increase their motivation, and provide a greater awareness of their academic career path (La Rocca, Margottini, & Capobianco, 2014).

“Cooperative learning” is a form of active learning in which students work in small groups with defined roles and tasks for each student to learn a specific content (Felder & Brent, 2007; Keyser, 2000; Mabrouk, 2007). A cooperative learning environment has certain conditions that include individual accountability for the entire content of the task to achieve a shared objective (Felder & Brent, 2007). However, personal responsibility is still emphasized to reach the group's goals. Even within a group setting, each student's performance is individually evaluated, and they are held responsible for making a meaningful contribution to the group's success (Leigh Smith & MacGregor, 1992). Therefore, cooperative learning activities are designed to ensure every learner contributes to the collaborative task by promoting interaction where students engage in constructive dialogue, communicate, and assist each other with formal or informal approaches

(Leigh Smith & MacGregor, 1992; Mabrouk, 2007). Since the cooperative learning approach is based on the idea that working together is better than competing in enhancing academic achievement and attitudes, it promotes effective teamwork and interpersonal skills together with achieving positive learning outcomes (Prince, 2004). Establishing positive interdependence between students; personal responsibility; meaningful and personal face-to-face communication between students; social interaction; applying appropriate collaborative skills; and group evaluation and reflection are some vital elements of cooperative learning (Felder & Brent, 2007; Mabrouk, 2007).

It has been recognized for a while that peer interactions, or interactions between students, provide an opportunity for students to practice and reinforce their skills, which can lead to learning and skill consolidation. Therefore, cooperative and collaborative active learning approaches are also supported by “peer learning”, which takes advantage of student variations and transforms them into valuable learning opportunities. There are two types of peer learning: mutual and directional peer learning. “Mutual peer learning” refers to situations where students collaborate in small groups to accomplish academic tasks, fostering the development of shared knowledge and skills by having mutual responsibilities and contributing to the interaction equally. In contrast, “directional peer learning” involves one student taking the responsibility of assisting another student or a small group of students with academic tasks (Topping, Buchs, Duran, & van Kesser, 2017). Within this context, both collaborative and cooperative learning approaches involve the construction of knowledge in a multidirectional manner, where information is shared among all members and relationships dynamically flow (Iborra, García, Margalef, & Pérez, 2010). Specifically, in collaborative learning, responsibilities are expected to be distributed equally between peers with similar statuses, resulting in a high level of equality (Topping et al., 2017). On the other hand, cooperative learning is characterized by group members mutually engaging in coordinating tasks with the aim of

constructing knowledge. While each member is directly responsible for their learning, they are also indirectly responsible for the learning of other group members (Iborra et al., 2010).

The widely used active learning approaches included in collaborative and cooperative learning methods are defined as problem-based, case study, and experiential learning approaches (Bean & Melzer, 2021; Berry, 2008; García-Peñalvo et al., 2022; Mabrouk, 2007; Prince, 2004; Vince & Reynolds, 2007).

“Problem-based learning” approach enables students to explore real-world problems that are unconstrained and often ill-defined through group activities (Mabrouk, 2007). As a result, problem-based learning can effectively achieve crucial learning outcomes, such as fostering positive student attitudes, promoting a deeper approach to learning, and facilitating longer retention of knowledge compared to traditional teaching methods. In addition, problem-based learning methods engage students in analyzing and solving complex problems and provide developing lifelong learning and problem-solving skills (Leigh Smith & MacGregor, 1992; Prince, 2004).

“Case studies” are often used as part of collaborative and problem-based learning approaches by providing context-based environments for active learning (Mabrouk, 2007). A case study is a narrative of a real-life situation that presents a problem, an unresolved tension, a designed short story, or an existing case to summarize essential facts about an event that explains principles studied in class for students to analyze and resolve (Leigh Smith & MacGregor, 1992; Mabrouk, 2007). Case studies focus on past events but can also help look to the future. It also differs from a problem-based study since it usually does not involve data collection (Mabrouk, 2007). Although cases do not need to involve collaborative learning or small group discussion, case method-based teaching often involves small groups of students working together to tackle issues during class or study sessions (Leigh Smith & MacGregor, 1992).

“Experiential learning” is a form of active learning through practical experience, allowing students to connect academic theories and knowledge learned in the classroom to real-life situations by engaging in hands-on experiences (Boston University Center for Teaching & Learning, n.d.; Kent State University, n.d.). Experiential learning aims to promote active engagement among students, facilitating the creation of real-life examples that can be used to analyze and reflect on the subject's emotional, relational, and political aspects (Vince & Reynolds, 2007). Moreover, experiential learning proposes different approaches to education, the interplay between learning, work, and other life activities, and even the generation of knowledge (Kolb, 2015). According to Dewey (1997), the educative value of experience depends on the extent to which it builds on a foundation of essential knowledge and how much this knowledge alters or adjusts the learner's perspective, approach, and abilities. Therefore, experiential learning involves presenting concepts to students in a comprehensive manner by fostering both individual learning and collective critical reflection (Vince & Reynolds, 2007). Within this context, examples of experiential learning activities include conducting experiments, completing internships, participating in field exercises, studying abroad, conducting research, and performing in a studio setting (Boston University Center for Teaching & Learning, n.d.).

3. Building and Construction Technology Courses and Studios

Technology has mainly two primary elements: physical components and knowledge (Kumar, Kumar, & Persaud, 1999). While the physical component comprises tools (materials, equipment, machinery, labor, etc.) and methods (process, action, technique, etc.), the knowledge component encompasses the accumulation of expertise in areas such as production and skilled workforce providing scientific knowledge and technical abilities (Edis, 2006; Gray & Hughes, 2001; Kumar et al., 1999).

In the architectural profession, two types of technology occur: building and construction

technology. Building technology is the practical application of the technical processes, methods, and knowledge necessary for assembling materials into a building (O'Sullivan, 2014). The building technology practice fundamentally focuses on bringing together the materials and components for a building design to provide shelter to its occupants by considering the necessary comfort conditions according to the building's function, users, and environmental constraints (Charlett, 2007). On the other hand, construction technology includes innovative tools, machinery, and software used during on-site construction practices to increase efficiency (CII, n.d.). Furthermore, it comprises the techniques employed in construction, the stakeholders involved in decision-making and execution throughout the process, such as employers, architects, engineers, contractors, subcontractors, and laborers, and the essential knowledge needed during the process (Chudley & Greeno, 1999). Since all of the technology components, such as any information, knowledge, data, materials, equipment, human resources, techniques, activities, and processes, provide a variety of options and relations to be considered during the decision-making phases of the building processes, the critical position of the technology courses in the architectural education should be indicating and interiorizing these aspects by using different teaching methods.

When considered from this point of view, the BCT course module of the undergraduate architectural education curriculum of AGU Department of Architecture comprises building material, building element system design, environmental control system design, structural design, and professional practice and ethics courses and studios. While "Structure 1" and

"Structure 2" courses deal with the engineering aspect of structural system design, the "Professional Practice & Ethics" course focuses on the ethical concerns and various practices involved in the field of architecture throughout different stages of building production. On the other hand, "Materials & Behaviors," "Elements & Components 1", "Elements & Components 2", and "Building Technologies" courses and studios cover the building material, building element system design, and environmental control system design topics, respectively. Therefore, the course content, objectives, and learning outcomes of these courses, which handle building and construction technology components directly, are designed based on a multilayered and interacting perspective not only within the BCT course model but also focusing on the other compulsory courses and studios of the curriculum.

Consequently, when designing the BCT courses and studios, the educational principles defined by Abdullah Gul University (AGU CELT, 2020) are followed, and the Backward Design model is used together with Bloom's Taxonomy of Education Objectives. After designing the overall structure of the courses, teaching methods are engaged by selecting appropriate learning activities to meet the course designs' overall performance. For this purpose, the teaching methods of the courses are structured based on the flipped classroom model through a student-centered approach, in which peer learning-based active learning methods are used. Furthermore, collaborative and cooperative active learning strategies are used by integrating the problem-based, case study-based, and experiential learning approaches (Figure 1).

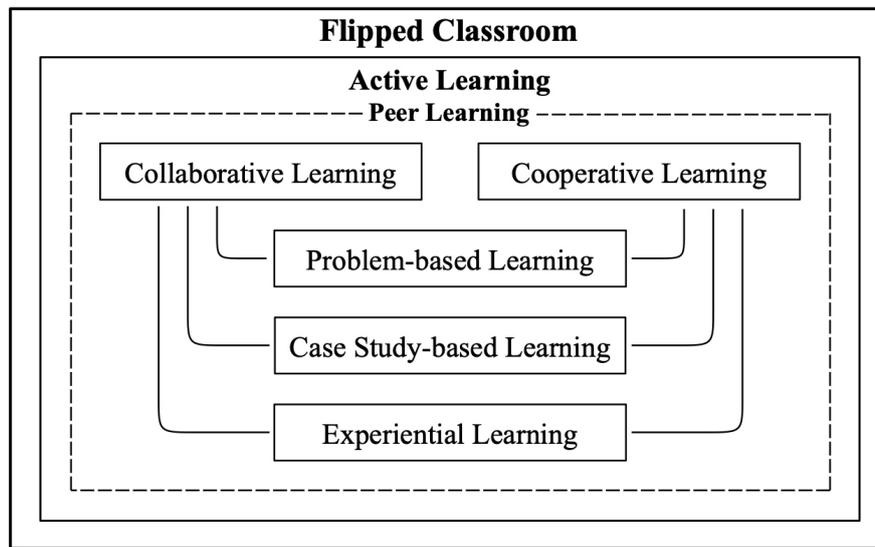


Figure 1: Course design approach for the building and construction technology courses

3.1 Materials & Behaviors

The “Materials & Behaviors” course is the first compulsory BCT course focusing on the “material” component of the technology concept in the second semester. It is primarily structured on the theme “Introduction to Materialization” to introduce the building materials through traditional, conventional, and innovative perspectives focusing on their developing and changing properties and usage possibilities. First, building material, component, and element concepts are defined and classified. Then, the basic properties and general characteristics of the building materials are explained by focusing on the environmental factors and user and performance requirements. Furthermore, the building materials are discussed in detail based on the building material selection criteria, such as perception, requirements, and properties, examining the relationship between building material selection and architectural design concept and relating the materials' usage areas with the building element systems. Therefore, the learning outcomes (LO) of the course are described as identifying the difference between building materials, components, and elements (LO1: understand), interpreting the basic properties, inherent characteristics, and performances of

the building materials (LO2: apply), examining the building materials based on their usage in the buildings (LO3: analyze), selecting appropriate building materials via detailed research and review processes (LO4: evaluate), and developing proposals for the given design problems using the material knowledge (LO5: create).

The knowledge is provided through online lecture videos, and in-class discussions, feedback sessions, and seminars from material companies, while analysis, research, and design activities, either in-class or out-of-class activities, are used for utilizing the knowledge (Table 1). At the beginning of each class, either before in-class activities or discussions of the out-of-class activities, further examples are provided related to the subject of the week, and students' questions about the online lecture videos are answered as part of the discussions. The material suppliers are also invited to give seminars about their products to integrate the knowledge from professional life into the learning process.

Table 1: Materials & Behaviors course design

Learning Activities	Teaching Methods	Learning Outcomes
Lectures**	Flipped Learning	Online Lecture Videos
Discussions*		Questions-and-Answers Sessions
Feedback*		Feedback Sessions
Seminars*		Lectures
Material Hunting: Literature Analyses**		Case study-based
Materials & Architects Research**	Active Learning	LO1, LO2, LO3 LO2, LO3
Façade Design*	Collaborative	Problem-based
Material Safari: Built Environment Analyses **		LO2, LO3, LO4, LO5
The Sense of The Material Research* - **	Cooperative	Experiential
		LO1, LO2, LO3 LO2, LO3

* In-class Activity; **Out-of-class Activity

Whereas “Material Hunting” and “Material Safari” are analysis activities, “Materials & Architects” and “Sense of The Material” are research activities. For the “Material Hunting” activity, students analyze a case building from the literature, focusing on a specific material’s usage in detail (Figure 2). On the other hand, students find constructed material examples from the surrounding built environment to analyze and discuss their usage based on possible selection criteria, such as perception,

requirements, and properties for the “Material Safari” activity (Figure 2). The “Materials & Architects” research activity focuses on analyzing assigned architects’ material usage characteristics in their designs (Figure 2). The “Material Hunting,” “Material Safari,” and “Materials & Architects” activities are performed as part of out-of-class activities. The outcomes of the out-of-class activities are then discussed, and feedback is provided during in-class activities. The “Sense of The Material” is

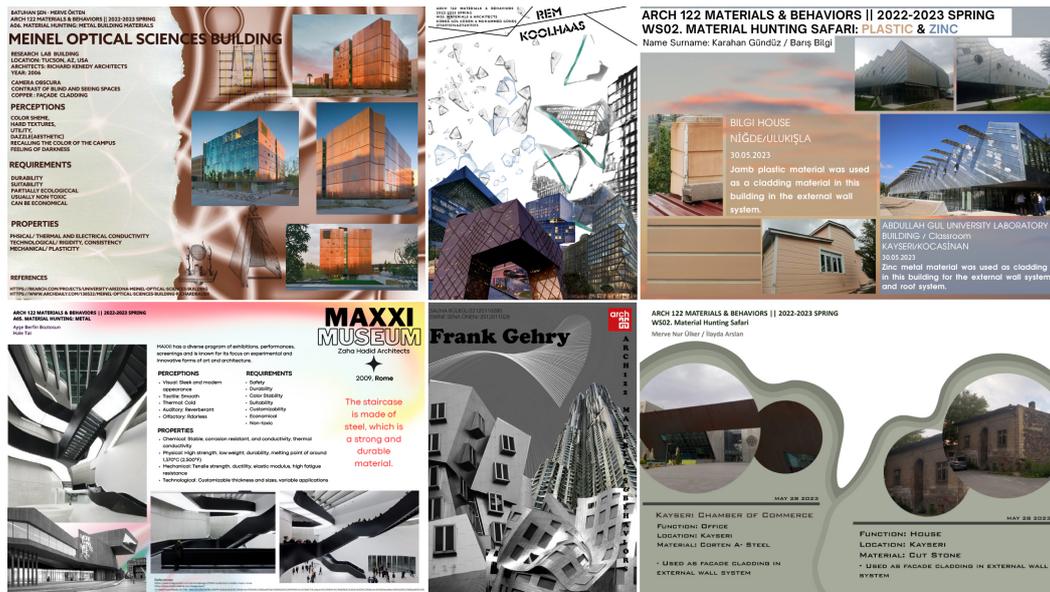


Figure 2: Examples of the “Material Hunting,” “Materials & Architects,” and “Material Safari” activities (from left to right)

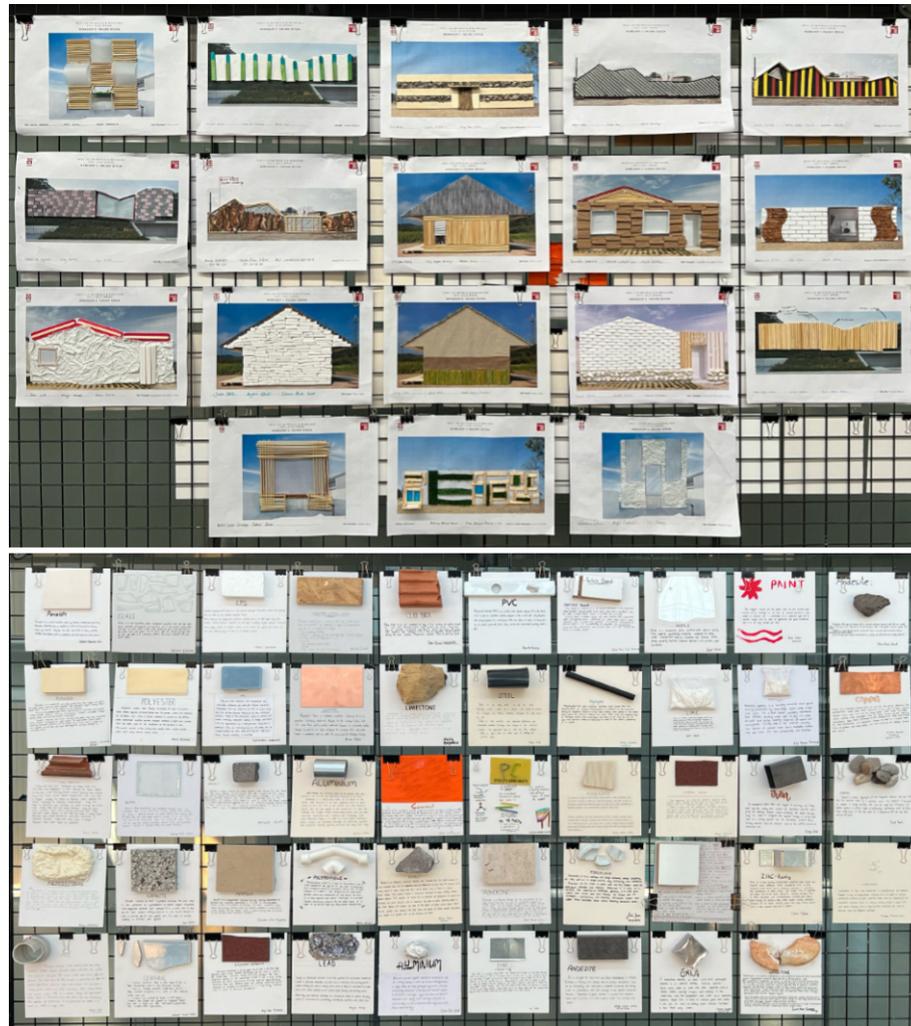


Figure 3: Examples from the exhibitions of the “Façade Design” (above) and “Sense of The Material” (below) activities

conducted by visiting material suppliers and construction sites to find a material sample and interview the professionals, in which students gather the necessary knowledge as an out-of-class activity and then prepare the outcome and get the feedback as an in-class activity (Figure 3). The “Façade Design” is a studio work conducted as part of in-class activities developed for linking the gathered knowledge to the design process (Figure 3). As part of this activity, the students design facades for the assigned housing projects using the collage

technique based on the given design problem and design inputs using the material knowledge they obtained throughout the semester. While the student groups work on the design activity, they get feedback, and, in the end, the outcomes are discussed. While students work in groups collaboratively for “Material Hunting,” “Material Safari,” “Materials & Architects,” and “Façade Design” activities, they work cooperatively for the “Sense of The Material” activity by having an assigned building material specifically for each student.

Table 2: Elements & Components 1 course design

Learning Activities	Teaching Methods		Learning Outcomes
Lectures**	Flipped Learning	Online Lecture Videos	LO1, LO2, LO3, LO4, LO5
Discussions*		Questions-and-Answers Sessions	
Feedback*	Feedback Sessions		
Mock-up Applications*	Active Learning	Collaborative	LO1, LO3, LO5
Model-making*		Collaborative/Cooperative	
Design Exercises*		Cooperative	Experiential
Performance Analyses*/**		Collaborative	Case study-based
Construction Process Analyses*/**			LO2, LO3, LO4, LO5
			LO1, LO2, LO3, LO4
			LO3

* In-class Activity; **Out-of-class Activity

3.2 Elements & Components 1

The “Elements & Components 1” course follows the “Materials & Behaviors” course in the third semester by dealing with the transition from material to component and building element. It is designed on the theme “Systems & Construction,” focusing on BCT knowledge through “methods” and “tools” components of the technology concept. The overall intention of the course is to equip the students for a successful building element system design process by providing awareness of its relationship with the architectural design concept and the variety of building materials and detailing options. First, the basic concepts related to building, building systems, performance-based design principles, and construction technologies are introduced. The building element systems are then discussed in detail by focusing on basics, classifications, performance-based design principles, and construction technologies, emphasizing the characteristics of each building element system. Hence, the learning outcomes are described as recognizing the building systems and sub-systems and their integration and relation (LO1: understand), implementing the performance-based design principles to building element

system designs (LO2: apply), examining the role of construction technology components in the building element system design process and the realization of the design (LO3: analyze), critiquing the building element system designs based on the user requirements and environmental factors (LO4: evaluate), and developing detailed drawings and models of building element systems for illustrating the use of materials, and components (LO5: create).

The knowledge is provided through online lecture videos and in-class discussions, and feedback sessions, whereas physical model-making, design exercise, performance and construction process analysis activities, and mock-up applications with guest companies are used for utilizing the knowledge (Table 2). Each class starts, either before in-class activities or discussions of the out-of-class activities, by providing further examples related to the subject of the week, and students’ questions about the online lecture videos are answered as part of the discussions.



Figure 4: Examples from the final submission of the “Model-making” activities

While the physical model-making, design exercises, and mock-up applications are conducted as part of in-class activities, the performance and construction process analyses can be either in-class or out-of-class activities. The primary purposes of the “Model-making” and “Design Exercises” are to understand the building element systems and construction technologies in a three-dimensional way by making physical models first and then to practice using performance-based design principles and detailed design drawing production through design exercises. As part of these activities, student groups first make three-dimensional models of the building sub-systems, either collaboratively to produce a

final product or cooperatively having personal tasks to produce an outcome (Figure 4). After the three-dimensional model-making activities, the design exercises cover hand drawings or sketches to present the design solutions or make analyses for building element systems, in which student groups work cooperatively, having a specific task for each student (Figure 5). In these exercises, students follow performance-based design principles based on the given conditions for user requirements and environmental factors. Student groups get feedback during in-class activities, and the outcomes are discussed at the end of class time.

“Performance Analyses” are performed using the given case building, either from the literature or the built environment, focusing on the building element system in the subject (Figure 6). On the other hand, “Construction Process Analyses” are performed by watching assigned construction process videos to predict the construction technologies used during the design realization by examining the construction technology components (Figure 7). Student groups work collaboratively for the performance and construction process analysis activities, and the outcomes are discussed during class time. Moreover, mock-up applications are conducted by the guest companies in which students experience the

construction techniques and construction process collaboratively under the supervision of the company representative as part of in-class activities.

3.3 Elements & Components 2

The “Elements & Components 2” course is structured on the theme “Design & Integration” by following the outcomes of the “Elements & Components 1” course in the fourth semester. Similar to the Elements & Components 1 course, it focuses on BCT knowledge through “methods” and “tools” components of the

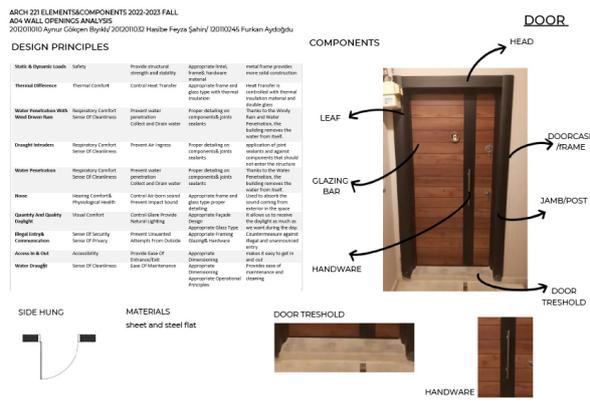
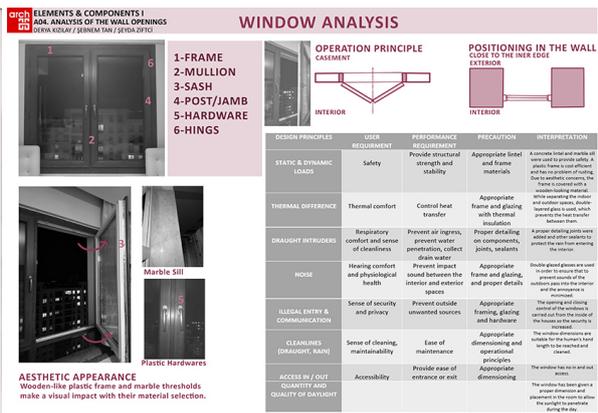
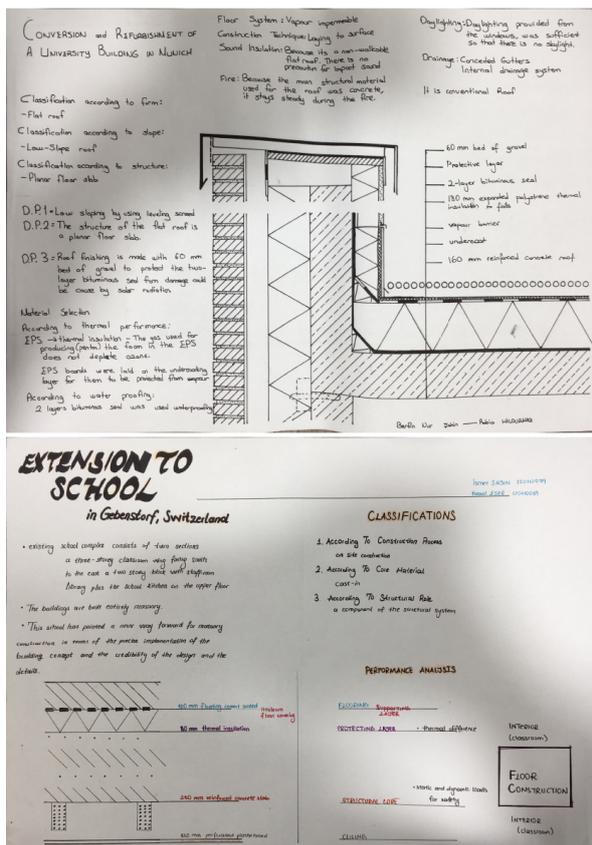


Figure 6: Examples of the “Performance Analysis” activities (left column: case building analyses from the literature; right column: case building analyses from the built environment)

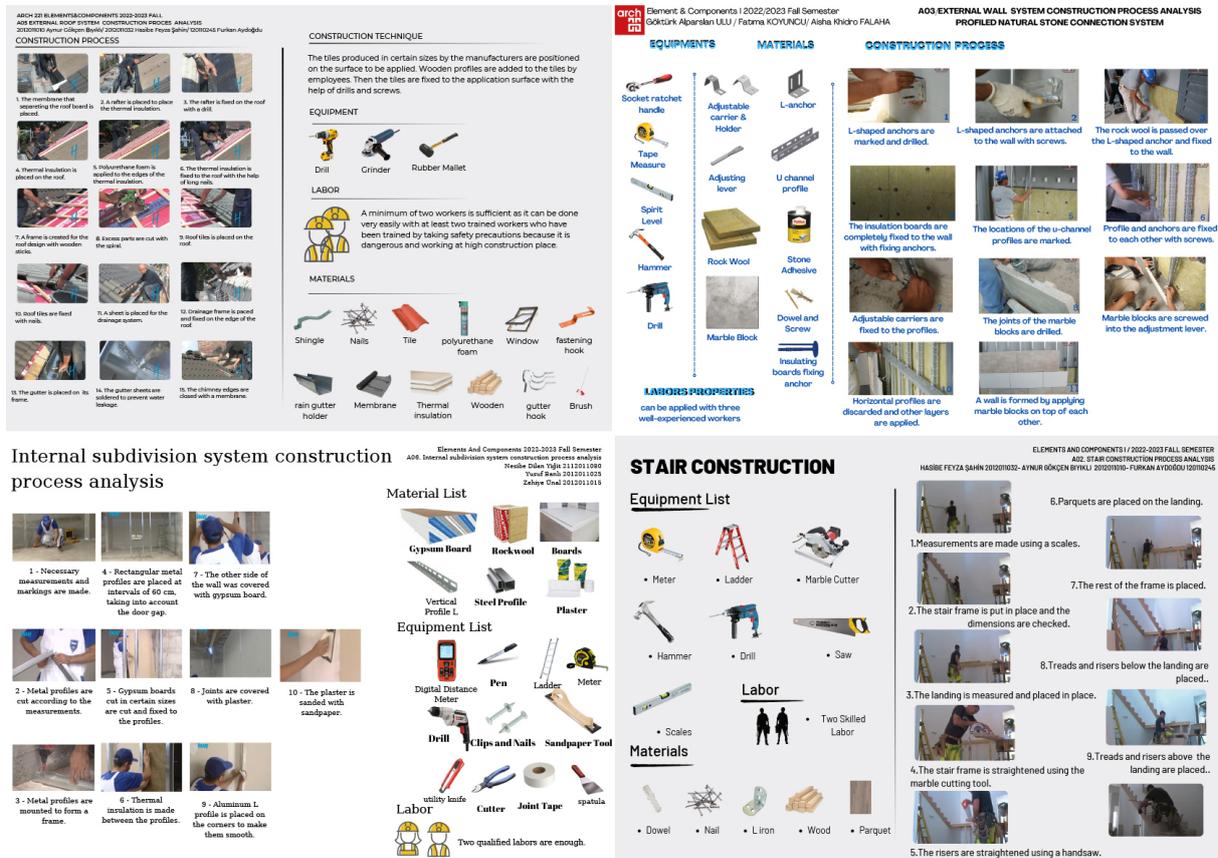


Figure 7: Examples of the "Construction Process Analysis" activities

technology concept in a detailed manner. The course mainly intends to equip the students for a successful detailed design process by experiencing a construction project development using the roadmaps given in the "Elements & Components 1" course. Within this context, the learning outcomes are described as identifying the architectural detail design principles focusing on the integration of the building element systems (LO1: understand), using performance-based design principles for building element system and architectural detail designs (LO2: apply), relating the architectural design concept and detailed design (LO3: analyze), selecting

appropriate construction technology components for the detailed design development (LO4: evaluate), and developing detailed drawings and models for identifying the assembly and integration of materials, systems, and components (LO5: create).

While the knowledge is provided through in-class lectures, discussions, and feedback sessions, construction project development and model-making activities are used for utilizing the knowledge as part of out-of-class activities (Table 3).

Table 3: Elements & Components 2 course design

Learning Activities		Teaching Methods		Learning Outcomes
Lectures*	Active Learning	Face-to-face Lectures	Experiential	LO1, LO2, LO3, LO4, LO5
Discussions*		Questions-and-Answers Sessions		
Feedback*		Feedback Sessions		
Construction Project Development**		Cooperative		
Model-making**				LO1, LO4, LO5

* In-class Activity; **Out-of-class Activity

For the “Construction Project Development” and “Model-making” activities, students work cooperatively through peer-learning sessions to develop the construction project for their previous architectural design studio project. Throughout the semester, they produce 1:100 scale design development drawings, 1:5 scale details of building element systems, 1:20 scale

system details of the building envelope and stair, 1:50 scale construction drawings (Figure 8), and make a 1:20 scale digital or physical model of the building envelope system (Figure 9). For each phase of the construction project development, students get personal and collective feedback, and the discussions also take part during class time.

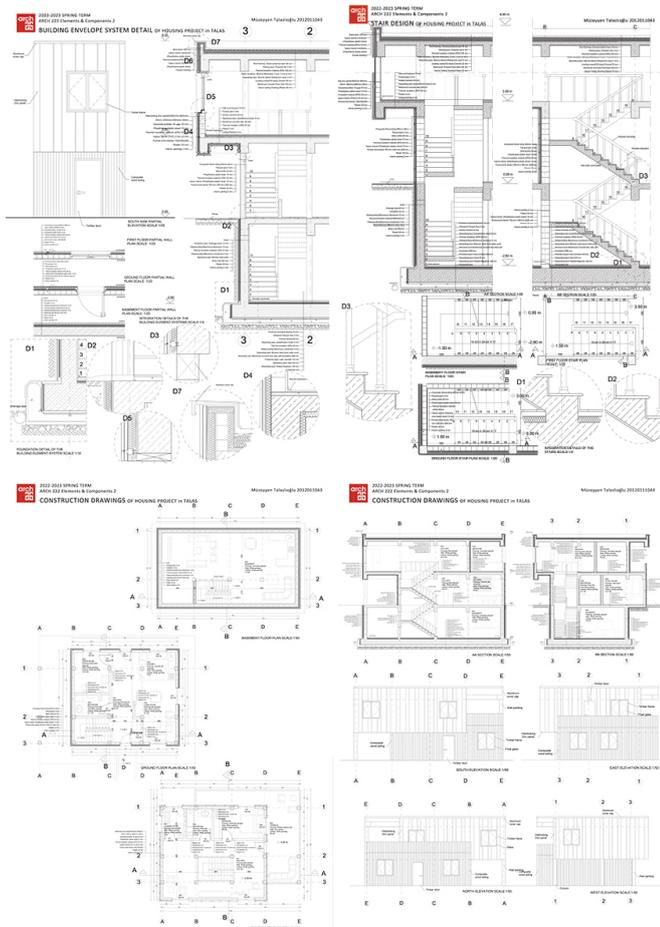


Figure 8: An example from the final submission of the “Construction Project Development” activities



Figure 9: Examples from the final submission of the building envelope system “Model-making” activities

Table 4: *Building Technologies course design*

Learning Activities	Teaching Methods		Learning Outcomes	
Lectures**	Flipped Learning	Online Lecture Videos	LO1, LO2, LO3, LO4, LO5	
Discussions*		Questions-and-Answers Sessions		
Feedback*	Active Learning	Feedback Sessions	LO1	
Seminars*		Lectures		
Performance Analyses*		Case study-based		LO2
Building Service Systems Design**		Cooperative		Experiential
Building Envelope Design**				
Model-making**				

* In-class Activity; **Out-of-class Activity

3.5 Building Technologies

The “Building Technologies” course is the last BTC course in the seventh semester. It is designed on the themes “Environmental Control” and “Environmentally Responsible Architecture,” mainly focusing on building technology knowledge through “methods” and “tools” components of the technology concept. The significant contribution of the course is to equip the students to conduct research and design on the fundamentals of building technologies and their application to buildings. The “Environmental Control” module mainly tackles energy efficiency, fire safety, lighting design, acoustic design, and sanitary installation issues focusing on the current technological advances and innovations in the construction industry. During the “Environmentally Responsible Architecture” module, the current issues considered critical for the built and natural environment are discussed through environmentally responsible architecture and green building envelopes subjects. Therefore, the learning outcomes are described as recognizing the requirements of building service systems by focusing on the importance of interdisciplinary studies and architects' responsibilities (LO1: understand), interpreting the design and construction process decisions based on the national and

international regulations and standards (LO2: apply), examining the environmental control requirements of buildings by focusing on the interactions between natural and built environment (LO3: analyze), selecting the appropriate technological solutions and innovations for a specific design problem (LO4: evaluate), and developing detailed drawings and models showing the design decisions on the building service and building element systems (LO5: create).

The knowledge is provided through online lecture videos, and in-class discussions, feedback sessions, and seminars; while performance analyses, building service systems design, and building envelope design, and model-making activities are used for utilizing the knowledge (Table 4). At the beginning of each class, either before in-class activities or discussions of the out-of-class activities, further examples related to the subject of the week are provided, and students’ questions about the online lecture videos are answered as part of the discussions. Professionals from other disciplines are also invited to give seminars to reflect the interdisciplinary position of the architecture profession.

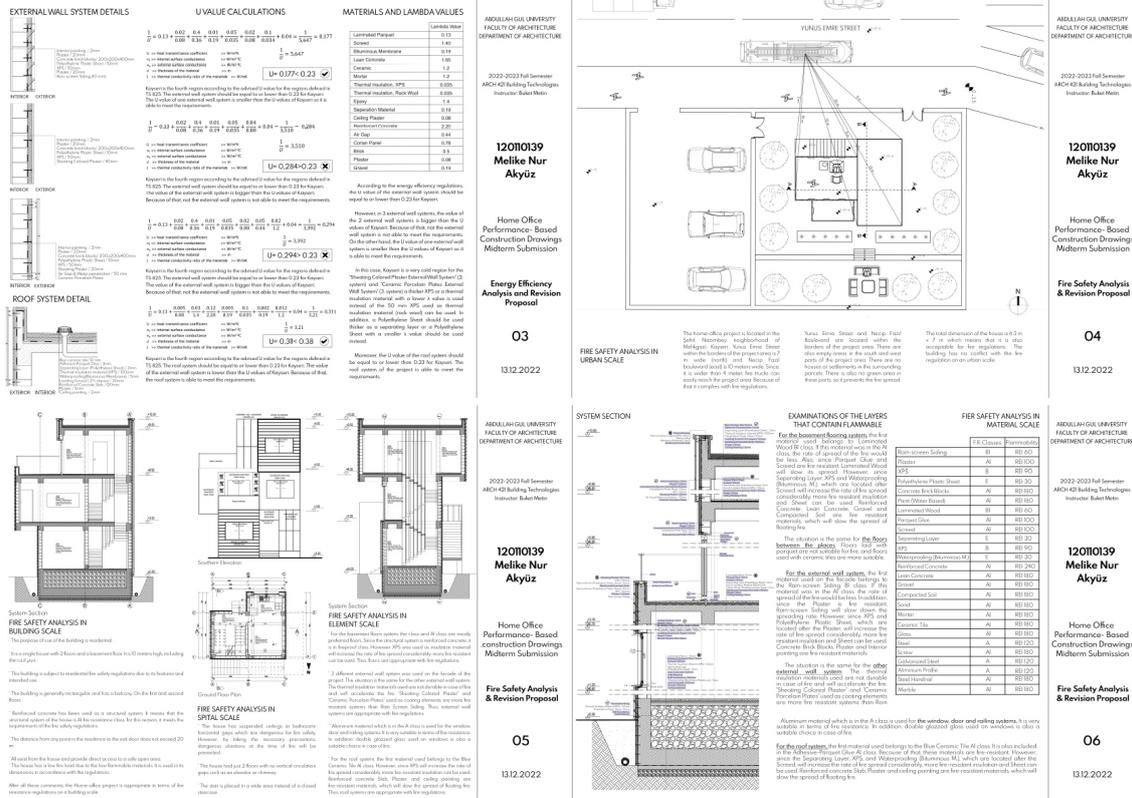
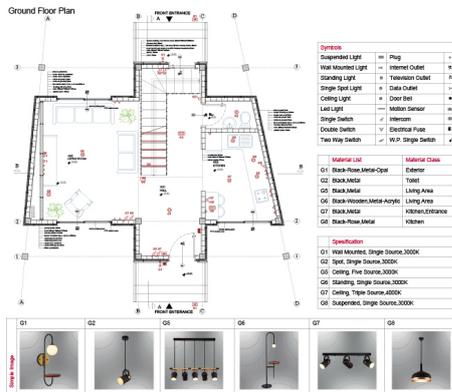


Figure 10: Examples from the final submission of the “Performance Analysis” activities

While performance analyses are performed as in-class activities, building service systems design, building envelope design, and modeling activities are conducted as part of out-of-class activities. The students work cooperatively through peer-learning sessions for conducting these activities. As part of the “Environmental Control” module, students conduct “Performance Analyses” on the previously developed construction project to interpret their previous design decisions regarding energy efficiency and fire safety (Figure 10). Since they make these analyses during class time, they get feedback while developing their analyses, and the outcomes are discussed at the end of the activities. On the other hand, they develop detailed drawings for

“Building Service Systems,” focusing on lighting design, acoustic design, and sanitary installation to enrich and finalize their previous design as part of out-of-class activities and get feedback during class time (Figure 11). In the “Environmentally Responsible Architecture” module, they design a new “Building Envelope” for the previous design using innovative approaches and following environmentally responsible architecture principles. They develop system detail drawings and make three-dimensional digital model of the building envelope to represent their design idea as an out-of-class activity and get feedback during class time (Figure 12).



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 Architecture Faculty
 ARCH 421
 Building Technologies

Fatma Nur Kanik
 120110149

Midterm Submission

Lighting Design

Ground Floor
 Scale: 1/50

09

Example Search



Conceptual Ideas



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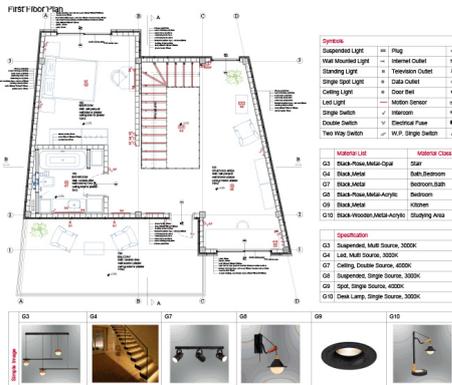
Fatma Nur Kanik
 120110149

Midterm Submission

Lighting Design

Example Search and
 Conceptual Ideas

08



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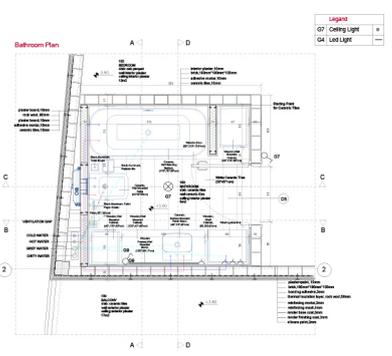
Fatma Nur Kanik
 120110149

Midterm Submission

Lighting Design

First Floor
 Scale: 1/50

10



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 Building Technologies

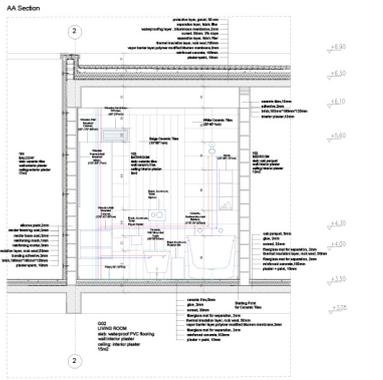
Fatma Nur Kanik
 120110149

Midterm Submission

Sanitary Installation
 Design of the Project

Bathroom Design
 Scale: 1/20

11



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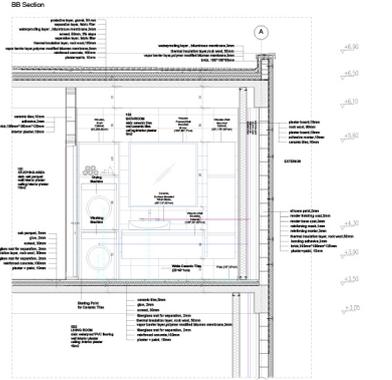
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Midterm Submission

Sanitary Installation
 Design of the Project

Bathroom Design
 Scale: 1/20

12



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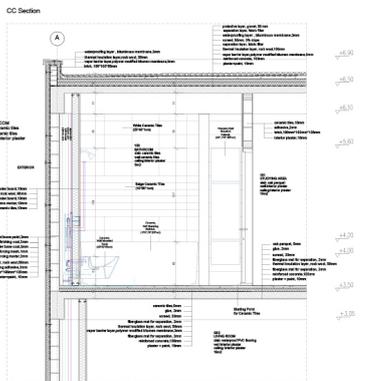
Fatma Nur Kanik
 120110149

Midterm Submission

Sanitary Installation
 Design of the Project

Bathroom Design
 Scale: 1/20

13



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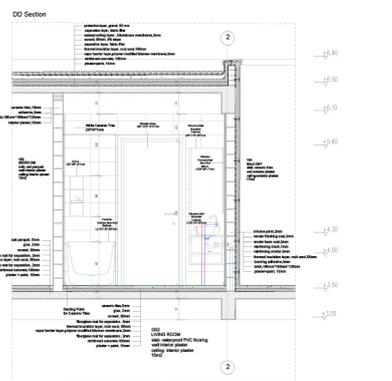
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Midterm Submission

Sanitary Installation
 Design of the Project

Bathroom Design
 Scale: 1/20

14



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 Building Technologies

Fatma Nur Kanik
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Midterm Submission

Sanitary Installation
 Design of the Project

Bathroom Design
 Scale: 1/20

15

Figure 11: Examples from the final submission of the “Building Service Systems Design” activities

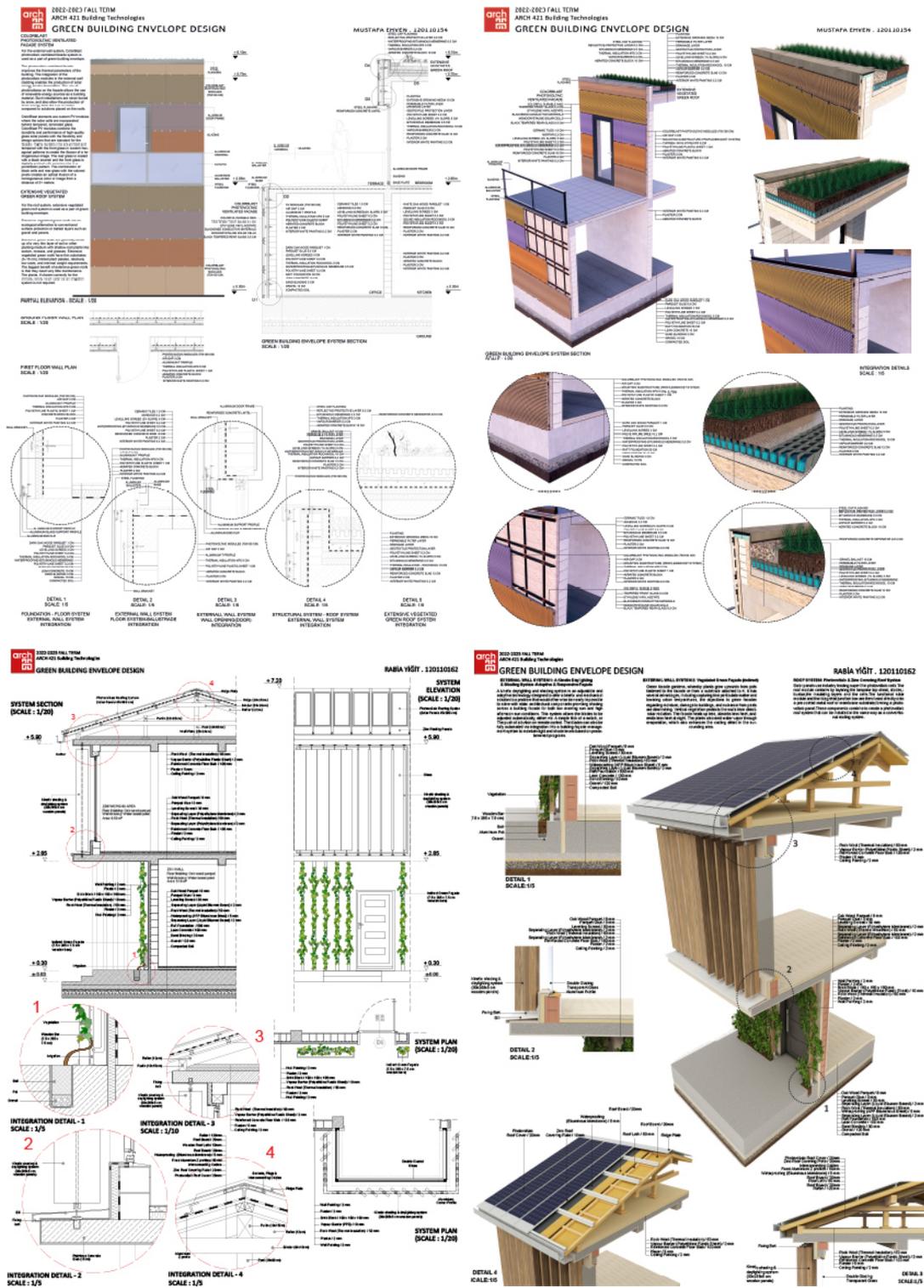


Figure 12: Examples from the final submission of the “Building Envelope Design and Model-making” activities

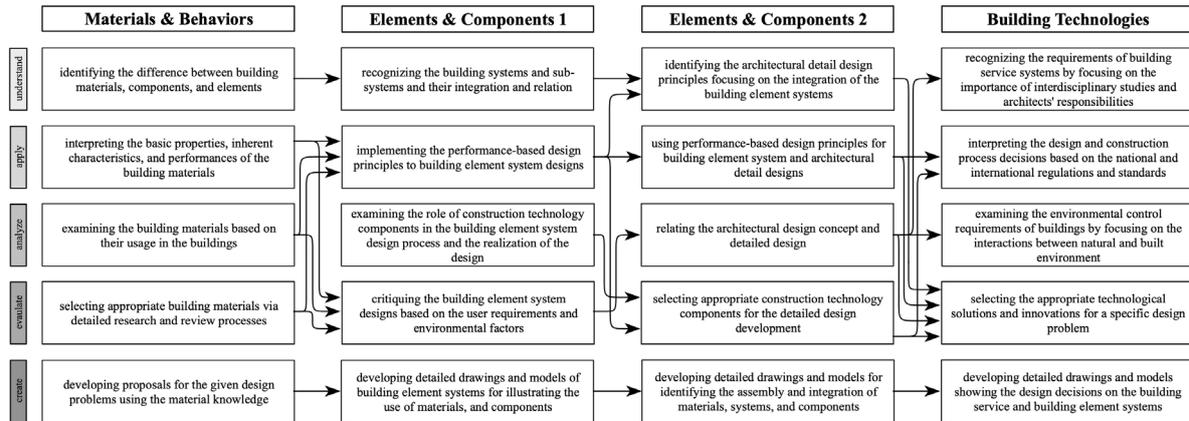


Figure 13: Multilayered learning outcome relations within the building and construction technology courses and studios

4. Course Interactions within the Curriculum

The BCT courses and studios are designed to provide knowledge accumulation by relating the learning outcomes within the BCT course module. On the other hand, the accumulated knowledge gathered through BCT courses and studios strongly interacts with the curriculum's compulsory courses and studios from other disciplines as well. The BCT courses provide not only knowledge input for the other courses and studios but the knowledge obtained from other courses is also engaged in the learning activities conducted as part of the BCT courses and studios.

4.1 Multilayered relations within the building and construction technology courses and studios

The knowledge of the BCT field is provided through the cognitive processes of “understand,” “apply,” “analyze,” “evaluate,” and “create, as outlined in Bloom’s Taxonomy of Education Objectives. This knowledge is acquired through specific learning outcomes established for each BCT course and studio. It is not limited to individual courses but encompasses a cumulative accumulation of knowledge throughout the BCT courses and studios, beginning with the “Materials & Behaviors” course and concluding with the “Building Technologies” course (Figure 13).

At the end of the “Materials & Behaviors” course, students identify the difference between building materials, components, and elements, which supports recognizing the building systems and sub-systems and their integration and relation in the “Elements & Components 1” course. Following this, in the “Elements & Components 2” course, identifying the architectural detail design principles focusing on the integration of the building element systems becomes possible based on previous knowledge. Eventually, this accumulated knowledge provides the system thinking perspective to the students. Finally, this knowledge supports selecting the appropriate technological solutions and innovations for a specific design problem in the “Building Technologies” course.

The knowledge gathered for interpreting the basic properties, inherent characteristics, and performances of the building materials; examining the building materials based on their usage in the buildings; and selecting appropriate building materials via detailed research and review processes in the “Materials & Behaviors” course become inputs for the “Elements & Components 1” course. They support implementing the performance-based design principles to building element system designs and critiquing the building element system designs based on the user requirements

and environmental factors since material selection is a critical input for these processes.

Afterward, implementing the performance-based design principles to building element system designs enables identifying the architectural detail design principles focusing on the integration of the building element systems, using performance-based design principles for building element system and architectural detail designs, and selecting appropriate construction technology components for the detailed design development in the “Elements & Components 2” course. Finally, using performance-based design principles for building element system and architectural detail designs supports interpreting the design and construction process decisions based on the national and international regulations and standards and selecting the appropriate technological solutions and innovations for a specific design problem in the “Building Technologies” course.

Critiquing the building element system designs based on the user requirements and environmental factors in the “Elements & Components 1” course supports relating the architectural design concept and detailed design in the “Elements & Components 2” course. This relation later provides recognizing of the requirements of building service systems by focusing on the importance of interdisciplinary studies and architects' responsibilities; examining the environmental control requirements of buildings by focusing on the interactions between natural and built environments; and selecting the appropriate technological solutions and innovations for a specific design problem in the “Building Technologies” course.

The knowledge obtained by examining the role of construction technology components in the building element system design and the realization of the design in the “Elements &

Components 1” course provides selecting of appropriate construction technology components for the detailed design development in the Elements & Components 2” course. This knowledge then contributes to interpreting the design and construction process decisions based on national and international regulations and standards and selecting the appropriate technological solutions and innovations for a specific design problem in the “Building Technologies” course.

Developing proposals for the given design problems using the material knowledge in the “Materials & Behaviors” course provides the initial representation knowledge for the BCT field. Later, it supports developing detailed drawings and models of building element systems for illustrating the use of materials and components in the “Elements & Components 1” course, which enables developing detailed drawings and models for identifying the assembly and integration of materials, systems, and components in the “Elements & Components 2” course. Moreover, this accumulated knowledge is used for developing detailed drawings and models showing the design decisions on the building service and building element systems in the “Building Technologies” course.

4.2 Mutual interactions with other compulsory courses and studios of the curriculum

While BCT courses and studios provide accumulated knowledge for building materials, building element system design, and building service system design subjects, they are also designed to both receive contributions from other compulsory courses and studios within the curriculum and contribute to them by ensuring a holistic and interacting learning experience (Figure 14).

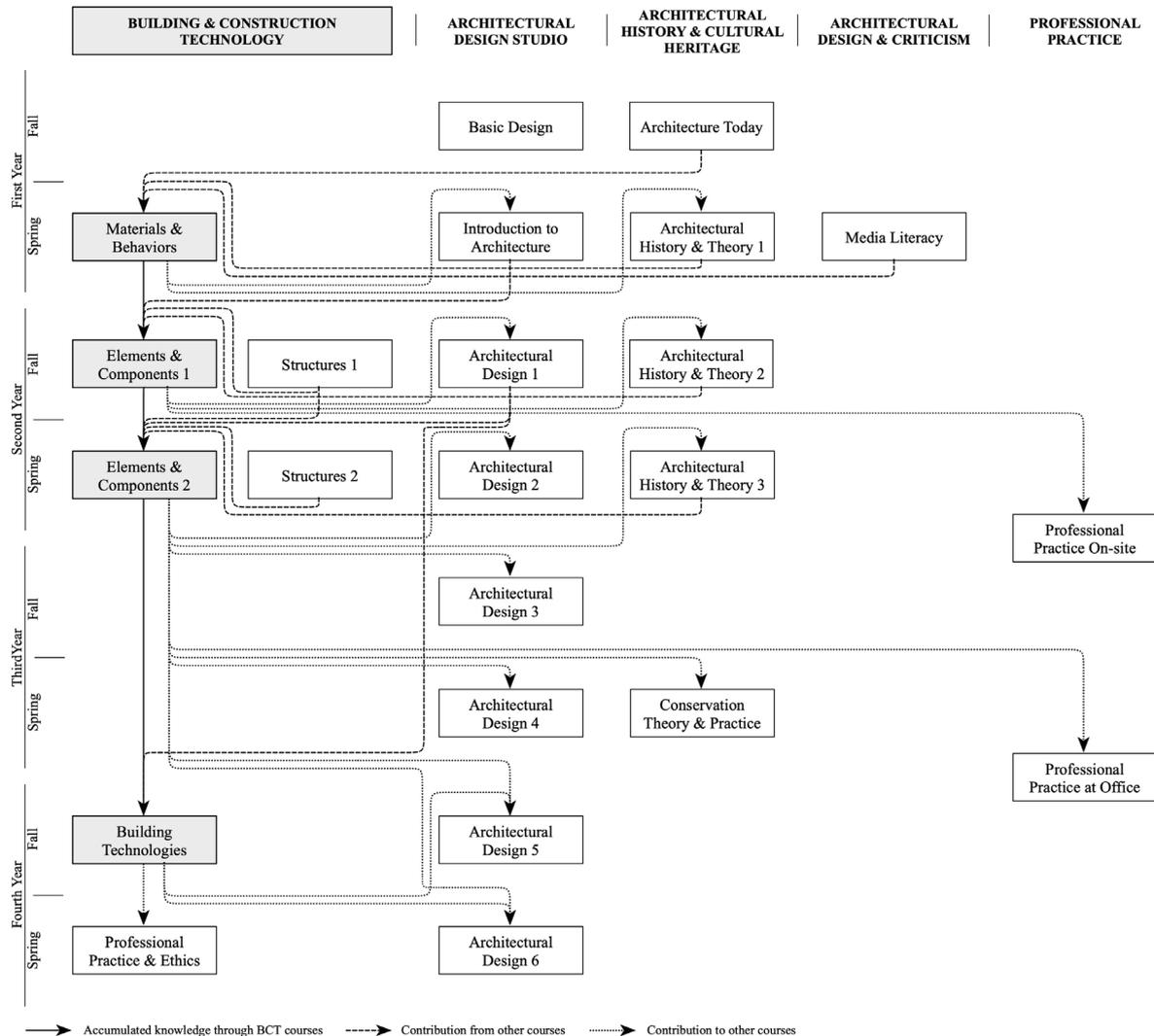


Figure 14: Mutual interactions with other compulsory courses and studios of the curriculum

The “Materials & Behaviors” course is contributed by the “Architecture Today” course from the previous semester, and also “Architectural History & Theory 1” and “Media Literacy” courses in the same semester. Since “Architecture Today” deals with the architectural works of both the present time and the twentieth century by developing a perspective on design, architecture, and related fields, the students use this knowledge for “Materials & Architects” and “Façade Design” activities. In addition, “Architectural History & Theory 1”, an architectural history course like “Architecture Today,” supports the learning activities, providing the technology knowledge

of the early civilizations from the settlement of the first cities to the end of the Middle Ages. The knowledge gathered from these courses assists students when examining the usage purposes and selection criteria of building materials in the buildings. Besides, the “Media Literacy” course focuses on various media techniques as tools for communicating ideas. Therefore, students use this representation knowledge to represent the outcomes of the learning activities to prepare posters or use collage techniques to represent their design idea for the given problem. On the other hand, the “Materials & Behaviors” course contributes to the “Introduction to Architecture” design studio

and the “Architectural History & Theory 1” course in the same semester. It provides the technology concept and building material knowledge for these courses.

The “Elements & Components 1” course is contributed by the “Introduction to Architecture” design studio from the previous semester, and the “Structures 1” and “Architectural History & Theory 2” courses in the same semester. The “Introduction to Architecture” design studio contributes to the model-making and design exercises by delivering representation knowledge on technical drawing principles and physical model-making techniques. On the other hand, the “Structures 1” course provides knowledge on structural system design, which is used as part of the model-making and design exercises and for performance analysis activities. It helps students to recognize the building systems and sub-systems and their integration and relation. “Architectural History & Theory 2” also provides accumulated knowledge for the technology concept of the architecture of medieval times until the end of the eighteenth century, which supports examining the role of construction technology and critiquing the building element system designs. On the other side, the “Elements & Components 1” course contributes to the “Architectural Design 1” studio and “Architectural History & Theory 2” course in the same semester. It provides the system thinking perspective together with a detailed building element system knowledge that students use as part of the design process in the “Architectural Design 1” studio. Moreover, they use this knowledge for the active learning activities of the “Architectural History & Theory 2” course when discussing different building techniques and technologies in the fifteenth to the eighteenth centuries.

The “Elements & Components 2” course is contributed by “Architectural Design 1” studio, and the “Structures 1” course from the previous semester, and also “Structures 2” and “Architectural History & Theory 3” courses in the same semester. The “Architectural Design 1” studio provides critical input for the “Elements & Components 2” course with the

“Housing Project” students develop as part of the studio, which is used for the construction project development process. Moreover, similar to the “Elements & Components 1” course, “Structures” courses contribute to the detailed design development process by providing knowledge on structural system design for designing structural system and building element system integrations. Besides, “Architectural History & Theory 3” provides the technology knowledge on nineteenth and twentieth centuries architecture that contributes to the perspective used for relating the architectural design concept and architectural detail design. On the other hand, the “Elements & Components 2” course contributes to the “Architectural Design 2” studio and the “Architectural History & Theory 3” course in the same semester and also the “Conservation Theory & Practice” studio two semesters later. It provides the building element system and detailed design development knowledge together with the ability to relate the architectural design concept and detailed design and develop detailed drawings and models on different scales. The accumulated knowledge of “Materials & Behaviors,” “Elements & Components 1,” and “Elements & Components 2” courses and studios contribute to the following “Architectural Design Studios,” in which students represent their material selection and detailed design decisions for their studio projects. However, their contribution to the “Architectural Design 3” studio in the following semester is significant, in which alternative building materials and construction methods are discussed and engaged to the studio project outcome.

The “Building Technologies” course is contributed by “Architectural Design 1” studio from the second year since the construction project of the “Housing Project” developed during the “Elements & Components 2” course is used for the performance analyses and developing detailed drawings of the building service systems and building envelope design. Also, it contributes to the “Professional Practice & Ethics” course in the following semester, explicitly providing the ability to recognize the importance of interdisciplinary studies and

architects' responsibilities in the architecture profession, and national and international regulations and standards literacy. Furthermore, not only the knowledge gathered with the “Building Technologies” course but also the accumulated knowledge obtained through BCT courses contribute to the “Architectural Design Studios” of the same and following semesters, of which the capstone project is also part.

The BCT courses also contribute to “Professional Practice” activities conducted in the summer. “Professional Practice On-site” is supported by the accumulated knowledge gathered with the “Materials & Behaviors” and the “Elements & Components 1” courses for utilizing the building material, building element system design, and construction technology selection knowledge through practice, and takes place after the second year. On the other hand, “Professional Practice in Office” is contributed by the accumulated knowledge gathered at the end of the “Elements & Components 2” course due to the building element system and architectural detail design, and construction project development knowledge, and performed at the end of the third year.

5. Discussion and Conclusion

The architectural education curriculum requires a holistic approach by engaging all architecture disciplines with a multilayered and interacting approach aligning with the current demands and expectations of the architecture profession. For this purpose, the BCT courses of AGU Department of Architecture are designed with this perspective, following the department’s and university’s educational principles and also selecting appropriate instructional design models and teaching methods. During this process, the course designs have been analyzed and revised according to the students' feedback and self-assessment outcomes at the end of each term. Ultimately, BCT courses are designed using flipped classroom model, in which active learning methods become core and increase the engagement of the students and the instructors. Within this course design model, students obtain knowledge using online lecture videos outside of class, and class times are used for active learning activities, face-to-face

discussions, feedback sessions, seminars, and mock-up applications with guest companies. This approach increases the benefits of student-instructor encounters by providing quality time for discussing the outcomes of the learning activities and expanding the discussions on the content of the lectures further. Furthermore, the designs of the BCT courses and studios provide an opportunity to explain and share the relationships with other disciplines by engaging their outcomes to the activities or how the students should use this knowledge for the other courses from the other architecture disciplines.

At the end of their education, AGU Department of Architecture students obtain accumulated knowledge for the BCT discipline, not only due to the course designs of the BCT courses and studios but also relating and using this knowledge in other courses, especially in architectural design studios. Therefore, these multilayered and interacting relations between the BCT courses and studios, and with other compulsory courses and studios of the curriculum, enable students to integrate the knowledge they obtain throughout their architectural education into their architectural design attitudes. Moreover, these curriculum characteristics take them a step further from the multidisciplinary approach by enabling them to think with inter- and trans-disciplinary perspectives corresponding to the AGU’s and AGU Department of Architecture’s mission.

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Book Review

Dreaming for Sivas Selections from Architectural Studios, 2014-2021

Ugur Tuztasi, Pinar Koc (Editors)
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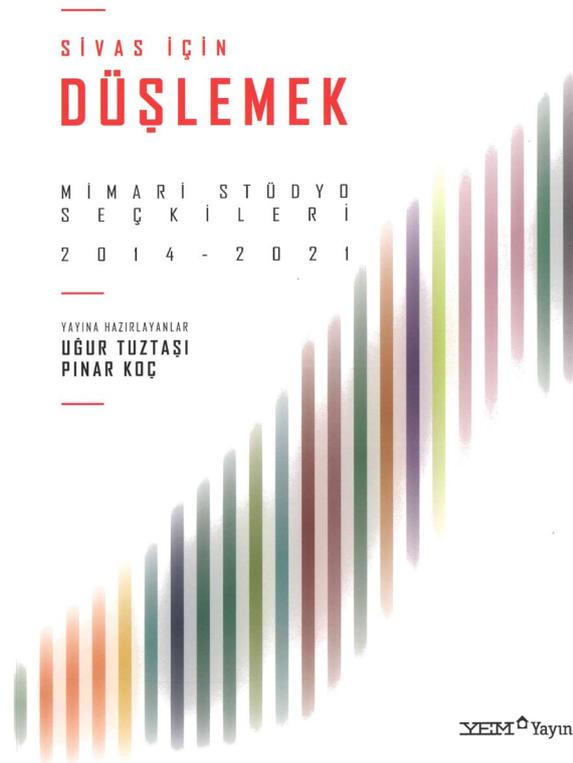
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The book titled "Dreaming for Sivas, Architectural Studio Selections 2014-2021" was compiled by Pinar Koc and Ugur Tuztasi and released by YEM Publication. The editors

of the book in introduction, emphasize how cities serve as "laboratories" for architectural schools and how the theme "Dreaming for Sivas" illustrates the pedagogical strategy used

in in architectural design studio studies at Sivas Cumhuriyet University. Understanding the city as a place of experimentation means that architecture students are not only subject to project processes that produce solutions to a defined problem area, but they are also surrounded by exploration processes intended to open all of the intuitive and perceptual sensors of the student to the city and to feel the daily rhythm of the city.

Recognizing the livable built environment, perceiving urban values, and understanding the permeable relationships between urban layers are stated as the goals of this entire process, which is based on experiencing the city (Tuztasi, Koc, 2021). The editors in this context present projects with a design problem definition, based on the studio outputs that are anticipated to be handled in architectural studios in various semesters, but each time students experience a portion of the city where they live and continue their education life, and design realizations by taking into account its data and values.

In Turkey, the four-year architectural program is typically completed in eight semesters, each of which includes a design studio. The projects in the book span the fourth through the eighth semesters. By combining the city's live or lost cultural and natural heritage values into the design, it is known that the projects aim to increase students' understanding and help them interact more effectively with the environment they create.

The book has twenty-four chapters divided into two major sections. Depending on a theoretical foundation, the editors provide broad information about the topic, setting, context, and learning goals they target with the project at the beginning of each chapter. Since the studies created by the undergraduate students in the departments are presented collectively, comparisons and exposure to various methods for the same location and subject are available. The results of the fourth and eighth semesters' worth of student work are included in the first group. The level reached in the student studies and the relationships with the city are especially

successfully read when the student projects in this section are evaluated with the text of the editors who explain the place and context with the theoretical interaction. The student studies from the sixth, seventh, and eighth semesters between the nineteenth and twenty-fourth sections, which were gained as a consequence of the sketch exams, are included in the second group. These students worked more independently throughout these semesters. The goal of these research is to identify design difficulties that can be resolved within a shorter amount of time and that are compatible with the subject and environment in particularly chosen, more constrained sections of the city of Sivas.

In the first part: There are 11 student studies within the scope of the Re-evaluation of Sivas Yıldız Blokları Campus and Its Neighborhood. In the second part: Analysis of Sivas Archeology Museum Neighborhood and Ethnography Museum included 10 student projects. Third part: Re-evaluation of the Historical Square Mosque Neighborhood. Within the scope of the 8th Semester project, 9 student projects are presented. In the fourth part: Re-evaluation of the Historical Gündük Minaret Neighborhood, 7 student projects are included within the scope of the 7th Semester project. In the fifth chapter: Analysis of the Traditional Texture of Höllülük Street and Suggestions for New Buildings The works of 4 students are included in the 7th Semester project. In the sixth chapter, there are 4 student projects under the title: From Section-models to Spatial Function: Free Designs-Experiments. In the seventh chapter: Re-evaluation of the Historical Gendarmerie Building and Its Neighborhood: Sivas City Museum 8th Semester project includes the work of 7 students. In the eighth chapter, the works of 14 students are presented within the scope of the Temporary High Speed Train Station. In the ninth chapter, there are 8 students' work within the scope of the 8th semester project "Re-evaluation of the Old Numune Hospital and Its Neighborhood: Sivas City Museum". In the tenth section, 4 student projects of the 7th semester project "Faculty of Law on Sivas Cumhuriyet University Campus" are presented. In the eleventh chapter, "Teacher's House in the

Old Hospital Campus" was prepared as a 7th semester project. There are 3 student studies in this section. In the twelfth chapter, there are 4 students' projects on the "Sports Complex" design as a 5th semester project. In the thirteenth chapter, "4 Eylül Science and Technology University Campus Design", 5 student works were included in the 8th semester design studio. In the fourteenth section, there are 4 student projects within the scope of the "Natural History Museum and Science Center on Sivas Cumhuriyet University Campus" as the 6th Semester design studio. In the fifteenth chapter, there are three students' projects in the book as an example of the design studio with the theme "Re-evaluation of the Historical Subaşı Inn Near Surroundings" as a 4th semester project. In the sixteenth chapter, there are three student works representing the design studio "Re-evaluation of the Old Dört Eylül Stadium Area", which was given as the 7th Semester design studio. In the seventeenth chapter, there is the "Re-evaluation of the Historical Wheat Market Area", where the students work as the fifth semester project. Two student projects made in this studio are included in the book. In the eighteenth chapter, there is a student project within the scope of the sixth semester studio "Re-evaluation of the Historical Old Prison Building and the Ethnography Museum".

In the nineteenth chapter as the first section of the second group of student studies, "The Capital of Folk Songs, Sivas Monument Design" was given as the Architectural Project VII Sketch Exam and five student works were included in the book. In the twentieth chapter, "Muzaffer Sarısözen Monument Design" was given as the subject of the Architectural Project VII Sketch Exam, and three student works related to this were included in the book. In the twenty-first chapter, as the seventh semester project, "Sivas High Speed Train and Railway Heritage Monument Design" was given as the Architectural Project VII Sketch exam and two sample student projects were included in the book. In the twenty-second part, there are "Fountain Designs" given as a sketch exam. In the twenty-third part, "Aşık Veysel Şatıroğlu Mausoleum Design" is included as the

Architectural Project VIII sketch exam with ten student works. In the twenty-fourth and the last chapter, the sketch work done within the scope of the architectural project 7 studio, 2 student projects related to the sketch exam on the "Sivas Congress 100th Anniversary Monument Design" are included in the book.

By creating modern, logical, sustainable urban and architectural solutions for the city that do not exclude local characteristics, it is possible to maintain the social, cultural, physical structure, cultural, and historical heritage of the cities and increase their resilience. In this context, the editors of the book "Dreaming for Sivas", concentrated on finding solutions to each of these issues in the architectural design studios they implemented for the students in the context of the aforementioned Sivas features, and they provided readers with excellent examples of student projects. The book "Dreaming for Sivas" is expected to serve as a model for our other cities, and it is expected that architecture students learn the cultural, physical, and social characteristics of the cities they study in and their surroundings in great detail. It is also expected that these students develop into future professionals who can make recommendations for the cities and the architectural problems of the cities.

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Book Review

Orhan Hacıhasanoğlu

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