

Unexpected Discoveries in Transition: An Online Informal Learning Experience

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Abstract. The dynamic nature of the design process brings about unexpectedness, uncertainty, and adaptability, which can be advantageous in evoking situated creativity within design contexts. The dynamic design context also facilitates unexpected discoveries that emerge from introducing new variables, which may sometimes be based on revisiting past instances and enables creativity to be revealed. Similarly, the new concepts brought into daily life, as well as architectural design and architectural education with the COVID-19 pandemic, created an exceptional opportunity to explore creativity and unexpected discoveries within the new variables. In this context, an online design workshop was organized to address the necessity of creating new architectural spaces catering to the pandemic's changing requirements. The outcomes were analyzed with summative content analysis and relation maps for in-depth readings that provide essential benefits to create new design methodologies for a more comprehensive educational environment and creativity in architectural design.

Keywords: Online Informal Learning, Unexpected Discoveries, Architectural Design, Pandemic, Creativity.

1 Introduction

The COVID-19 pandemic brought about significant changes in various aspects of life, including architectural decisions. During the quarantine period, while various places, such as offices, schools, museums, libraries, restaurants, and cafes, were closed, social communication and interactions also moved to digital platforms and online working became the norm. Furthermore, as many spaces designated for specific functions were out of use for approximately two years, the houses, on the other hand, were equipped with various utilities in addition to dwelling, and health institutions experienced an unprecedented activity. Most importantly, the pandemic has introduced new concepts like 'contact,' 'quarantine,' and 'isolation', both medically and architecturally.

Different isolation procedures were implemented for infected (COVID-19 PCR+) individuals, and quarantine procedures for the ones in close contact with infected people. As they were isolated from their families and friends, those coming abroad were also required to self-isolate. While in some cases, infected individuals had to isolate themselves in a room of their own family homes, healthcare workers stayed in hotels and guesthouses to avoid contact with their families. In this process, the lack of dedicated spaces for these isolation and quarantine purposes and the insufficient capacity of health institutions due to the infected crowds led to the transformation of student dormitories and guesthouses into temporary accommodation units. Accordingly, the re-functioning of buildings with the unexpected emergence of the pandemic highlighted the need for creating 'new spaces' that serve these new concepts and usage patterns and fundamentally for updated architectural design ideas.

While discussions on the effectiveness of online education on architectural design education have also intensified during the pandemic, the significant potential of informal learning for creating new education forms is often ignored. The expression "informal learning" encompasses all encounters between the student and the learning experience outside traditional classrooms or studios. In other words, it is possible to consider it as learning from experience, objects, and interactions (Rogers, 2014; Herrera et al., 2019). Unlike formal teaching processes where predefined knowledge is organized around well-structured actions and activities, there are discussions in informal learning processes where students can take a more active role, shape what they will learn, and embrace the process with high motivation (Rogers, 2014). In these discussions, it is often emphasized that students are becoming aware of being almost tutors rather than just learners in education (Yürekli and Yürekli, 2004), that informality creates the necessary free-thinking environment for the student's creativity (Ciravoğlu, 2003), and that it promotes the development of creativity and cognitive activities (Ketizmen Önal, 2017). Studies also mention the contributions of informal education that triggers imagination and creativity in an environment where actions and activities in the design process are not restricted, such as supporting professional development expanding perspectives (Beycan et al., 2014; Ciravoğlu, 2003; Erkin and Soygeniş, 2014; Polatoglu and Vural, 2012), and imparting skills that cannot be gained in formal education (İnce and Işır Yarkataş, 2017). Therefore, informal learning environments allow designers to "formulate new solutions for the present and the future as the new era will bring grave and complex challenges" (UIA, 2017). Among informal environments, workshops stand apart from other learning forms as fostering imagination and creativity without formal constraints.

In this context, an online design workshop was organized to address the necessity of creating new architectural spaces catering to the pandemic's changing requirements to observe the creative decisions made in a suitable environment for a unique design problem.

2 Methodology

Design is a highly complex process involving generating new knowledge characterized as a decision-making process (Asimow, 1962) and problem-solving (Newell & Simon, 1972; Lawson, 2006; Cooper & Press, 1995). This process encompasses two different modes of thinking: "deductive, rational" and "creative, intuitive". Combining these two modes of thinking constitutes one of the most crucial abilities in the design process (Lawson, 2006). In this sense, the design process can be described as a specific problem-solving form involving "creativity."

Creativity is a multifaced concept in design, often influenced by the design medium or environment. With its ever-changing parameters, the dynamic nature of the design process brings about unexpectedness, uncertainty, and adaptability, which can be advantageous in evoking situated creativity within design contexts. While situated creativity is the novelty in a design inspired by the specific design situation and context (Tang and Gero, 2001); the idea of "design situatedness" suggests that designers' concepts are influenced by the evolving design context, encompassing their observations and interpretations of the design situation (Smith and Gero, 2000). Furthermore, design situatedness includes constructive memory, which is constructed in response to the design needs at that moment and continuously integrates with the existing knowledge or experiences.

The dynamic design context also facilitates "unexpected discovery," a fundamental aspect of situated creativity (Suwa et al., 1999). Suwa et al. (1999) describe unexpected discovery as a novel perceptual action that relies on previous physical actions or constructive memory, often building upon past instances. Such unexpected discoveries emerge from introducing new variables, which may sometimes be based on revisiting past instances, and enable creativity to be revealed.

Similarly, the new concepts brought into daily life, as well as architectural design and architectural education with the COVID-19 pandemic, created an exceptional opportunity to explore creativity and unexpected discoveries within the new variables. In this context, the workshop's primary objective was to design isolation or quarantine scenarios considering various physical and social conditions and diverse user profiles shaped by the "new normal" lifestyles that emerged due to the pandemic. The aim was to design new living spaces that adapt to these scenarios' changing isolation and quarantine conditions.

2.1 The Framework of the Workshop

As a creative process, design is closely related to design tools. Computer-aided design (CAD) allows designers to experiment with different forms, enabling rapid design without being dependent on materials and manual skills from the initial design stages. This capability positively influences the creativity of designers (Akipek and İnceoğlu, 2007; Güney, 2015; İslamoğlu and Değer,

2015). Therefore, the workshop was structured as a one-day online design marathon with 27 undergraduate architectural students as participants who will use CAD tools throughout the process. The workshop's short-term and intensive nature necessitated collaboration among the participants, so teamwork was encouraged to support collective learning and cooperation (Polatoğlu and Vural, 2012). The participants were divided into nine teams of three members each, and virtual studios accessible only to the team members were built for each team to work through learning from each other and free discussions during the day.

Participants were tasked with creating scenarios and various design alternatives in these virtual studios through the specific parameters categorized as "variable" and "stable", following the COVID-19 pandemic guidelines of the Republic of Türkiye Ministry of Health. The variable parameters included (1) the number of users (one, two and five individuals), (2) the health status of the users (infected, uninfected, and in close contact with infected individuals), (3) the period of usage (unlimited for uninfected, ten days isolation period for infected and 14 days for close contact individuals). The stable parameters included: (1) the ages of users (20 years old and under, between 20 and 65 years old, and 65 years old and over), (2) the architectural context (attached, mobile and detached)

The workshop was organized as a three-period design cycle, each lasting 2.5 hours. In all periods, participants represented their ideas using computer-aided design programs in architectural expressions as plans, sections, and digital models. Moreover, at the end of each design period, the work of each team was transmitted to another team through digital transfer methods. In the subsequent design period, each team was expected to build upon the received designs, re-designing and developing them based on a new set of parameters, while they were not particularly informed about the parameters of the transmitted works. In the first design period, all stable and variable parameters were randomly determined for each team. In the second period, while the designs of the first period were transferred to the following team, the variable parameters were again randomly determined for each team, and the stable parameters remained unchanged. In the third period, the designs of the second period were transferred to the following team and all the teams were given the same parameters as those in the first period.

For the variable parameters, the difference in the number of users was based on observing the changes in spatial configuration and dimension for single, multiple, and group users; the users' health status and usage period were determined due to the notifications appointed by the Ministry of Health. For the stable parameters, while the difference in architectural context was based on observing the changes in design ideas and concepts, age groups were again determined due to the notifications. Participants were also asked to define the design's surrounding environment, the users' occupations and family relations.

The aim was to observe how designs specifically tailored for a particular scenario, user profile, and situation in the previous period would transform with a new set of design parameters in the following one. Thus, it is possible to

reveal how the designer integrates the previously acquired design knowledge with the newly changing design concept and knowledge, in other words, how the creativity is triggered. To understand the cognitive design process within a design cycle, analyzing the transitions of specific concepts between design periods reveals unexpected discoveries and situated creativity.

2.2 Tools of Analysis

After the workshop, the participants were tasked to create one poster for each design period to represent their designs, ideas and concepts. Additionally, they were encouraged to include short written explanations of their design decisions in posters, if necessary. The visual and written data collected from these posters were then analyzed in two distinct methods:

- Classification and Ordering of Parameters with Content Analysis

Content analysis is used to interpret text and data through a systematic classification process of coding and identifying themes or patterns (Hsieh and Shannon, 2005). Furthermore, it also allows the exploration of meaning and patterns underlying texts and helps a meta-cognitive state (Kurt and Kurt, 2016; Patton, 2002) to be activated, providing the researchers with raw information ready to be analyzed. While concept-driven concept analysis (directed or deductive coding) is based on a predetermined approach or model, data-driven concept analysis (conventional content analysis or inductive coding) is based on emerging categories without any preconceptions of the researcher and with the analysis of the text (Schreier, 2012; Hsieh and Shannon, 2005). However, summative content analysis uses inductive and deductive methods by forming themes and allowing categories to emerge by inductive coding (Hsieh and Shannon, 2005).

Within the workshop's scope, since the design decisions are mainly based on stable and variable (predetermined) parameters and the ones constructed in response to the design needs at that moment (emerging), summative content analysis is used to analyze the design works. Therefore, analyzing the predefined parameters (health status, age and number of users, and architectural context) through concept-driven concept analyses and analyzing designers' decisions and additional parameters (surrounding environment, number of floors, building formation, building material and spatial configuration) through data-driven concept analyses reveal the situated creativity and unexpected discoveries of the design process and action (Figure 1).

The relational analysis aims to explore the content analysis findings at a higher level and visualizes the data by centrality mappings to reveal the relations between categories. These maps draw a model of the content and enable visible comparisons of the semantic relations between the categories rather than just numeric comparisons. Mapping makes inter-relations between parameters explicit by applying network analysis to discover patterns, central actors, indirect relations, and organic clusters that are otherwise hidden.

TYPE	PARAMETER						
Concept-driven "variable"	<ul style="list-style-type: none"> Number of users Health status of users 	T1	T2	T1	T2	T1	T2
		A1 B1 C1	A3 B3 C3	A2 B2 C2	14 contact 1 person 65+	10 Covid + 5 people 65+	14 contact 1 person 65+
Concept-driven "stable"	<ul style="list-style-type: none"> Ages of users Architectural context 	A2 B2 C2	A1 B1 C1	A3 B3 C3	10 Covid + 5 people 20-65	- Covid - 2 people 20-65	10 Covid + 5 people 20-65
Data-driven	<ul style="list-style-type: none"> Environment Formation Number of floors Plan configuration Material 	A3 B3 C3	A2 B2 C2	A1 B1 C1	- Covid - 2 people -20	14 contact 1 person -20	- Covid - 2 people -20

Figure 1. Parameters and their transfer (T1-T2) in process. Source: Authors, 2023.

- Discussing Comparisons in Parameters through Relational Analysis Using Mapping

In this context, these relational mappings representing the networks were used to analyze the cognitive creativity of the participants (Figure 2). These mappings provide a better understanding of the relations of data obtained from the content analysis and, thus, how the design decisions were changed between the design periods was examined semantically. Through the intense readings of the participants' posters, the data-driven parameters were analyzed sequentially using Graph Commons mappings of the relations. Moreover, it also discovers the most preferred design parameters using the centrality measures, which are the most influential actors in the network.

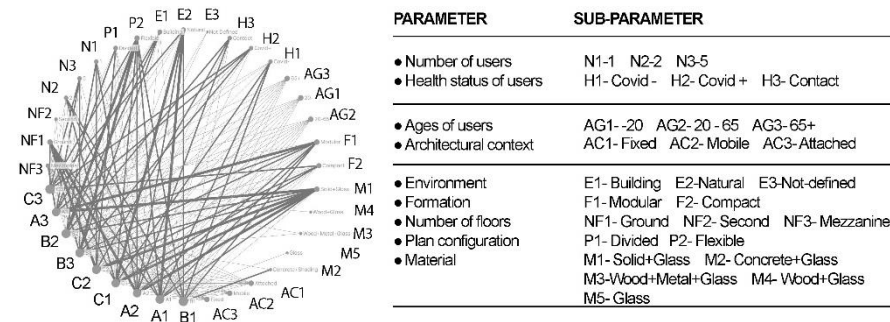


Figure 2. Relational map of parameters. Source: Authors, 2023.

The methodology of combining these two analysis methods helps to comprehensively present the workshop's outcomes to identify design patterns, variations, and the impact of different parameters. Moreover, it allows for a deeper exploration of creativity in the design process and the decision-making processes concerning the design parameters. Thus, it will be possible to understand the situated creativity through the different design periods and design parameters, but most importantly, unexpected discoveries in transitions

(Figure 2). Therefore, data transformation during the transitions was examined instead of the ones included in the three design periods.

3 Results

When the five data-driven parameters were examined through the differences in the transitions where the unexpected discoveries occur as the most remarkable point of the creativity, it was revealed that three different transition types are affecting the design decisions: Continuing their own design decisions in the following period, without considering the transmitted parameters (P: previous); developing a new design decision only according to the new parameters (N: new); and integrating the transmitted parameters to their own decisions (P+N: previous+new)

- *The transformation of the design decisions of the surrounding environment:*

Although in the first transition between the first and second design period, all teams continued the decisions of the previous period, in the second transition between the second and third design period, on the contrary, they had a different approach and used the newly transmitted environmental decisions. According to the centrality analysis, most designs were created in a natural surrounding environment instead of built (Figure 3). This decision to design in a natural environment may be related to the concerns of the pandemic, where many people prefer to live in less crowded places by escaping from crowded cities with the online working and education life. Moreover, using new design decisions in the second transition indicates that teams completely changed their previous decisions and tended to a new proposal according to the new parameters.

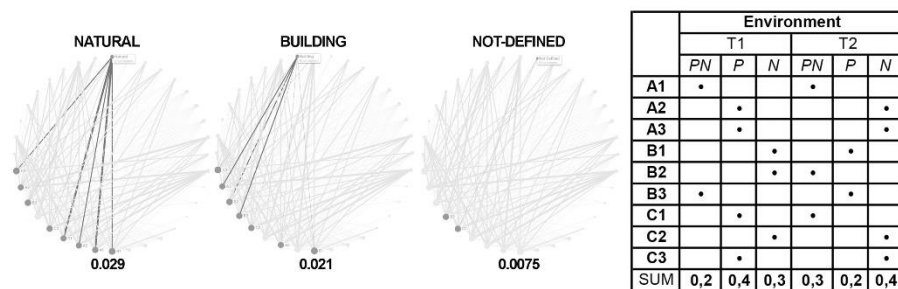


Figure 3. Centrality map of environmental parameters. Source: Authors, 2023.

- *The transformation of the design decisions of the building formation:*

In the first and second transitions, the teams mostly made their design decisions according to the previous decisions that were transferred from other teams. However, the difference between these two parameters, which are modular and compact, is not that significant in the centrality analysis (Figure 4). Nevertheless, modular formations, which define relatively more flexible spaces, were preferred more, even with a slight difference, and may also be associated with the pandemic. In this process, the need for flexibility and variability between spaces has come to the fore, mainly as houses undertake functions such as working, education, sports, and entertainment in addition to dwelling.

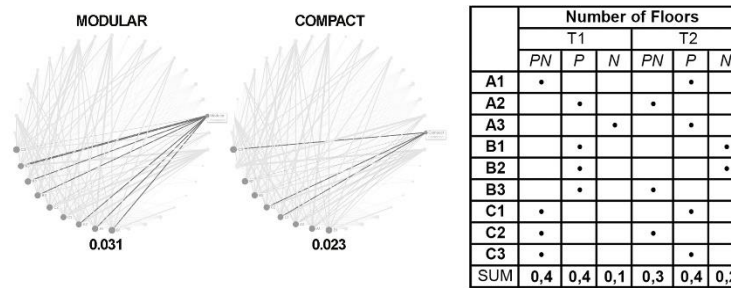


Figure 4. Centrality map of formation parameters. Source: Authors, 2023.

- *The transformation of the design decisions of the plan configuration:*

The need for flexible spaces also dominated the plan configurations. The design decisions on flexible spaces are prominent in plan configurations rather than divided analysis (Figure 5). Similar to the building formation, in both the first and second transitions, the teams mostly made their design decisions according to the previous decisions that were transferred from other teams. This kind of design decision of using the previous teams' decisions as new parameters refers to experiencing different previous alternatives and exploring new potentials through previous knowledge.

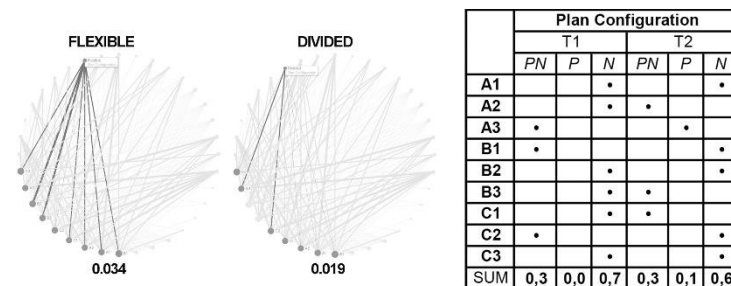


Figure 5. Centrality map of plan configuration parameters. Source: Authors, 2023.

- *The transformation of the design decisions of the number of floors:*

However, the teams had a more conservative attitude regarding the number of floors in their design decisions, significantly affecting the building formation and plan configuration. Both in the first and second transitions, teams mostly preferred to continue their decisions regarding the number of floors. Similarly, most designs had only ground floors, while a few had a mezzanine or second floor as a new creative alternative (Figure 6). Although no height limit has been defined in the parameters, the fact that most of the designs only include the ground floor should be related to the need for interaction with the ground and outside during the pandemic period.

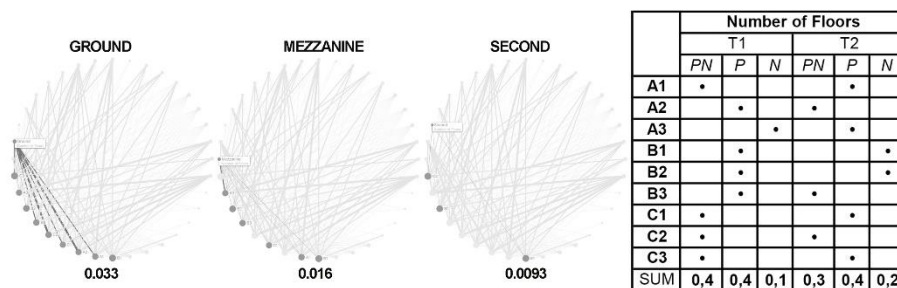


Figure 6. Centrality map of floor number parameters. Source: Authors, 2023.

- *The transformation of the design decisions of the building materials:*

The attempt to interact with the indoor and outdoor space is also significant in using building materials. As it was in the number of floors, the teams again preferred to continue their own decisions in the previous period. On the other hand, the centrality values of the building materials data (Figure 7). indicate that while the transparent surfaces are clearly defined as glass, the material of the solid surfaces is defined explicitly in some designs; in most designs, they are only undefined solid surfaces. However, the need for transparency defined by glass surfaces that allow interaction with the outdoors, even if only visually, is due to the interruption of social relations with other individuals during the pandemic and the fact that individuals are stuck in houses, especially in cities.

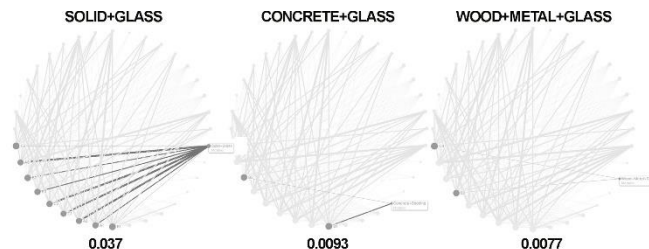


Figure 7. Centrality map of material parameters (continues). Source: Authors, 2023.

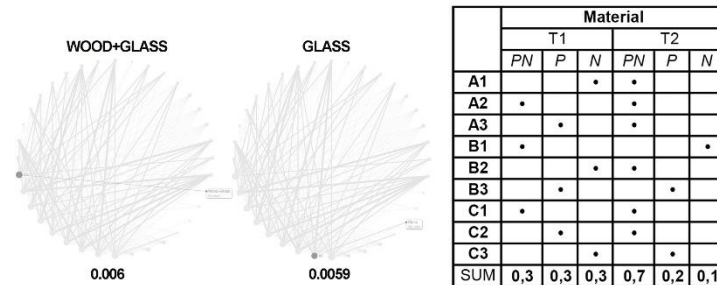


Figure 7. Centrality map of material parameters (ends). Source: Authors, 2023.

4 Discussion

The workshop's design process presented a creative and dynamic cycle, where designs continually transformed based on changing parameters in all three design periods. The short-term and intense working process encouraged participants to adapt and reimagine their designs in response to different contexts, resulting in unexpected, diverse and innovative architectural solutions.

While the designs transformed into other ones with a new set of parameters during the first transition between the first and second design periods, they evolved into entirely different ones despite having the same initial parameters as in the first period. Although stable and variable parameters have been given, the most decisive factor in all designs has been the concerns about the COVID-19 pandemic.

Creative and innovative ideas on architectural design decisions such as the surrounding environment, building materials, number of floors, building formation and plan configuration have been shaped by the information they have been intensely exposed to during the pandemic. Thus, a creative design process has occurred unexpectedly in which the knowledge gained through current or previous experiences and the emerging knowledge in the process was integrated. During transitions between design periods, not only developing a new design decision according to the new parameters but also continuing their own design decisions in the following period, without considering the transmitted parameters, reveal a new creative design process concerning the changing design context.

The participants did not encounter any problems due to the workshop's base design idea, which uses CAD as a representation medium and design partner rather than just a drawing tool. This result is essential in demonstrating how quickly a well-structured digital design environment can establish a beneficial relationship. Although participants have different levels of knowledge in design, it was observed that they acquired a certain level of skill set after a short and intensive workshop experience. The acquired skill set includes experiences such as representing a process related to computational design with given

stable and variable parameters and relations while developing innovative solutions between parameters, form-topological relationships, and function. The potential of the acquired skill set to be adapted to different contexts and design problems is a contribution that can be addressed in informal learning research in the context of digital design pedagogy in architecture in the longer term.

Throughout the process, it was observed that increasing the frequency of design interactions between learners in a group dynamic creates an environment where they start learning from each other. This outcome is an essential input for informal learning forms in digital design. These unexpected discoveries in the design process that triggered creativity required a deeper understanding of the design action about all different social, physical and architectural circumstances.

In a near future, the new ways of learning will become more widespread in use in every design stage, with their potential to diversify and transform individuals learning capabilities and choices. Therefore, this study explores and creates a base about the designers' attitudes, decisions, design concepts and contexts in terms of creativity for further research.

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