

ISTANBUL TECHNICAL UNIVERSITY ★ GRADUATE SCHOOL

**EXPLORING DESIGN GRADUATES' UNDERSTANDINGS TOWARDS THE
CONCEPT OF SUSTAINABILITY: A PHENOMENOLOGICAL STUDY FROM
TÜRKİYE**



M.Sc. THESIS

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Department of Industrial Design

Industrial Design Programme

FEBRUARY 2024

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İSTANBUL TEKNİK ÜNİVERSİTESİ ★ LİSANSÜSTÜ EĞİTİM ENSTİTÜSÜ

**TASARIM MEZUNLARININ SÜRDÜRÜLEBİLİRLİK KAVRAMINA
YÖNELİK ANLAYIŞLARININ İNCELENMESİ: TÜRKİYE'DEN
FENOMENOLOJİK BİR ÇALIŞMA**

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To my family,



FOREWORD

Conducting this thesis study concurrently with my professional life was quite challenging, yet every phase of this process was immensely instructive. First of all, I would like to express my gratitude to my advisor, Assoc. Prof. Dr. Koray Gelmez, for guiding me throughout this process, contributing to my research, and keeping me motivated. I extend my deepest appreciation to all my lecturers at Istanbul Technical University who have enriched my educational experience, offered me diverse perspectives during the courses I took. I would like to thank Assist. Prof. Dr. Elif Küçüksayraç and Assoc. Prof. Dr. Aykut Coşkun for agreeing to evaluate my thesis and for providing valuable recommendations for its development.

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January 2024

Seher Naz AYHAN ARDA
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ABBREVIATIONS

| | |
|-------------|-----------------------------------|
| AI | : Artificial Intelligence |
| CE | : Circular Economy |
| DfS | : Design for Sustainability |
| DfBC | : Design for Behavior Change |
| DfSB | : Design for Sustainable Behavior |
| LCA | : Life Cycle Assessment |
| SD | : Sustainable Development |
| SDGs | : Sustainable Development Goals |





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EXPLORING DESIGN GRADUATES' UNDERSTANDINGS TOWARDS THE CONCEPT OF SUSTAINABILITY: A PHENOMENOLOGICAL STUDY FROM TÜRKİYE

SUMMARY

The 21st century has brought to the forefront increasingly important global challenges such as the climate crisis, and economic and social inequalities. Against these challenges, education becomes essential for building more sustainable societies, facilitating change in understanding, altering behaviors, and stimulating these practices on a larger scale. Sustainability is a broad concept that has been discussed in the design discipline with different approaches so far, including eco-design, design for sustainability, design for circular economy, design for behavior change, and design at the socio-technical level. However, many of these approaches in the literature are generally focused on developing strategies for product design, understanding user perceptions, or changing user behavior. In this context, studies focusing on designers within the scope of sustainability are quite limited. In design education, studies on the concept of sustainability are generally discussed through in-class projects with students, sustainability-related curricula, and students' understandings. Nowadays, the contribution of design education in integrating sustainability approaches into design practices has become a mainstream topic. While designers are often portrayed as intermediaries and facilitators of sustainability, this role may not always be evident in current realities and professional practices. Factors such as perceptions of the concept of sustainability not being adequately recognized professionally, sector-based constraints, or employers' perspectives may affect designers' understanding, behavior, and even professional identity in the context of sustainability. It is clear that there is a need for future designers in the design discipline who can generate solutions to real-world problems and take action accordingly. In this regard, designers not only need to acquire the skills required by new world problems, but they also need to quickly adapt to these new challenges. In order to understand the competencies required within the scope of sustainability, it is significant to figure out the understanding that design education provides to students. Although there are studies in the literature focusing on the understandings of design students, these studies are not sufficiently comprehensive, and studies focusing on the understandings of design graduates are quite limited. The contributions of design education in the context of sustainability at the level of knowledge, competence, behavior and professional identity is not clear.

This thesis focuses on design graduates' understandings towards sustainability, in line with the importance of its background, and by targeting these gaps in the literature. With this focus, it aims to reveal the understanding of design graduates in Türkiye towards the concept of sustainability and the contributions of design education. Then, it aims to understand the contributions of design education to the knowledge, competence, behavior, and professional identity in terms of sustainability from the perspectives of design graduates. In general, this thesis study consists of 5 chapters. The first chapter covers the introduction. It explains the background and motivation, scope and aim, research questions, and structure of the thesis. The second chapter

covers the literature research. Firstly, this chapter presents sustainability and design literature, and the approaches specific to design for sustainability and circular design. It then explains the concept of sustainability in design education, exemplifies studies on sustainability and design education around the world. Finally, it presents sustainability-related courses in design education curriculums with their learning outcomes in Türkiye. In the third section, the knowledge, competence, behavior, and professional identity levels of the Miller Pyramid are explained. The integration of this model into design education is proposed with a study derived from this thesis study in the context of sustainability. Finally, approaches in the literature regarding the competencies, behaviors, and professional identities of designers in the context of sustainability corresponding to each level of the Miller pyramid are presented.

In the third part of the study, the phenomenological approach of the thesis, the mixed method data collection, and the data collection context are explained. Two data collection methods were conducted with the participation of industrial design graduates in Türkiye. First of all, two face-to-face pilot interviews were conducted to obtain general insights about the research. Later, semi-structured interviews were conducted with 18 industrial design graduates. The designers who participated in the semi-structured interviews also had professional experience in the field of design. The second data collection method of the research is a survey that will support semi-structured interviews. The survey was prepared online via Google Forms and shared on social platforms. Since the target participants of the survey were industrial design graduates, 181 out of a total of 188 survey participants were included in the data analysis phase of the study. When the data collection phases were completed, the qualitative data from the semi-structured interviews and survey were coded with the thematic analysis. Sub-themes and themes were created with the codes according to the number of repetitions. Quantitative data from the survey was analyzed using descriptive statistical analysis and the findings were visualized and tabulated according to data frequencies. These findings were incorporated into relevant themes that emerged from the thematic analysis process.

In the fourth chapter of the thesis, the results of these data analyses are expressed with 5 categories under the findings. These categories are named Designers' Sustainability Approaches, Designers' Knowledge Sources on Sustainability, Circular Design Approaches of Designers, Contribution of Design Education, and Designers' Competence, Behavior, and Professional Identity. A total of 15 themes and 17 sub-themes were revealed under all these categories and were explained in detail in the findings chapter.

The last chapter of the study includes summarizing the process of the research, discussing the findings, summarizing the findings that answer the research questions, explaining the limitations of the research, recommendations for design education, and recommendations for further research. The findings revealed different aspects of the understandings of design graduates towards the concept of sustainability in Türkiye and contributions of the design education. These understandings have emerged with conceptual approaches, approaches in daily practice, approaches with a critical perspective, and approaches with internal and external motivations. Circular design concepts were mostly discussed by design graduates with an upcycling approach. Design graduates expressed that they did not exactly know the definition of this concept but they could make guesses somehow. It was concluded that sustainability knowledge sources mostly come from design education, text-based online resources, and social media. However, the knowledge provided by design education was

perceived by designers more at the theoretical and basic knowledge level. In general, the knowledge provided by design education was expressed by design graduates as material knowledge, production-related knowledge, and usage process knowledge. In general, the contribution of design education was evaluated by design graduates at the levels of thinking, comprehensive understanding, and self-criticism abilities. The contribution of design education to competence in the context of sustainability was expressed by design graduates through the acquisition of designer vision, reasoning skills, and conscious consumption behaviors. Other findings highlighted design graduates' criticism that while design education contributes to promoting knowledge sharing and exemplary behavior at a performance level, it does not provide the self-confidence and persuasion skills that will create behavioral change in others. It has been stated that design education at the action level provides knowledge and understanding for idea sharing. However, there are barriers that design graduates express when it comes to taking action, especially in a professional work environment. It has been stated by design graduates that design education at the identity level provides self-awareness, professional responsibility, and the ability to technically integrate sustainability practices into design practices, but especially the impact of design practice is a very transformative obstacle in terms of identity. In general, the understanding that design education provides within the scope of sustainability is ambiguous in design practices. The contribution of design education in terms of knowledge has not been evaluated comprehensively and practice-based enough by design graduates. The impact of design education on designer behavior and the development of designer identity is not clearly explained by design graduates. Integration of sustainability approaches in design education as a basis may be important for design graduates to more clearly understand the contributions of design education. For this purpose, it is clear that further studies are needed to investigate how can be developed and evaluated at the knowledge, skills, competence, behavior, and professional identity levels of designers in design education and to take appropriate actions in this direction.



TASARIM MEZUNLARININ SÜRDÜRÜLEBİLİRLİK KAVRAMINA YÖNELİK ANLAYIŞLARININ İNCELENMESİ: TÜRKİYE'DEN FENOMONOLOJİK BİR ÇALIŞMA

ÖZET

21. yüzyılın getirdiği iklim krizi, ekonomik ve sosyal eşitsizlikler gibi daha pek çok global zorluklar giderek önemini arttırarak karşımıza çıkmaktadır. Bu global zorlukların getirdiği sürdürülebilirlik problemleri karşısında eğitim, anlayışlar sağlayan, davranışları değiştiren ve daha büyük ölçekte teşvik eden rolüyle daha sürdürülebilir toplumlar inşa edebilmek için bir gereklilik haline gelmiştir. Sürdürülebilirlik, tasarım disiplinde de bu zamana kadar eko-tasarım, sürdürülebilirlik için tasarım, döngüsel ekonomi için tasarım, davranış değişikliği için tasarım ve sosyo-teknik düzeyde tasarıma kadar farklı yaklaşımlarla tartışılan geniş bir kavramdır. Ancak literatürdeki bu yaklaşımların birçoğu genel olarak ürün tasarımına yönelik stratejiler geliştirmeye, kullanıcı algılarını anlamaya veya kullanıcı davranışını değiştirmeye odaklanmaktadır. Sürdürülebilirlik kapsamında tasarımcıya odaklanan çalışmalar ise oldukça kısıtlıdır. Tasarım eğitiminde sürdürülebilirlik kavramına ilişkin çalışmalar genellikle derste yapılan projeler, sürdürülebilirlik ile ilgili müfredatlar ve öğrencilerin anlayışları üzerinden tartışılmaktadır. Günümüzde sürdürülebilirlik yaklaşımlarının tasarım uygulamalarına entegre edilmesinde tasarım eğitiminin katkısı ana akım konu haline gelmiştir. Tasarımcılar sıklıkla sürdürülebilirliğin araçları ve kolaylaştırıcıları olarak tasvir edilse de, bu rol mevcut gerçekliklerde ve profesyonel uygulamalarda her zaman belirgin olmayabilir. Sürdürülebilirlik kavramının profesyonel anlamda yeterince tanınmadığına ilişkin anlayışlar, sektör bazlı kısıtlamalar veya işverenlerin bakış açısı gibi faktörler, tasarımcıların sürdürülebilirlik bağlamındaki anlayışlarını, davranışlarını ve hatta mesleki kimliklerini etkileyebilmektedir. Tasarım disiplinde gerçek dünya sorunlarına çözüm üretebilen ve buna göre aksiyon alabilen geleceğin tasarımcılarına ihtiyaç olduğu açıktır. Bu bakımdan tasarımcıların sadece yeni dünya sorunlarının gerektirdiği becerileri kazanmaları değil, aynı zamanda bu yeni zorluklara hızla uyum sağlamaları da gerekmektedir. Sürdürülebilirlik kapsamında gerekli olan yetkinlikleri anlamak için tasarım eğitiminin öğrencilere sağladığı anlayışı anlamak önemlidir. Literatürde tasarım öğrencilerinin anlayışlarına odaklanan çalışmalar olmasına rağmen bu çalışmalar yeterince kapsamlı değildir ve tasarım mezunlarının anlayışlarına odaklanan çalışmalar oldukça sınırlıdır. Tasarım eğitiminin sürdürülebilirlik bağlamında bilgi, yeterlilik, davranış ve mesleki kimlik düzeyindeki katkıları net değildir.

Bu tez çalışması, tasarım mezunlarının sürdürülebilirliğe yönelik anlayışlarına, arka planının önemi doğrultusunda ve literatürdeki bu boşlukları hedef alarak odaklanmaktadır. Bu odak noktasıyla Türkiye'deki tasarım mezunlarının sürdürülebilirlik kavramına yönelik anlayışlarını ve tasarım eğitiminin katkılarını ortaya çıkarmayı amaçlamaktadır. Daha sonra tasarım eğitiminin sürdürülebilirlik açısından bilgi, yeterlilik, davranış ve mesleki kimliğe katkılarını tasarım mezunlarının bakış açısından anlamayı amaçlamaktadır. Bu tez çalışması genel olarak 5 bölümden

oluşmaktadır. Birinci bölümde giriş yer almaktadır. Tezin arka planını ve motivasyonunu, kapsamını ve amacını, araştırma sorularını ve yapısını açıklar. İkinci bölümde literatür araştırması yer almaktadır. Bu bölümde öncelikle sürdürülebilirlik ve tasarım literatürü ile sürdürülebilirlik için tasarım ve döngüsel tasarıma yönelik yaklaşımlar sunulmaktadır. Daha sonra tasarım eğitiminde sürdürülebilirlik kavramını açıklanmaktadır ve dünya çapında sürdürülebilirlik ve tasarım eğitimi üzerine yapılan çalışmalara örnekler verilmiştir. Son olarak Türkiye'deki tasarım eğitimi müfredatlarında yer alan sürdürülebilirlik ile ilgili dersler öğrenme çıktılarıyla birlikte sunulmaktadır. Üçüncü bölümde Miller piramidinin bilgi, yeterlilik, davranış ve mesleki kimlik düzeyleri anlatılmaktadır. Sürdürülebilirlik bağlamında bu tez çalışmasından elde edilen bir çalışma ile bu modelin tasarım eğitimine entegrasyonu önerilmektedir. Son olarak Miller piramidinin her bir düzeyine karşılık gelen sürdürülebilirlik bağlamında tasarımcıların yetkinlikleri, davranışları ve mesleki kimliklerine ilişkin literatürdeki yaklaşımlar sunulmaktadır.

Çalışmanın üçüncü bölümünde tezin fenomenolojik yaklaşımı, karma yöntem veri toplama yöntemi ve çalışmanın veri toplama bağlamı açıklanmıştır. Türkiye'deki endüstriyel tasarım mezunlarının katılımıyla iki veri toplama yöntemi yürütülmüştür. Öncelikle araştırma hakkında genel bilgi edinmek amacıyla yüz yüze iki pilot görüşme gerçekleştirilmiştir. Daha sonra 18 endüstriyel tasarım mezunu ile yarı yapılandırılmış görüşmeler yapılmıştır. Yarı yapılandırılmış görüşmelere katılan tasarımcıların aynı zamanda tasarım alanında mesleki deneyimleri de bulunmaktadır. Araştırmanın ikinci veri toplama yöntemi ise yarı yapılandırılmış görüşmeleri destekleyecek anket çalışmasıdır. Anket çalışması online olarak Google Forms üzerinden hazırlanıp sosyal platformlarda paylaşılmıştır. Endüstriyel tasarım mezunları yine anket çalışmasında hedeflenen katılımcılar olduğu için toplamda 188 anket katılımcısının 181'i çalışmanın veri analiz aşamasına dahil edilmiştir. Veri toplama aşamaları bittiğinde ise araştırmanın yarı yapılandırılmış görüşmeler ve anket çalışmasından gelen kalitatif verileri tematik analiz yöntemiyle kodlanmıştır. Kodlar ile tekrar sayısına göre alt temalar ve temalar oluşturulmuştur. Anket çalışmasından gelen kantitatif veriler ise tanımlayıcı istatistiksel analiz yöntemiyle analiz edilip bulgular veri frekanslarına göre görselleştirilmiş ve tablolaştırılmıştır. Bu bulgular, tematik analiz sürecinden ortaya çıkan ilgili temalara dahil edilmiştir.

Araştırmanın dördüncü bölümünde bu veri analizlerinin sonuçları bulgular altında 5 kategori ile ifade edilmiştir. Bu kategoriler Tasarımcıların Sürdürülebilirlik Yaklaşımları, Tasarımcıların Sürdürülebilirlikle ilgili Bilgi Kaynakları, Tasarımcıların Döngüsel Tasarım Yaklaşımları, Tasarım Eğitiminin Katkısı ve Tasarımcıların Yeterlilik, Davranış ve Profesyonel Kimliği olarak isimlendirilmiştir. Tüm bu kategoriler altında ise toplamda 15 tema ve 17 alt tema oluşmuş ve bulgular bölümünde detaylı olarak açıklanmıştır.

Çalışmanın son bölümünde araştırma sürecinin özetlenmesi, bulguların tartışılması, araştırma sorularına cevap veren bulguların özetlenmesi, araştırmanın sınırlılıklarının açıklanması, tasarım eğitimine yönelik öneriler ve ileri araştırmalar için öneriler yer almaktadır. Bulgular, Türkiye'deki tasarım mezunlarının sürdürülebilirlik kavramına yönelik anlayışlarını ve tasarım eğitiminin katkılarını farklı yönleriyle ortaya çıkarmıştır. Bu anlayışlar kavramsal yaklaşımlar, günlük pratiklerindeki yaklaşımlar, eleştirel bakış açısı ile yaklaşımlar ve içsel ve dışsal motivasyonlar ile oluşan yaklaşımlar ile ortaya çıkmıştır. Döngüsel tasarım anlayışları ise çoğunlukla tasarım mezunları tarafından ileri dönüşüm yaklaşımıyla tartışılmıştır. Tasarım mezunları bu kavramın tanımını tam olarak bilmediklerini ancak bir şekilde tahmin

yürülebildiklerini ifade etmiştir. Sürdürülebilirlik bilgi kaynaklarının çoğunlukla tasarım eğitimi, metin tabanlı çevrimiçi kaynaklar ve sosyal medyadan geldiği sonucuna varılmıştır. Ancak tasarım eğitiminin sağladığı bilgiler tasarımcılar tarafından daha çok teorik ve temel bilgi düzeyinde algılanmıştır. Ancak tasarım eğitiminin sağladığı bilgiler tasarım mezunları tarafından daha çok teorik ve temel bilgi düzeyinde algılanmıştır. Tasarım eğitiminin sağladığı bilgiler genel olarak tasarım mezunları tarafından malzeme bilgisi, üretime ilişkin bilgi ve kullanım süreci bilgisi olarak ifade edilmiştir. Genel olarak tasarım eğitiminin katkısı, düşünme, kapsamlı anlama ve özeleştirme yapma becerileri düzeyinde değerlendirilmiştir. Tasarım eğitiminin sürdürülebilirlik bağlamında yeterliliğe katkısı, tasarım mezunları tarafından tasarımcı vizyonu, muhakeme becerileri ve bilinçli tüketim davranışlarının kazanılması yoluyla ifade edilmiştir. Diğer bulgular tasarım eğitiminin performans düzeyinde bilgi paylaşımını ve örnek davranışları teşvik etmesine katkıda bulunduğuna yönelik tasarım mezunlarının anlayışlarını gösterirken başkalarında davranış değişikliği yaratacak özgüven ve ikna becerilerini sağlamadığına yönelik eleştirilerini de öne çıkardı. Aksiyon düzeyinde, tasarım eğitiminin fikir paylaşımına yönelik bilgi ve anlayış sağladığı ifade edilmiştir. Ancak tasarım mezunlarının özellikle profesyonel bir çalışma ortamında aksiyon alma konusunda dile getirdiği engeller vardır. Kimlik düzeyinde, tasarım eğitiminin kişisel farkındalık, mesleki sorumluluk ve sürdürülebilirlik uygulamalarını teknik olarak tasarım uygulamalarına entegre etme yeteneği sağladığını ancak özellikle tasarım pratiğinin etkisinin kimlik açısından oldukça dönüştürücü bir engel olduğu tasarım mezunları tarafından ifade edilmiştir. Genel olarak tasarım eğitiminin sürdürülebilirlik kapsamında sağladığı anlayış tasarım uygulamalarında muğlaktır. Tasarım eğitiminin bilgi açısından katkısı tasarım mezunları tarafından yeterince kapsamlı ve uygulamaya dayalı olarak değerlendirilmemiştir. Tasarım eğitiminin tasarımcı davranışına ve tasarımcı kimliğinin gelişimine etkisi tasarım mezunları tarafından net bir şekilde açıklanamamaktadır. Sürdürülebilirlik yaklaşımlarının tasarım eğitime temel olarak entegre edilmesi, tasarım mezunlarının tasarım eğitiminin katkılarını daha net anlamaları açısından önemli olabilir. Bu amaçla tasarımcıların tasarım eğitiminde bilgi, beceri, yeterlilik, davranış ve mesleki kimlik düzeylerinde nasıl geliştirilebileceği, değerlendirilebileceği ve bu doğrultuda uygun aksiyonların alınabileceği konusunda daha fazla çalışmaya ihtiyaç olduğu açıktır.



1. INTRODUCTION

This chapter begins with the self-motivation and background of the thesis, which forms the beginning of the research scope. The following section, explains the scope and aim of the thesis and then explains the main research question, and sub-questions to be answered in the study. Finally, it shows the structure of the thesis briefly.

1.1 Background and Motivation

As a professional designer who has been working on studies related to the concept of sustainability with different aspects throughout my master's education, I have always had the motivation to work on the concept of sustainability in my thesis study. Realizing that sustainability-related issues are essentially based on education has encouraged me to work within the scope of design education. However, the most important motivation that enabled this study to take shape is based on my design career, which started in 2020. In a sustainability-focused team project in which I was involved in the consumer electronics sector, the process of designing systems for recycling, sorting, and encouraging recycling behavior in plastics led me to question my behavior. While these thoughts were going through my mind, I realized that the thought of throwing the empty PET bottles in my hand to the area dedicated to PET bottle recycling located one floor below had never been on my mind until that moment - whereas the team project we were working on was focused on encouraging the sustainable behavior for PET bottle recycling. This behavior was directly related to my lack of motivation, but what else could be the real reasons?

When I started to observe this behavior pattern in other designers around me, I observed that their behavior in this regard was not much different from my attitude. While we are designers who focus on sustainability, why were we not demonstrating the behavior we desired? Were we taking action in our daily lives towards the problems we pursued? My research process, which started with questioning my behavior with the urge to follow the answers to these questions, led me to question the designer's understanding and behavior towards sustainability and the designer's professional

identity. This questioning also directed me to examine the contributions of design education. Eventually, a learning model that we drafted with my advisor encouraged me to question the existence of such a model in the literature and indicated to the existence of a theory that had been studied much earlier: the Miller Pyramid (1990).

All these self-motivations formed the starting point of this thesis study. As we all know, the 21st century has brought climate crises as well as economic and social inequalities, which have become increasingly crucial global problems. Broadly, education has a significant role to play in developing a clear understanding of sustainability, encouraging sustainable behavior, and facilitating the widespread internalizing of these behavioral patterns for building a more sustainable society. At this point, the design discipline is in a position to offer solution-oriented ideas to real-world problems with the power to transform abstract ideas into concrete realities (Doordan, 2013). Sustainability discussions are not new in design and design education, but they continue to be a highly debated topic today. The concept of sustainability is inherently quite broad and approaches to this concept range from eco-design approaches to design for the circular economy and approaches based on innovations at the socio-technical level. These changing approaches to the concept of sustainability have brought about different perspectives. Design practitioners and design educators are beginning to realize that sustainability is no longer a “nice to have” in design, but a necessity (Humphries-Smith, 2008; Meyer ve Norman, 2020; Voûte vd., 2020).

Although designers, as individuals with an interdisciplinary position in the context of sustainability, have been discussed in the literature as mediators, facilitators, and transformers of behavior, these roles attributed to the designer have difficulty in revealing themselves in today's realities. Economic challenges, and sector-based requirements affect designers' understandings and actions regarding sustainability. The need for professional expertise in sustainability is evident for designers to adopt sustainable practices. However, the lack of professional expertise in the field of sustainability makes it difficult for design graduates to find a job in this sense (Faludi & Gilbert, 2019). According to the Future of Jobs report conducted by the World Economic Forum and the LinkedIn platform, the field of job creation for the current global employment in the next five years is shown to be "sustainability specialist" as the second most important field of expertise (Di Battista et al., 2023, p.30). While these

results show that professional fields are growing in line with climate change targets for the future, they also reveal global expertise requirements in line with these targets. There is a need for educational structures that will make competent and prepare design students for professional life regarding the concept of sustainability in design education. To date, studies on the perception and implementation of the concept of sustainability have generally been examined through studies on curriculum and course content in design education. However, the understandings, and knowledge about design professionals' approach to the concept of sustainability, their skills, competencies, behaviors, and professional designer identity to implement this concept in practice are not clear. Therefore, this thesis targeted the gap in how design graduates understand the concept of sustainability and design education contribution in Türkiye.

1.2 Scope and Aim of the Thesis

This thesis mainly focuses on revealing the understanding of design graduates towards the concept of sustainability with a phenomenological approach in Türkiye. Then, taking Miller's (1990) pyramid as a reference model, it aims to explore the knowledge, skills, competencies, behaviors, and contributions to professional identity development that design education provides in the context of sustainability.

Within this scope, the main aims of this thesis study are as follows:

- To reveal the understanding and approaches of design graduates towards the concept of sustainability including their practices.
- To obtain preliminary insights about design graduates' understanding of the concept of circular design besides the concept of sustainability.
- To evaluate the contribution of design education regarding design graduates' knowledge, skills, competence, behavior, and professional identity in terms of sustainability.
- To discuss the future implementations of design education in line with all these purposes.

1.3 Research Questions

In line with the purpose of this thesis study, the research questions will be answered are presented as follows:

Main research question:

- How does design education inform the concept of sustainability among design graduates in Türkiye?

Sub-questions:

- How do design graduates conceptualize "sustainability"?
- What are the knowledge sources of sustainability for designers?
- How do design graduates conceptualize “circular design”?
- How does design education contribute to designers in terms of sustainability?
- How does design education contribute to the designer’s competency, behaviors (performance + actions), and professional identity?

1.4 Structure of the Thesis

This thesis consists of 5 chapters. Figure 1.1 illustrates the structure of the thesis with these chapters.

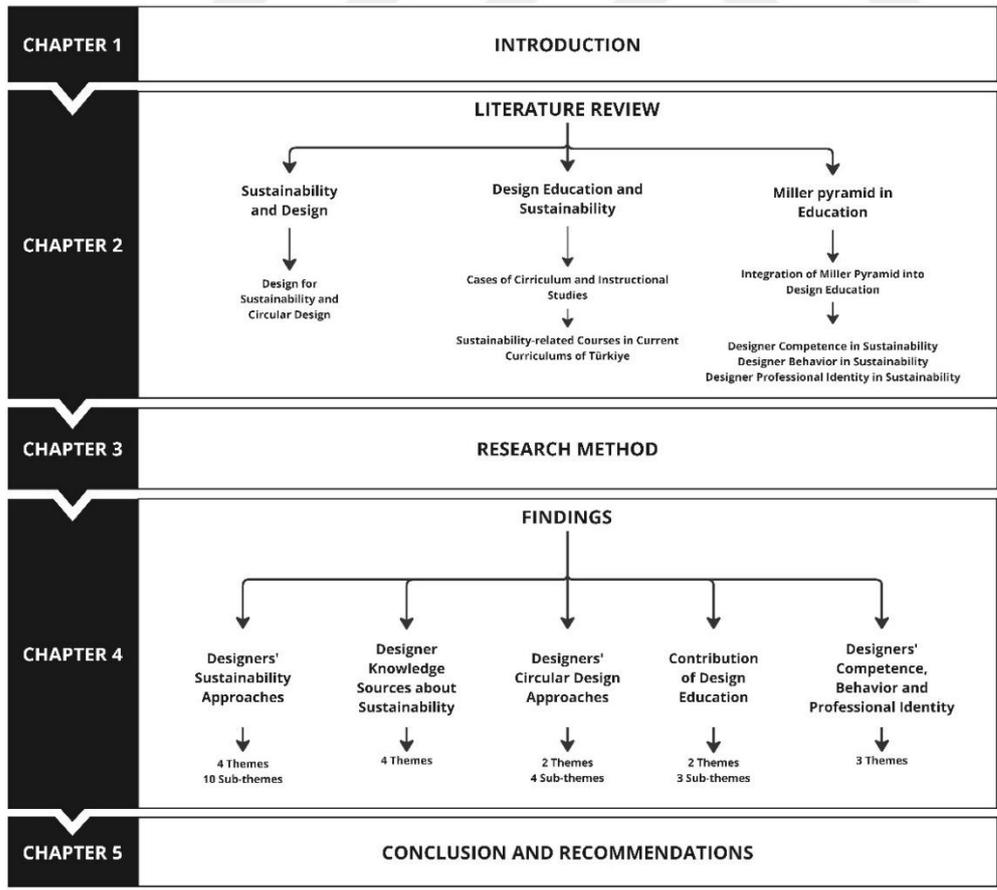


Figure 1.1 : Diagram explaining the structure of the thesis.

Chapter 1 introduces the background explaining the motivation of the study, the scope and purpose of the study, and the research questions to which answers are sought in line with these purposes.

Chapter 2 contains the literature review that covers three main topics: concepts of sustainability and design, design education and sustainability with examples of curricula and instructional studies in this direction, and sustainability-related courses from prominent countries and Türkiye. Then it introduces the Miller pyramid learning model, which is the theoretical reference of the research, and the sustainability competencies, behaviors, and professional designers of the designer under the proposal of integrating this model into design education.

Chapter 3 explains the approach of the research, data collection methods, characteristics of the participants of the research, and data analysis methods and procedures.

Chapter 4 presents the analyzed findings under relevant themes, and sub-themes.

Chapter 5 summarizes the overview of the study and presents a summary of the main outcomes by revisiting the research questions. It discusses the outstanding findings. It explains the limitations of the research and offers recommendations for design education and further studies.



2. LITERATURE REVIEW

This chapter begins by explaining the approaches to sustainability from the first discussions in the field of design to the present day and then continues by explaining the concepts of design for sustainability and circular design. It emphasizes the need for sustainability practices in design education by considering various innovation approaches within the framework of sustainability. In the following section, it is emphasized how the issue of sustainability is addressed in education. Then, it exemplifies the prominent case studies that address sustainability around the world based on addressing curriculum and instructional content. Additionally, an overview of examples of sustainability-related courses at universities in developed countries is presented, followed by sustainability-integrated courses in current curricula of universities in Türkiye. Finally, it explains Miller's (1990) pyramid in education and presents designers' competencies, behaviors, and professional identity within the framework of this pyramid.

2.1 Sustainability and Design

The framing of early concerns about resource limitations and the environmental impact of our material production in a design and engineering context dates back to the works of Buckminster Fuller (Fuller, 1969). Later, Fuller and Papanek (1972) argued that designers should recognize their responsibilities in the book *Design for the Real World*. However, Papanek was the first to criticize the design profession and its role in encouraging consumption and causing ecological and social degradation. According to Papanek, design is not just about giving shape to something, but is also a transformative tool that should take into account social and ethical considerations (Papanek, 1984). In this way, he advocated encouraging the transformation of the design profession. During this period, the World Commission on Environment and Development (WCED), published the Brundtland Report, also known as *Our Common Future* in 1987, defining sustainable development (SD) as “SD is the development that meets the needs of the present without compromising the ability of future generations to meet their needs”. This report expresses the guiding principles for sustainable

development in industries and remains valid today because it highlights global environmental problems and the consequences of consumption and production patterns. During the same period, the concept of Life Cycle Assessment (LCA) emerged as an important tool for eco-design. LCA represents a cradle-to-grave approach as a system for identifying, quantifying, and evaluating a product's inputs throughout its life (Doordan, 2013). Later, Madge (1993) discussed the connections between design and ecology and stated that concepts such as 'design for need' and 'alternative design' of the 1970s were the forerunners of the 'green design' and 'eco design' of the 1980s. A decade later, Lyle (1996) introduced "regenerative design" to restore the ecosystems. In the same period, Benyus (1997) suggested the implementation of "biomimicry", arguing that industry goals should be parallel to nature.

In the 2000s, McDonough and Michael Braungart (2002) introduced the Cradle-to-Cradle design philosophy. This approach means closed-loop systems where raw materials are not thrown away and the reuse of these raw materials imitates the cycle of nature and serves as "food" for a new product. With this philosophy, they discussed reducing waste in circular economies in a way that will provide permanent benefits to society through the integration of design and science in their book *Cradle to Cradle: Remaking the Way We Make Things*. The Cradle-to-Cradle approach was then considered to align with economic interests in the circular economy. In line with this, the Ellen MacArthur Foundation (2013) defines the Circular Economy (CE) as a system in which materials never become waste through processes such as maintenance, reuse, refurbishment, remanufacture, recycling, and composting but remain in constant circulation, thus regenerating nature. Tackling climate change and other global challenges such as biodiversity loss, waste, and pollution is essential for this approach and goes beyond recycling. For all these challenges, the United Nations (UN) later developed goals for many global problems, including environmental, economic, and social under the Sustainable Development Goals (SDGs) (UN, 2015).

In approaches to sustainability, the framework proposed by (Elkington, 1997) as the triple bottom line also known as the three pillars of sustainability is accepted as a basis and shows what dimensions the concept of sustainability includes. These are expressed as environment (planet), social (people), and economic (profit). In the literature, this approach has been modeled as weak and strong sustainability (Figure 2.1).

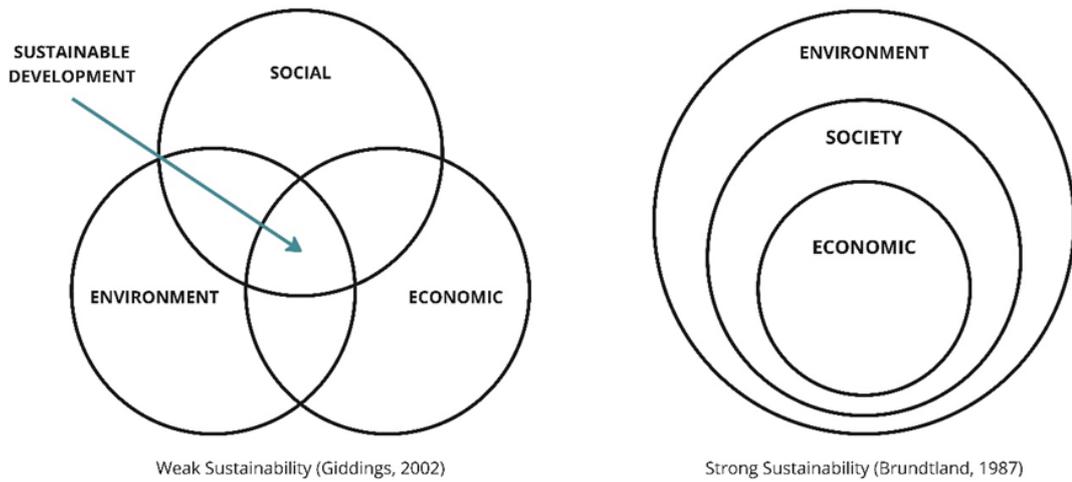


Figure 2.1 : Weak sustainability and strong sustainability model.

According to this model, in a weak sustainability approach to sustainable development, the environment, society and economy are shown to be of equal importance (Giddings et al., 2002), while in the strong model this approach is environment-oriented, society and economy are included in environmental interests (WCED, 1987). Many approaches to sustainability have been expressed in the design literature to date, and these approaches continue to develop.

2.1.1 Design for sustainability and circular design

WCED (1987)'s definition of SD has popularized the concept of sustainability in the field of design (Bhamra & Cooper, 2007). The goal of sustainable design, also called design for sustainability (DfS) is to change the way products are made so that they are better for everyone in the long term (Faludi et al., 2020), by that means of taking into account the environmental and social impacts of a product, service, or system with economic concerns (Bhamra & Lofthouse, 2007). This perspective shows that sustainable design is a broad approach that also includes social and environmental factors. In the first approaches to sustainability principles in design processes, LCA tools that measure environmental impact were integrated into the processes (Brezet & van Hemel, 1997). In this direction, the life cycle design approach emerged with a focus on eco-design (Mestre & Cooper, 2017). The eco-design strategy wheel models proposed in the literature for the eco-design approach by many academics (Brezet & van Hemel, 1997; Vezzoli & Manzini, 2008; Tischner & Charter, 2017), and these are considered the first circular representations (Mestre & Cooper, 2017). These eco-design strategies include selecting low-impact materials, reducing materials usage,

optimizing production and distribution techniques, reducing impact during use, optimizing initial life and the end-of-life system, and new concept development. The approach to ensure product longevity with certain interventions within the product life cycle is expressed as reuse, repositioning, and recycling. However, Cooper (2012) later suggests that the design should include durability, reparability, upgradability, optimized energy and material consumption, and recyclability approaches to ensure product longevity. In line with all these approaches, environmental concerns have progressed from green design to DfS, and more recently to circular design, or design for CE in recent years (Moreno et al., 2016).

Design discussions for CE with the closed loop concept as a popularized Cradle-to-Cradle approach, advocate the opposite of the traditional linear economy approach based on take-make-dispose. There are various definitions of the concept of CE in the literature argued by academics. However, one of the CE definitions for design is stated by the Ellen MacArthur Foundation (2013) as an industrial economy whose design purpose is restorative or regenerative. Arguments in some studies addressing the relationship between sustainable development and CE emphasize that it contributes to sustainable development (Kirchherr et al. (2017) with approaches similar to eco-design. Some views suggest that CE is conducted within the framework of sustainable development (Suárez-Eiroa et al., 2019). It is also argued that the circular economy can be considered as an umbrella concept (Merli et al., 2018; Friant et al., 2020) to achieve sustainable development inspired by resource management concepts and ideas (Merli et al., 2018). It has also been stated that by CE proponents, it offers new methods for SD for future generations and defines it through the triple bottom line concept of addressing economic performance, social inclusion, and environmental issues together (Elkington, 1997; Geissdoerfer et al., 2017).

In the literature, the CE concept is mainly based on the 3R principle: reduction, reuse, and recycling (Geng & Deborstein, 2008). The approach which is referred to circular design aims to address concerns in the product life cycle. There are various strategies for circular design in this direction. Moreno et al. (2016) suggested five design strategies for CD based on DfS: resource conservation, multiple cycles, long-life use, and system change. Some researchers suggested design strategies for product integrity and design for recycling (den Hollander et al., 2017). Some of the suggested strategies for slowing resource cycles (Bocken et al. 2016).

Circular design differs from sustainable design in some points. Fundamentally it differs from sustainable design in that the goal is measurable or closes a loop (Early, 2017). The circular design process can be perceived as challenging and complex because it aims for changes from a product-oriented approach to innovative and function-oriented systems (Camacho et. al., 2020). Sustainable design is considered a more comprehensive approach because it considers social issues (Bhamra & Lofthouse, 2007), and it can be said that it includes circular design. But in some cases, they can complete each other in suitable conditions. In addition, discussions on sustainable design are considered more established since they started nearly six decades ago, and approaches to circular design have been discussed since the early 2000s.

Design practice is seen as a catalyst in achieving a circular economy (Moreno, et al., 2016) and designers have a significant role in contributing to sustainability and CE (Andrews, 2015). In a broader perspective, Ceschin and Gaziulusoy (2016) conducted a theoretical review as one of the studies that most comprehensively addresses the responsibilities of designers expanding to socio-technical dimensions, and indicate four different levels of innovation within design for sustainability (DfS) approaches.

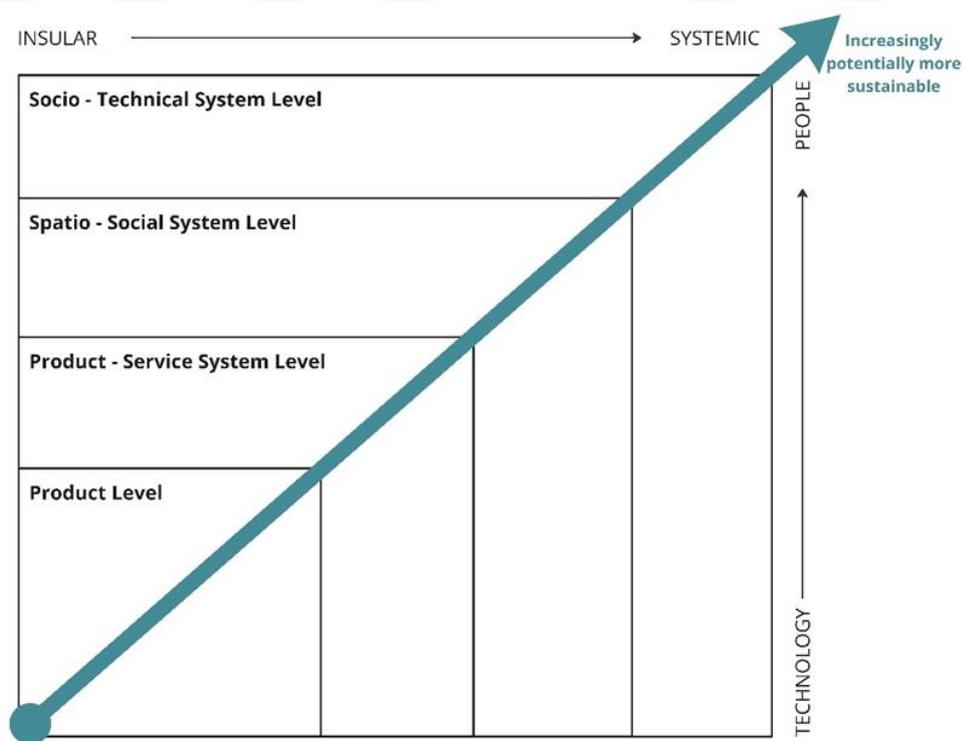


Figure 2.2 : DfS evolutionary framework (Ceschin & Gaziulusoy, 2016).

According to this model, the product innovation level includes Green Design, Eco Design, Emotionally Durable Design, Design for Sustainable Behavior (DfSB), Cradle to Cradle Design, Biomimicry design, and Design for the Base of the Pyramid approaches. Cradle to Cradle and Biomimicry approaches are also nature-inspired approaches. Approaches at the product innovation level cannot fully solve sustainability issues but rather focus on improving existing products or developing completely new products. Green Design, Eco Design, Biomimicry, and CTC approaches focus more on the technical aspects of sustainability. In the Emotionally Durable Design and DfSB approaches, the importance of users is emphasized. At the product-service system innovation level, there is the product-service system design (PSS) approach. At this level, the focus is mostly on developing new business models. It includes a combination of products and services beyond individual benefit. At the spatio-social system innovation level, there are Design for Social Innovation and Systemic Design approaches. At this level of innovation, the spatial and social conditions of communities come to the fore. Finally, innovations at the socio-technical system level include the Design for System Innovations and Transitions approach. At this level of innovation, encouraging radical changes to meet social needs is addressed. According to Ceschin and Gaziulusoy, (2016), these approaches can also be guides for CE solutions as follows: Cradle-to-cradle and Biomimicry approaches can be provided for closed-loop material cycles, a CE solution can be achieved by implementing 3R Principles to eco-design products. The PSS approach can be a guide for CE in business model designs. Most importantly, the DfST can be a new recommendation instead of CE for socio-technical scenarios.

Designers today have the potential to be leaders in a paradigm shift to design closed-loop systems, and they need to change their practices and ways of thinking in this direction (Andrews, 2015). So far, changing designer roles, design knowledge, skills, and competencies in CE have been investigated by many researchers (Andrews, 2015 and 2020; Bocken et al., 2016; De los Rios et al., 2017; den Hollander et al., 2017; Dokter et al., 2021; Mestre and Cooper, 2017; Moreno et al., 2016; Sumter, 2021; Wastling et al., 2018; Watkins et al., 2021). However, sustainable design knowledge, including circular design, is not considered mandatory within the scope of the profession and is not even intentionally included in sufficiently intensive design processes (Andrews & Robbins, 2010).

DfS approaches can guide students and teachers as a supportive tool in design education, including the circular economy, as stated by Ceschin and Gaziulusoy (2016). Nowadays, it has become crucial to integrate sustainability approaches into design practice and to reconsider design education accordingly (Faludi et al., 2023).

2.2 Sustainability in Design Education

Global leaders recognized the necessity of integrating the principles of Education for Sustainable Development throughout all educational tiers when they endorsed the 2030 Agenda for SD at the United Nations Sustainable Development Summit in 2015 (UN, 2015). In parallel, UNESCO (2017) published Quality Education of SDG 4 under the Education for Sustainable Development Goals: Learning Objectives. In this publication, cognitive, socio-emotional, and behavioral learning objectives are emphasized. In addition, it highlights the basic knowledge and skills required for the 21st century, the need for knowledge, skills, values, and behaviors required for sustainable development, and especially the pedagogical approaches for sustainability competencies by establishing the base in educational institutions. These goals guide the requirements in overall education in the literature. When we look at higher education specifically, design education provides a significant understanding of the design process and methods. However, it is evident that the responsibilities of designers extend beyond the technical realm and encompass organizational and managerial responsibilities (Meyer & Norman, 2020). According to current research, it is suggested that design students need to acquire domain knowledge from many disciplines to solve complex problems. The main issue is the specific domain knowledge required to solve such problems. Although this situation does not seem very realistic, it also puts a burden on the individual's cognitive capacity. In this sense, Watkins et al. (2021) stated that the educational requirements for sustainable product design differ from the conventional teachings of product design. In order for designers to realize sustainable design practices, they need to know how to deal with the relevant problems (Lofthouse, 2017).

According to Meyer and Norman, (2020), for design education to meet the changing needs of the 21st century, educational materials should be expanded and all educational institutions should advocate the core principles in line with these needs. Today's needs may pose different challenges in the field of design. Accordingly, there

is also a need for new technologies, new developments, and tools in design processes (Friedman, 2019). In this regard, Friedman (2019) expressed 11 challenges under 4 groups that the design field may face: Performance Challenges, Systemic Challenges, Contextual Challenges, and Global Challenges (Figure 2.3).

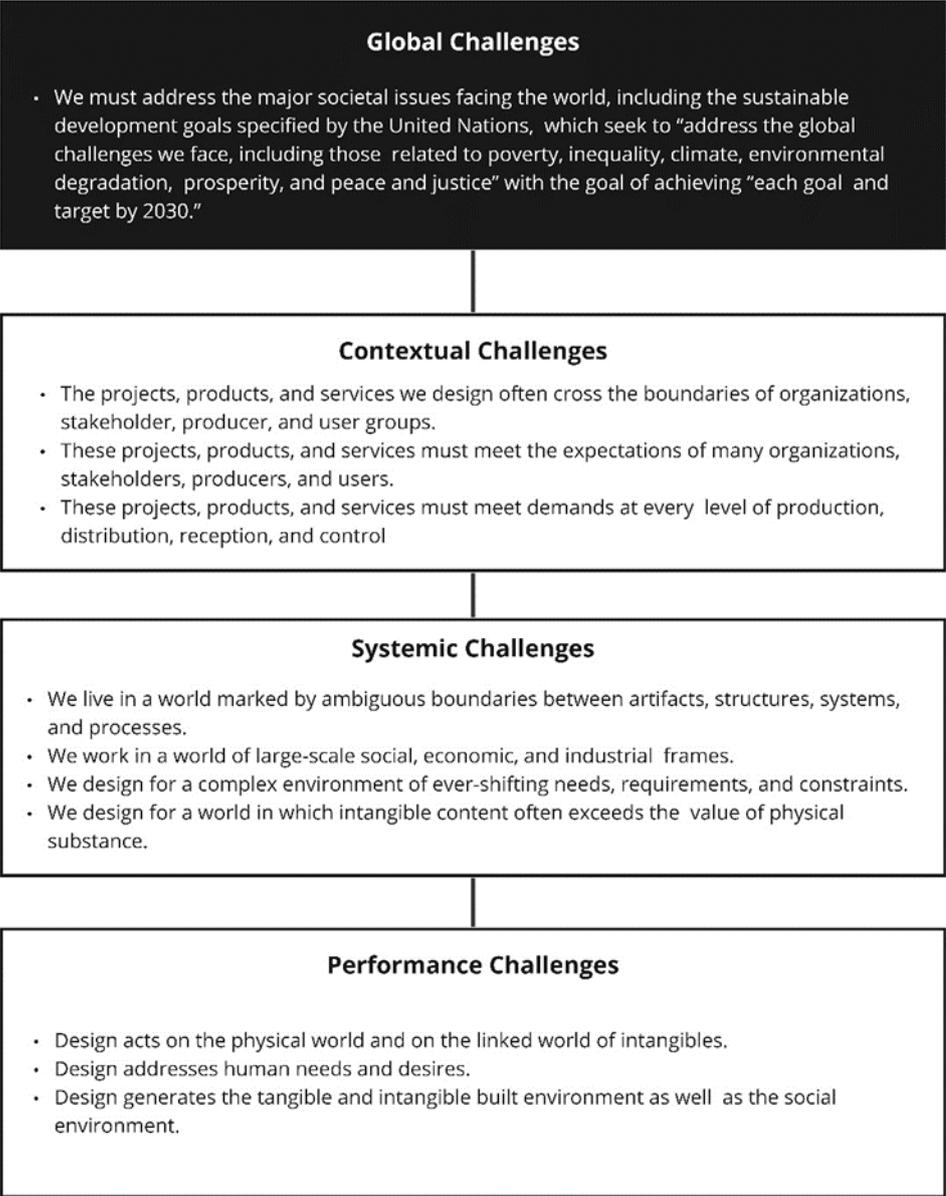


Figure 2.3 : List of challenges for the design profession (Friedman, 2019).

Especially, Global Challenges stand out within the scope of this thesis. According to Friedman (2019), these challenges require tackling global challenges such as poverty, inequality, climate, and environmental degradation by 2030, in line with the UN's SDGs. However, each group requires the knowledge and skills of the previous group, and design education generally focuses on performance challenges (Meyer and

Norman, 2020). This performance challenge is only related to the impact of design on the physical world and human needs and desires.

According to Bhamra and Dewberry (2007), there is a need to develop students' capacity to adapt and embrace new knowledge and ways of knowing in a way that challenges the status quo, by engaging students in complex eco-social issues. However, some of the biggest obstacles to sustainability-oriented practices are the availability of information, the clarity and usefulness of information, and the self-confidence of designers (Lofthouse, 2001a; Stevenson, 2013). Because educational curricula are inadequate to meet today's challenges, students' current skills and attitudes cannot match the requirements of their jobs (Collina et al., 2017). Few design programs offered by universities enforce the inclusion of dedicated courses focused exclusively on sustainable design, while other courses may just provide a brief introduction or offer it as an optional topic (Watkins et al., 2021). As one of the approaches to integrating sustainability into design education curricula, Fletcher and Dewberry (2002) stated two extremes in integrating sustainability into the curriculum of design education: design as a context in which sustainability is seen within existing design practices, and sustainability as a context in which design is seen as a dimension of sustainability that is compatible with sustainability goals (Figure 2.4).

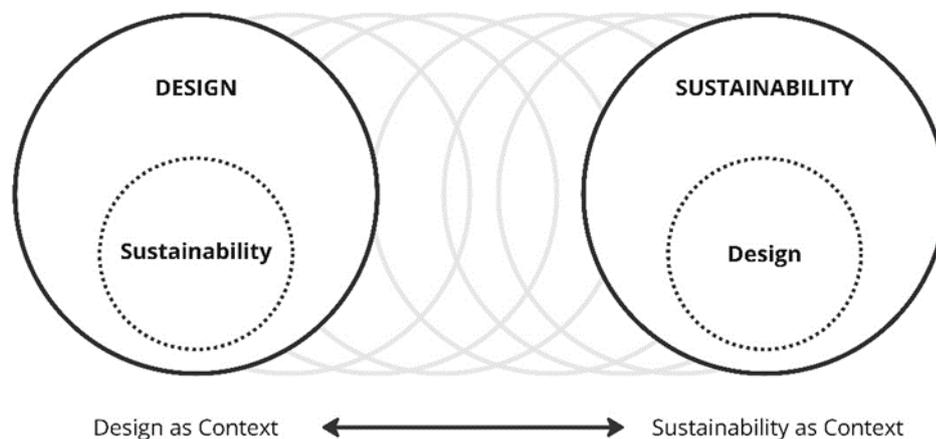


Figure 2.4 : Possible starting points for sustainability in design education (Fletcher & Dewberry, 2002).

In addition to this view, Giard and Schneiderman (2013) stated that integration of sustainability into design education occurs in three common ways: through independent sustainability courses or programs offered on a large scale in educational institutions, through sustainability concepts integrated into studio courses in design

education, and through sustainability courses offered at universities. According to researchers, some models will integrate sustainability into design education through the combination of these three ways. However, design education against complex sustainability problems is still in the learning phase (Faludi, et al., 2023). If knowledge about sustainability is not acquired in design education, opportunities to obtain it through professional development are rare (Lofthouse, 2017).

In the most recent publication by Faludi et al. (2023) expressed the curriculum recommendations for future design education that include sustainability topics. They expressed these curriculum recommendations under six main headings: Fundamentals of Sustainability, Circular Economy, Whole Systems Thinking, Sustainable Innovation Strategies, Impact Assessment, Laws and Standards, and Communication, Collaboration, and Leadership. Under these main headings, researchers categorized the subjects with three aspects: subjects that are critical and recommended to be learned, subjects that are not required for designers but are required for a course or program on sustainability, and finally subjects that are not compulsory but suitable for elective courses or advanced studies are expressed as curriculum recommendations.

Design education is in an important position to create the self-confidence and capacity of designers to find solutions to sustainability problems. There is also a need for expertise in this field for future designers to ensure rapid adaptation to the changing challenges of the 21st century.

2.2.1 Cases of sustainability in design education

In this section, studies in the literature on the integration of sustainability in design education around the world are exemplified. There are prominent studies from countries such as Netherlands, Australia, UK, and Türkiye. This section also includes an example from worldwide research. Furthermore, this section also includes studies that include examples of sustainability courses offered by some universities. It also touches upon studies that evaluate sustainability-oriented education curricula, investigate the sustainability perceptions of undergraduate and graduate students, and even conduct research with lecturers and employers.

Case studies on sustainability in design education were obtained by scanning the International Journal of Sustainability in Higher Education, Journal of Cleaner Production, Journal of Design Research, and Engineering Education.

2.2.1.1 Curriculum cases

In the literature on the integration of the sustainability approach in design education, the studies of Ramirez (2006 and 2007) and Humphries-Smith (2008) on the integration of the social aspect of sustainability into design education curricula stand out. In the worldwide literature, Ramirez (2007) conducted worldwide survey research in which designers graduated from 221 different Universities from Asian, North American, and Oceanian universities. As a result of this study, participants interpreted sustainable design together with the ecological design approach and rarely focused on the social aspects of sustainability. It was revealed that 52% of the 221 participants stated that sustainability was included in the curriculum as a basic course or subject, 37% stated that it was included in the education curriculum as an elective course, and 11% did not include sustainable design in the design education curriculum. Although it stands out in the study findings that the sustainable design approach is increasingly included in education, the issue of sustainability has not been able to overcome evaluation factors such as functionality, ergonomics, aesthetics, and manufacturability.

In a study investigating how issues related to environmental sustainability were integrated into educational curricula at universities in Australia, Ramirez (2006) invited lecturers and program heads at Australian universities to an online survey and collected data by examining the curricula of the universities. As a result of this study, it was concluded that environmental sustainability issues were included in most industrial design programs in Australia, but issues such as eco-design were missing.

In Humphries-Smith's (2008b) study, the researcher uncovered the scope and needs of education in terms of sustainable design. In this regard, evaluated the number and quality of design and engineering courses offered at the undergraduate level in UK Higher Education institutions. Then, survey research was conducted to understand the views of undergraduate students on sustainable design. The research results revealed that there are significant differences in the perceptions of sustainable design among academicians, students, and employers. Academicians' belief that sustainability-related issues are already included in the courses has emerged. However, this situation was perceived as the opposite by students and employers, and the need for a higher level of knowledge on this subject in education was expressed. This study also emphasizes the necessity of sustainability in design education. Many sustainability-

related design and engineering courses include sustainability-related elements, but at varying levels. Awareness of ecological design is also high, but understanding is low. In general, the integration of sustainable design into existing education was understood to be difficult. In this regard, the researcher offers suggestions for future research on what knowledge and skills are needed to become an expert designer on sustainability.

In UK, Watkins and Lofthouse (2010) also conducted a broader study and surveyed with the participation of lecturers from 29 universities. The study findings revealed that academicians have a high awareness of sustainability and a large percentage of them advocate that sustainability should be integrated into design education curricula. Sustainability was expressed in terms of economic, environmental, and social aspects by half of the academicians participating in the study. During this period, more than half of the universities participating in the study were offering courses on both the social and environmental dimensions of sustainability. Although the findings of the study do not provide clear insights into how to fully integrate sustainability into product design curricula, findings show that British Universities are well-positioned to teach sustainability to future industrial designers.

In nearly same years with the mentioned cases previously, a thesis study conducted in 2009 on the integration of sustainability into industrial design programs in Türkiye, the educational status of the Middle East Technical University (METU) Industrial Design department in terms of sustainability and the student's understanding in this regard were investigated. In this study, it was stated that for more than half of the students who took courses on sustainability at METU, these courses did not affect the integration of sustainability into design processes (Turhan, 2009). Material selection has been expressed as an important criterion for design students. However, time constraints have been expressed as an important barrier to addressing sustainability in project processes. Students associated sustainability with concepts such as product life cycle, production, distribution, use, and disposal. In the study, more than half of the design students stated that the institution they worked for was not willing to work towards sustainability, and the instructors and students participating in the study stated that they did not have sufficient knowledge and opportunities to address sustainability issues in education. According to Turhan (2009), adding a course on sustainability to the design education curriculum is not considered sufficient for sustainable development.

Some years later, as a study on sustainability at the undergraduate level, Yılmaz (2015) examined sustainability-related courses at Istanbul Technical University, Middle East Technical University, Izmir University of Economics, Anadolu University, Mimar Sinan Fine Arts University, and Marmara University according to their scope, type, and way of teaching in Türkiye. As a result of this study, 9 courses with sustainable design content were identified. However, none of these courses fully included sustainable design criteria. Only one course included green design, four courses included eco-design, and the remaining courses included sustainable design criteria. According to Yılmaz (2015), the courses had insufficient content in many schools, and social and ethical criteria had to be integrated into the course contents to improve. The researcher advocates that sustainability-related courses should be compulsorily integrated into the curriculums.

More than 10 years ago, in research focusing on the situation and materials of sustainability-oriented design education in the world, it was stated that some universities do not include sustainability in their curricula, while some universities directly include sustainability, and these courses related to sustainability focus on theoretical knowledge (Turhan & Ünlü, 2009). According to these researchers, the importance of practice-based courses in developing a critical perspective on sustainability in education is clear. Many course definitions in the world support an interdisciplinary approach and highlight the importance of collaboration and interdisciplinary work (Turhan & Ünlü, 2009).

2.2.1.2 Instructional cases

In the Department of Industrial Design Engineering of TU Delft University of Technology, changes were made to the sustainability-related project elements in 2004. In the study of Boks and Diehl (2006), they made a comparison with the learning outcomes between 2003 and 2004. It was determined that the number of students who could truly integrate sustainability into their product development processes increased from 26% to 48% compared to the previous year. However, they stated that the attitudes of project managers and mentors were also effective. Meetings with sustainability-related experts were also found useful. However, the lack of expert educators on sustainability and the lack of expertise in the sectors were not seen as

encouraging for students. This study showed the impact of instructional factors on students' development of understanding towards the concept of sustainability.

As another example, Bhamra and Dewberry (2007) aimed to develop an understanding of how the right questions should be asked regarding sustainability by providing different evaluation opportunities to design students at Loughborough University in the UK. The authors address this issue by using student works as an example through an undergraduate course. The main purpose of the design practices in this undergraduate course was to understand students' understanding of sustainability and to provide suitable context for discussion and practice on complex sustainable development issues in the courses.

In the same university and nearly same years, Lilley and Lofthouse (2009) discussed the development and evaluation of 'design-behaviour' in the web-based resource developed by the Department of Design and Technology at Loughborough University to teach Design for Behavioral Change. This resource aims to spread learning materials for design and engineering students and to understand future improvement potentials. The researchers conducted the study in several steps and collected data. They conducted a pilot study to teach postgraduate industrial design students the design applications of a behavioral change design approach in terms of sustainability at Loughborough University. In this research, students designed a mobile phone in the 2005 study and a refrigerator in the 2006 study. As a result of these studies, literature research, and interviews with design professionals, researchers have created a new web-based resource to teach design for behavioral change. Feedback to the source showed that information regarding behavioral change was needed for students. It is also planned to be integrated into education for second-year undergraduate students at Loughborough University.

Few years later, Humphries-Smith (2010) conducted instructional-based research to provide a web-based resource for engineering and product design students to better understand the socio-centered dimension of sustainability. In this sense, existing learning and teaching resources were evaluated for web-based sustainable design. The data in the study was obtained by determining the current knowledge level of 3rd or final-year engineering and design undergraduate students at Bournemouth University on sustainable design in the UK, collecting their information about existing web-based resources, and receiving feedback about the web-based resource developed as a result

of the study. As a result of the study, it is intended that this web-based resource will continue to be updated by users. Since it is open to the public, the information and document resources here are intended to reach a wider audience of designers and engineers as a learning tool.

As one of the studies on sustainability-related courses in Türkiye, Doğan (2012) discussed the course entitled "Product Design for Sustainability," which was opened at Middle East Technical University in 2011 for graduate-level students, on the integration of sustainability into industrial product design. This study presents approaches such as extending the life of the product, localization, and effective resource use for sustainability in design education. The course is taught with both a theoretical and practical approach. The first phase of the course is more theoretical and includes content such as behavior change, responsible consumption, and ecological feedback. The final phase of the course allows design students to conceptualize sustainable products. In this sense, students designed a lighting product, which is a potential product category, by reflecting these understandings into their design processes. Since this program combines theoretical and practical approaches, it offers insights for future studies about sustainability integration to design education. However, it does not reflect an undergraduate study in design education.

The rapidly changing nature of the industrial design profession requires rethinking of educational curricula. In a study that includes exemplary cases from design projects conducted within Carleton University and Middle East Technical University, which deals with the sustainability approach in education, both transformation and personalization-oriented and open design-oriented project examples are presented by Doğan (2017). In the findings of the study, it was stated that system thinking would help rethink sustainable design issues, and personalization and open design approaches could significantly affect design outcomes (Doğan, 2017).

As a different research approach to guide educators when creating sustainable design-focused courses, Yılmaz and Kapkın (2020) conducted a study to understand students' perceptions of the concept of sustainable development and design within the scope of the sustainable design studio course as an elective course at Eskişehir Technical University, Industrial Design Department in Türkiye. Researchers investigated the development of students' perception of sustainable design concepts who participate in sustainable design studio courses. Accordingly, they conducted this research in two

groups: students who took this course as an experimental group and students who did not take this course as a control group. The students evaluated 22 concepts that the researchers selected. Researchers found that the Sustainable Design studio course led to a shift in students' perceptions of the concept of sustainable development and design. However, the limitation of this study is that it was conducted with a limited number of sustainability concepts and a small number of students.

More recently, some researchers and scholars have explored how sustainability can be integrated into project-based design courses. In this sense, Küçüksayrac and Arıburun-Kirca (2020) conducted two workshops at the Istanbul Technical University Industrial Product Design Department, focusing on product and product-service system levels of sustainable design innovation approaches. In these workshops, researchers tried to understand students' learning approaches. The first of these workshops was a project under the brief of "Designing sustainable furniture" within the scope of the "Contemporary Furniture Design" elective course in the spring semester of 2016, and the second was a project under the brief of "Designing a sustainable 3 x 3 m² expo stand for a company" within the scope of the "Space Organization" elective course in the fall semester of 2016. Küçüksayrac and Kirca (2020) stated that they provided students with the necessary information during these workshops to understand the competent use of knowledge because there was no course on sustainable design during the relevant education period. As a result of these workshops, scholars stated that the students who attended the workshop had difficulty in deciding what level of design they should do and what the required design process should be to create the greatest sustainability impact. They mentioned some students could not focus on the product-service approach due to project time constraints and lack of knowledge about the service design process and only addressed the sustainability approach at the product level. Thus, researchers emphasized the need for a special course on this subject where students can gain more opinions and experience. In addition, to improve design processes, they proposed a model for project processes with a sustainable design.

2.2.1.3 Sustainability course examples from universities of prominent countries

In terms of worldwide education programs and research activities, countries such as the Netherlands, England, Finland, and Denmark stand out with their approaches to

sustainability in design education. Factors contributing to their prominence include the level of development, and investments in sustainability initiatives.

If the Netherlands is given as an example in terms of design education, it focuses not only on theoretical knowledge but also on practical projects for real-world problems. Education has an interdisciplinary approach, focuses on the circular economy, and the country has also high level of social awareness. It is known that TU Delft University of Technology in the Netherlands has included sustainability in its design education curriculum since the 1992 (Boks & Diehl, 2006; Faludi et al., 2023; Ramirez, 2007). Research from the official website of the university shows that the undergraduate program in industrial design engineering offers an educational framework designed for the application of knowledge and skills acquired from various disciplines, including sustainability. In this context, students can choose courses or projects focusing on sustainability-related topics. Students who prefer to gain in-depth knowledge and specialize in sustainability can benefit from courses and projects related to sustainability and circular design offered by the Sustainable Design Engineering Department. The mission of this department is to develop methods to design sustainable products, services, and systems that will have a positive impact on the planet, by using emerging technologies responsibly. In the undergraduate program of Industrial Design Engineering, courses focus on design for the circular economy, available online as open resources. Through this online learning platform, a professional certificate in Sustainable Engineering Design is offered. Curricula accessed since 2022 within the scope of the Industrial Design Engineering undergraduate program include the "Sustainable Impact" course as compulsory for second-year students. For the final-year students, "Design for the Circular Economy" is offered as an elective course. However, it is known that the "Design for Sustainability" course was also compulsory for second-year undergraduate students in previous years (Watkins et al., 2021).

Among other prominent countries, Loughborough University in the United Kingdom has included sustainable design in its curricula at both undergraduate and graduate levels since the 2000s (Lilley & Lofthouse, 2009). In the 2023-2024 curriculum, Loughborough University has included the "Sustainable Design" course as an elective for final-year undergraduate students. This course aims to equip students with the necessary knowledge and skills to develop innovative, sustainable design solutions.

Aalto University in Finland has included the "Sustainable Design" course as a compulsory for first-year undergraduate students since 2019, as seen in its previous accessible curriculums. This course is aimed at developing an understanding of fundamental design strategies related to sustainability and exploring design opportunities around materials and technology. Projects within the course focus on the redesign of existing products or services through individual and teamwork. Additionally, Aalto University offers online access to the "Digital Ethics and Sustainability" course via the FITech platform on its website. This course focuses on digital ethics topics such as big data and analytics, promoting critical discussions on sustainability and the impact of business and technology on society.

At the Technical University of Denmark, the undergraduate course "Product Life Cycle and Environmental Issues" was established two decades ago (Watkins et al., 2021). The course begins with an overview of trends such as the circular economy and the Sustainable Development Goals (SDGs) and includes discussions aimed at considering sustainability in the early stages of the design process. Students are required to submit a final project for a given product, which involves planning for eco-design using appropriate methods and tools.

2.2.1.4 Sustainability course examples from universities of Türkiye

In desktop research conducted through the most current curricula on the official websites of 14 universities in Türkiye, elective and compulsory courses directly related to sustainability, their course descriptions were examined in industrial design undergraduate education curriculums. Table 2.1 demonstrate sustainability-related courses in the most up-to-date curriculums as an overview. In this context, courses from the last 2 years are generally included in the table. Accordingly, it was observed that nine universities included sustainability-related courses in their curricula. However, only in 4 universities, sustainability-related courses are included as compulsory courses in the undergraduate design education curriculum.

Table 2.1 : Sustainability-related undergraduate design courses in Türkiye

| Syllabus Year | Universities | Compulsory Course | Elective Course | Course Description |
|---------------|---|--|--|---|
| 2023-2024 | Middle East Technical University | | Design for Sustainable Behavior Change | The course aims to teach sustainable behavior change strategies and interventions emerging roles of designers. It enables students to learn sustainable behavior change approaches, and develop collaborative skills. |
| 2021-2022 | Istanbul Technical University | Society & Sustainability in Industrial Design | | The course description has not yet been entered. |
| | | | Sustainable Product Design | It covers sustainable design approaches, eco-design strategies, environmentally friendly materials, life cycle analysis, sustainable behaviors and lifestyles, cradle to cradle approaches, and PSS design. |
| | | | Bio-inspired Design | The course description has not yet been entered. |
| 2023-2024 | Anadolu or Eskişehir Technical University | Courses directly related to sustainability are not seen in the current curriculum. | | |
| 2023-2024 | Marmara University | | Sustainable Design | It aims to teach the principles and methods of sustainable design. A project is conducted by examining the methods or need. It aims to provide theoretical knowledge, and develop a project accordingly. |
| 2023-2024 | Mimar Sinan Fine Arts University | Courses directly related to sustainability are not seen in the current curriculum. | | |
| 2023-2024 | Gazi University | Courses directly related to sustainability are not seen in the current curriculum. | | |
| - | Selçuk University | Sustainability in Design | | The objective of the course is to teach environmental criteria in product and system design. As an outcome, the course offers theoretical knowledge. 2 or 3 projects can be undertaken in semester. |

Table 2.1 (continued) : Sustainability-related undergraduate design courses in Türkiye.

| Syllabus Year | Universities | Compulsory Course | Elective Course | Course Description |
|---------------|---|--|--------------------------|--|
| - | TOBB University of Economics & Technology | | Sustainable Design | In this course, where this important design philosophy is addressed, students are intended to become knowledgeable about sustainable design and to undertake studies in this direction. |
| 2023-2024 | İstanbul Bilgi University | Courses directly related to sustainability are not seen in the current curriculum. | | |
| 2023-2024 | Özyeğin University | Design for Sustainability | | The course content includes defining the main principles of circular design, developing a systems thinking approach to design problems, and defining concepts such as purpose economy, commons, sharing economy, and citizen empowerment. |
| 2023-2024 | İstanbul Medipol University | Courses directly related to sustainability are not seen in the current curriculum. | | |
| 2021 | Kadir Has University | | Sustainable Development | The course aims to examine the historical and current economic development from the perspectives of human development, poverty and inequality, demography, urbanization and migration, education, health, environment, and agricultural policies. |
| 2023-2024 | Yeditepe University | | Sustainability in Design | The course aims to enable students to learn the concepts of sustainability, ecology, and sustainable design from an interdisciplinary perspective through readings and discussions, and to create awareness in design and product development. |
| - | Beykent University | Sustainability in Design | | The course aims to teach the ecosystem and environmental issues, the history of sustainability, its definition, and objectives. It includes topics on renewable energy, product life cycle, materials, and recycling. Eco-Design examples are taught in detail within the scope of the course. |

It is known that Middle East Technical University offered sustainability-related courses to graduate students in the early 2010s (Doğan, 2012), and today, three different sustainability-related courses are offered to graduate students. In the current curriculum, it offers an elective course to undergraduate students that focuses on

sustainable behavior change. However, there is a need to access more information about previous years' courses offered at the undergraduate level.

Current curriculums also show that undergraduate students at Istanbul Technical University are offered 1 compulsory and 2 elective courses directly related to sustainability. These courses comprehensively cover approaches to sustainability, from eco-design approaches to PSS design. It has been observed that sustainability-related courses have been included as elective courses between 2009-2010 and since 2015 in the university's past curricula, which can be accessed via its website.

When looking at the curricula of other universities listed in Tables 2.1, it is observed that Marmara University, TOBB University of Economics and Technology, Kadir Has University, and Yeditepe University have integrated sustainability-related courses into their current curricula as electives. On the other hand, Selçuk University, Özyeğin University, and Beykent University offer sustainability-related courses as compulsory. Notably, Özyeğin University defines learning outcomes focused on the circular economy through its compulsory course. Although Medipol University does not seem to have integrated sustainability into its current curriculum, it is known that it offered an elective course related to biomaterials in design to students in 2018-2019. At this point, there is a need to obtain more information about the past curricula of these universities.

Overall, it can be said that in Türkiye, the majority of courses in the most current curricula of some universities offering design education focus on delivering theoretical knowledge, with a particular emphasis on environmental issues. However, it is observed that many universities have started to incorporate sustainability into their curricula in a more comprehensive manner, not limited only to eco-design approach. Nonetheless, more detailed future studies are needed.

For curriculum development for sustainability in design education, the Miller pyramid model is explained in the next two sections and its integration into design education is proposed.

2.3 Miller Pyramid in Education

The Miller Pyramid model, which was created by psychologist George Miller in 1990 to assess the clinical competence of students, was later applied to educational competence models. Miller stated that faculties should search for instructional methods and evaluation methods at the top of this pyramid model (Miller, 1990). Although the model was designed for use in medical education, it can also be applied to other disciplines. It consists of phases illustrating how various competencies are acquired over the course of education. This model expresses the growth competence as four hierarchical processes (Figure 2.5).

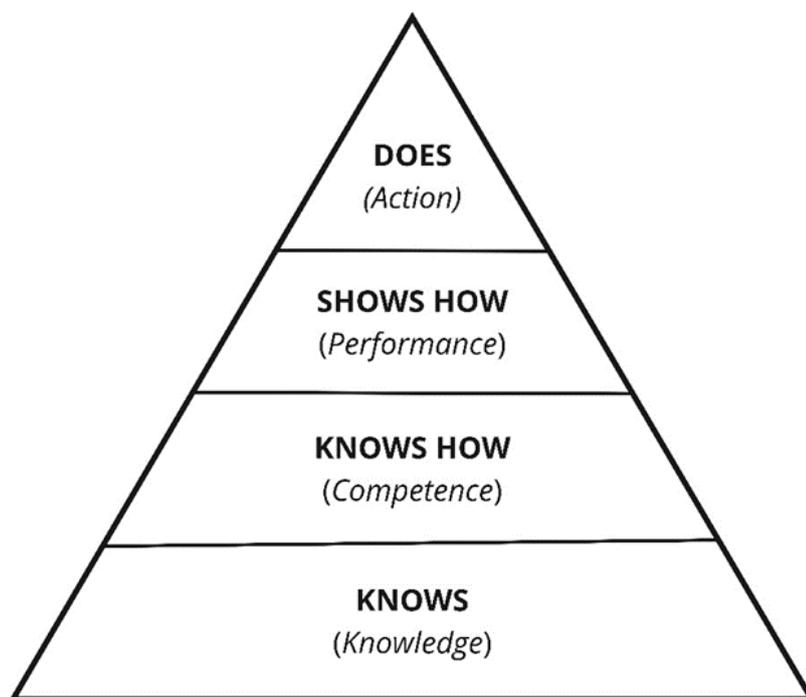


Figure 2.5 : The Miller pyramid model (Miller, 1990).

The base of the pyramid in Miller's pyramid model is "knows", which demonstrates knowledge. At the second level of the pyramid, there is a transition from "knowing how" or competence. Then the "shows how" demonstrates performance. Finally, at the top of the pyramid, "does" or action level is expressed.

According to some researchers, understanding the significance of professional identity formation in medical education has led to the need to re-examine the structure of the Miller pyramid. After Miller's fundamental work, Cruess et al. (2016) expanded

Miller’s pyramid by adding the “identity” level to evaluate professional identity formation with this pyramid model (Figure 2.6).

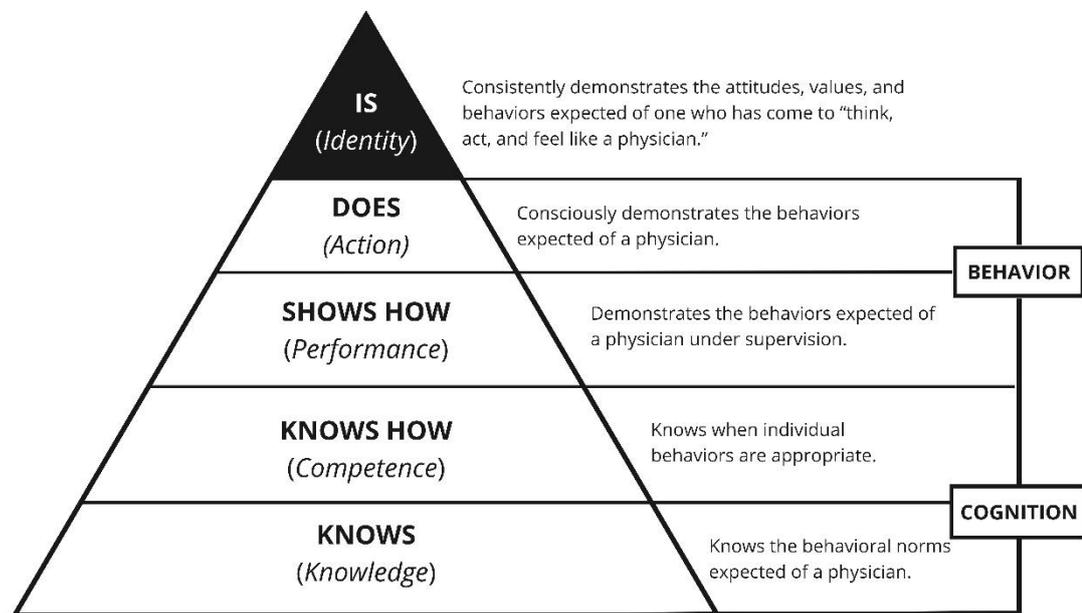


Figure 2.6 : The amended version of Miller’s pyramid (Miller, 1990) with the addition of “Identity” level, adapted from (Cruess et al., 2016).

According to Miller (1990), as an individual moves up the pyramid, assessment of competence becomes more complex, and the individual's expertise in the relevant profession increases. The "knowledge" level at the base of the pyramid is the least difficult to assess and can be easily assessed using traditional methods such as exams. At this level, the learner gathers information and knows the norms of behavior expected from the relevant professionalism. The learner implements knowledge into practice and interpretation at the "competence" level, which is the second level of the pyramid. At this level, the learner's knowledge of when behavior is appropriate is evaluated. The knowledge and competence levels of the pyramid are assessments related to the learner's cognition.

At the "performance" level, the learners demonstrate what they learned. At this level, the behaviors expected from the learners are evaluated. The "action" level is related to the performances integrated into the implementation are evaluated. At this level, the learners consciously demonstrate the behaviors expected from them. The performance and action levels of the pyramid are related to the learners' behavior. Finally, the Identity level offered Cruess et. al. (2016), is the top of the pyramid expressed as "Is". It is related to the learners' internalization of the relevant behaviors, attitudes, and

values. At this level, the learners feel, think, and act concerning the relevant expertise. Consistently demonstrates the values, attitudes, and behaviors expected of them. According to these pyramid levels, it becomes more difficult to evaluate the "identity" level compared to the evaluation of "action". Because the desired identity also includes the individual's values and attitudes, which are difficult to assess directly (Ginsburg et al., 2004). Accordingly, the next section explains Miller pyramid model integration into the design discipline.

2.3.1 Integration of Miller pyramid into design education

As a part of this thesis study, the paper titled *Designer Identity in the Context of Circular Behavior: A General Overview in Terms of Design Education* was published at the National Design Research Conference (UTAK) organized by Middle East Technical University in 2022, and the findings in this publication are referenced and presented in this section. In the context of this study, literature research was conducted under the levels of the Miller pyramid in the context of circular economy, and a preliminary mapping of studies focusing on both users and designers. Table 2.2 shows the findings of this preliminary mapping of the literature research with 16 study.

Table 2.2 : Studies from user and designer perspective in CE and design literature.

| CE Context | Studies on User Perspective | Studies on Designer Perspective |
|------------------------|--|--|
| Knowledge | | Andrews (2015); Dokter et al. (2021); Leube and Walcher (2017); Moreno et al. (2016); van Dam et al. (2020); Watkins et al. (2021); Wandl et a. (2019) |
| | Camacho-Otero et al. (2018); Piscicelli and Ludden (2016); Selvefors et al. (2019) | |
| Competence | | de Los Rios and Charnley (2017); den Hollander et al. (2017); Sumter et al. (2021) |
| Performance and Action | Daae et al. (2018); Mugge (2018); Wastling et al. (2018) | |
| Identity | | |

According to these findings, studies focused on behavior and identity from the designer's perspective in the context of circular economy are quite limited. Studies in this direction are discussed as more user perspective in the design literature. Miller's pyramid was introduced to improve the behavior of students in real-life practices and also advocated the importance of performance-based assessment. As a result of this study, the integration of this pyramid model into design education was evaluated in terms of internalizing circular behavior as an identity element in terms of sustainability. The amended version of Miller pyramid (Cruess et al., 2016) was adapted to design education (Figure 2.7).

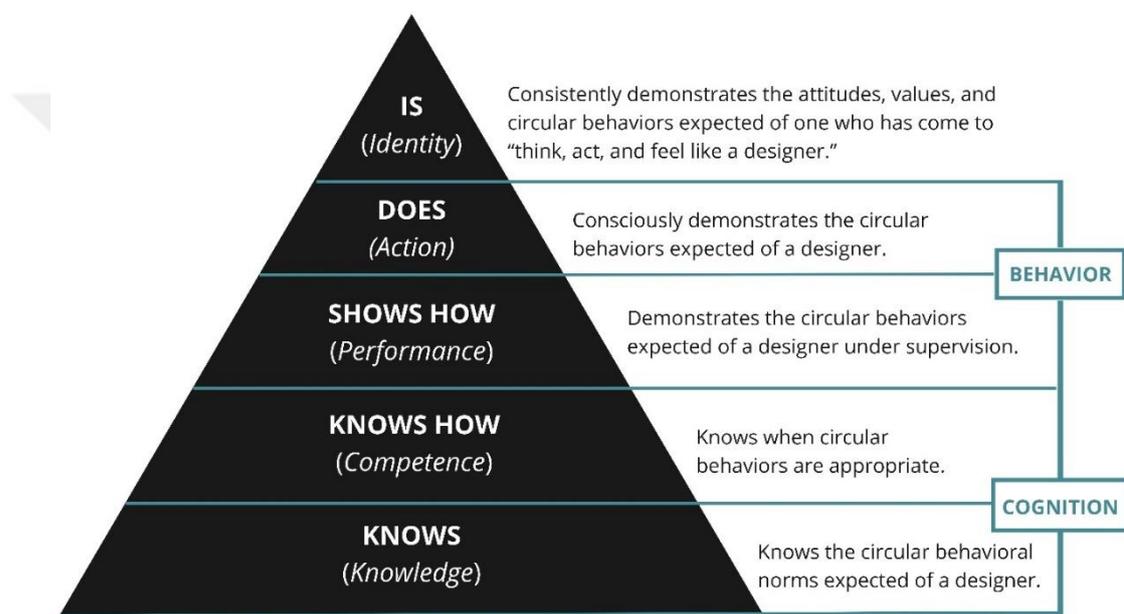


Figure 2.7 : A proposal to adapt the amended version of the Miller pyramid (Cruess et al.,2016) into design education to assess circular behavior.

According to this model, the designer's knowledge is expressed by knowing the expected circular behavioral norms. The designer's competencies mean that designers know when circular behaviors are appropriate. The performance level is expressed as the designer demonstrating circular behaviors, and action evaluation is expressed as the conscious demonstration of these behaviors. At the identity level, designers consistently demonstrate the values, attitudes, and behaviors expected from them with their professional identity and implement the circular behaviors expected from them to their lifestyles.

Considering the concept of sustainability in a broader context, the following sections explain the skills, competencies, behaviors, and professional identities of designers and explain the findings regarding design education.

2.3.2 Designer competencies in sustainability

The world has an imperative need for competent professionals who can contribute to sustainable societal transformations (Gordon et al. 2019). From an educational perspective, there is increasing consensus on the list of core competencies in sustainability (Redman et al. 2020). However, the assessment of students' sustainability competencies is still in its infancy (Waltner et al. 2019). According to Rieckmann (2012), competencies can be defined as individual tendencies that enable self-organization, and these tendencies are formed by the interaction of knowledge, skills, capacity, motivation, and emotional tendencies. In other words, it includes these individual tendencies within itself. With this view, Wiek et al. (2011) defined competence as a complex, functionally linked summary of knowledge, skill, and attitude that enable successful task performance and problem-solving.

The importance of competencies in relation to the complex challenges and opportunities of contemporary societies, such as globalization, artificial intelligence, and sustainable development, is increasing (Lambrechts et al., 2013; Mindt & Rieckmann, 2017). De Haan (2006) defined comprehensive competencies to emphasize sustainability issues, thus introducing into the higher education literature the concept of 'Gestaltungskompetenz' (shaping competencies), which changes and shapes economic, ecological, and social issues. Later, some prominent researchers in the context of sustainability competencies in education have proposed frameworks that overlap with each other but differ at some points regarding the key competencies for sustainability required in education up to date.

From the higher education perspective, Wiek et al. (2011) categorized five key sustainability competencies as system thinking competence, anticipatory competence, normative competence, strategic competence, and interpersonal competence. Figure 2.8 shows the these five competences with relation integrated sustainability research and problem solving framework of Wiek (2010).

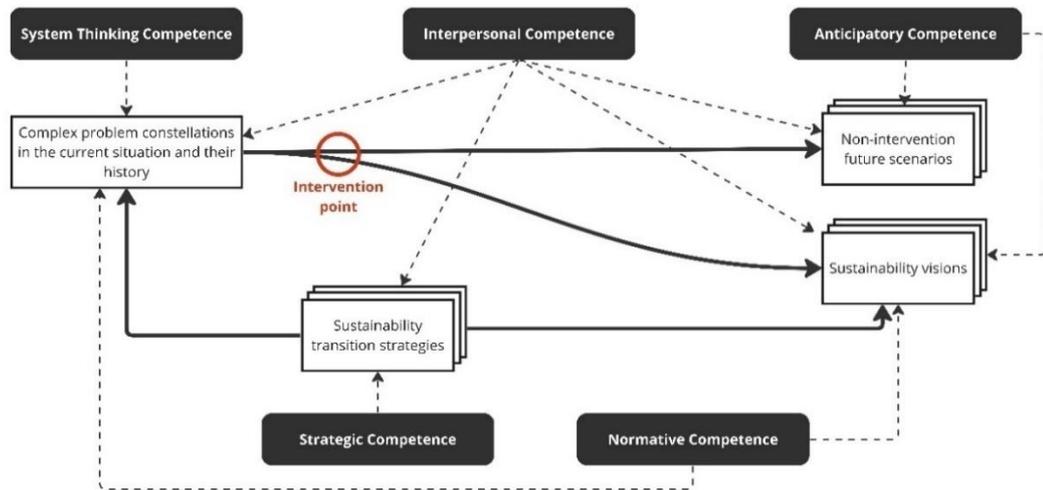


Figure 2.8 : The five key competencies in sustainability in relation to integrated sustainability research and problem-solving framework, adapted from (Wiek et al., 2011).

According to Figure 2.8, the dashed arrows between these five key competencies (shaded in black background) and the research and problem-solving framework (rectangular frames) indicate that individual competencies may have more than one component. The four modules that constitute this sustainable research and problem-solving framework are: analyzing the current problem constellations; creating and crafting sustainability visions, which mean “problem solved”; exploration of future scenarios that are less desirable without interventions; and sustainability transition strategies.

When this framework and five key competencies are interpreted together, *systems thinking competence* is related to the ability to analyze complex systems at different scales, from local to global, in various contexts such as society, environment, and economy. In this context, it addresses the approach to analyzing current situations and problems. *Anticipatory competence*, on the other hand, is the ability to collectively analyze and evaluate the images of the future and create sustainability visions. *Normative competence* involves collectively mapping, defining, implementing, reconciling, and negotiating sustainability values, principles, and goals. It is related to both analyzing problems in current situations and creating sustainability visions. *Strategic competence* is the ability to design and implement interventions, transitions, and management strategies for sustainability. Finally, *interpersonal competence* is related to motivating, facilitating, and enabling collaborative and participatory sustainability research and problem-solving. It is related to all modules in the

framework to produce solutions in this direction. In the study by Wiek et al. (2011), there are no specific recommendations provided for the incorporation of these competencies into education and their acquisition by students. Nevertheless, the model indicates the importance of integrating these competencies into higher education. Subsequently, Brundiens et al. (2020b) have proposed the integration of this model in higher education. When considering the levels of student assessment in the Miller Pyramid, Redman et al. (2020) offer a proposal related to student assessments of sustainability competencies where students self-rate on predefined scales. However, methods such as reflective writing, which reflects students' competency development, and the scenario or case test method, where students respond to specific competency-related questions presented in a scenario or case, have also emerged as prominent assessment methods.

Most recently, in parallel to the framework of Brundiens et al. (2020), Redman and Wiek (2021) proposed the framework in Figure 2.9 for key competencies in sustainability with updated definitions.

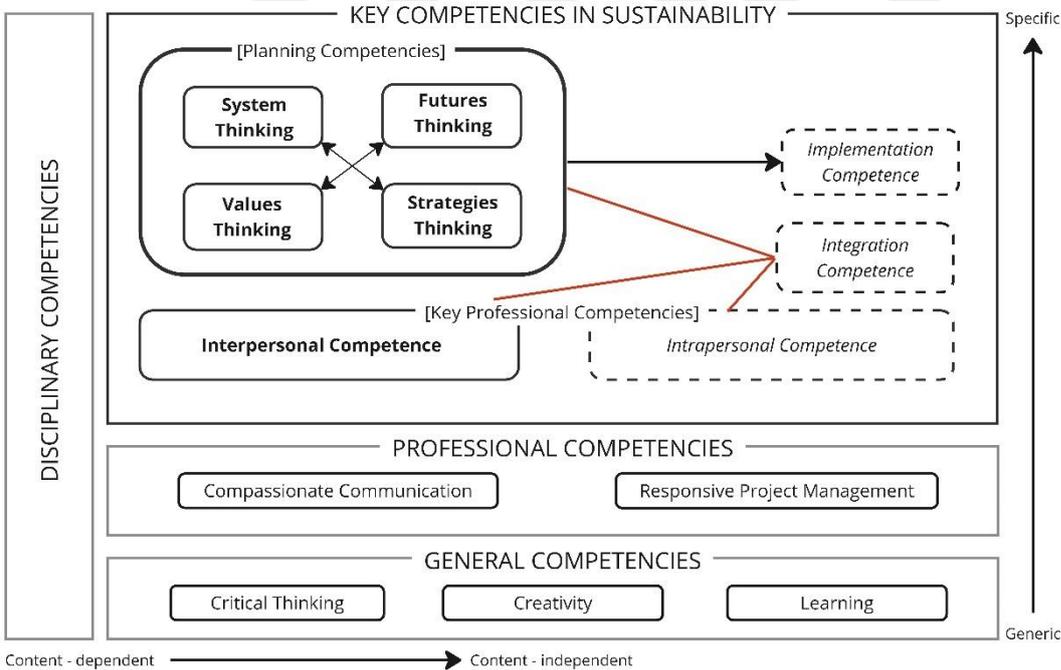


Figure 2.9 : Framework of competencies for advancing sustainability transformations, adapted from (Redman & Wiek, 2021).

The 8 key competencies, 5 in bold and 3 in italics, are shown in Figure 2.9. Within the 8 key sustainability competencies, systems-thinking, futures-thinking (anticipatory competence), values-thinking (normative competence), and strategies-thinking

competencies are the established competencies. They are expressed for sustainability action planning and provided to the emerging implementation competence. These are also linked with the emerging integration competence. Inter-personal (collaboration competence) which is the fifth established competence, and intra-personal competencies which is the emerging competence, defined as key professional competencies. Complementary competencies have also been demonstrated in terms of disciplinary, general, and professional competencies. Competencies that are considered complementary are expressed on two axes. Disciplinary competencies complement key competencies and define expertise-related competencies that are related to content-oriented. Another axis related to content-independent general competencies such as critical thinking, creativity, and learning, and professional competencies such as responsible project management and compassionate communication.

Understanding these competence requirements in the context of design education can be a supportive framework for future designers who will be able to offer solutions for complex systems. For this purpose, Sumter et al. (2020) also reframed these competencies in the context of a circular economy in design education based on Wiek et al. (2011)'s study. O' Rafferty et al. (2014) stated competencies have an important place as learning outcomes in design education. In this regard, they proposed a conceptual framework for the core six competencies required for capacity building in design education for SD in two aspects as "exploration" and "exploitation". Explorations includes creativity, culture and values, intelligence and insights competencies. Exploitation includes analytical, organizational and methodological competencies. According to Faludi et al. (2023), sustainability has three levels of competencies that should be considered in design education: what students need to know and do; what designers as future sustainability practitioners need to know and do; what students might study at advanced or elective levels. However, as a crucial point for designer skills as the part of their competencies, the need to acquire competence also may vary depending on the role, and characteristic of the designer (de Los Rios & Charnley, 2016; Lawson, 2006; Sumter et al., 2018). Regarding these designer skills (DS), (Kunrath et al., 2019) refer to the set of competencies required to achieve the goals of a design project, such as structuring open problems, gathering information, and divergent and convergent thinking. In this sense, Kunrath et al. (2016)

categorized four main design skills with a holistic view of the elements that constitute design competence. These are cognitive skills, communication skills, technical skills, and management skills and represent both physical and mental areas as a part of designer identity.

2.3.3 Designer behaviors in sustainability

Norman (1988) stated design can activate or suppress some behaviors that create change due to the opportunities it provides. Later on, Norman's *Design of Everyday Things* (Norman, 2013) marked the emergence of design as a recognized domain in the context of behavior change. The concept of design for behavior change (DfBC) is not new as a strategy that aims to influence or change user behavior. One of the first contributions to DfBC studies in the field of design was demonstrated by Lilley (2009) three strategies, which are referred to as the designer's 'axis of influence': eco-feedback, behavior-steering, and persuasive technology. As different approaches, it has been stated that DfBC can facilitate the reduction of undesirable behaviors by redesigning the environment (Lockton et al., 2010; Tromp et al., 2011) or design approaches for targeted behaviors can be aimed at motivating or persuading individuals to perform certain behaviors (Lockton et al., 2010; Niedderer, 2013) similar to Lilley's (2009) model. These studies also address the effect of products, services, and the social environment on behavior.

There is also a large group of researchers focusing on designing intervention strategies for behavior change (Daae & Boks, 2012; Lilley, 2009; Lockton & Harrison, 2012; Tang & Bhamra, 2011; Wever et al., 2008). To choose the right design intervention strategies with a focus on sustainability, Coskun and Erbug (2014) emphasize that the right individuals should be selected for the right behaviors. In this regard, they point out the user characteristics for the behavior change strategies.

While there are studies in the literature suggesting that sustainable designs cannot reach their full potential without taking into account the product use phase and user behavior (Boks, 2011; Wever et al., 2008), some researchers consider the DfSB approach. They talk about the need for more sustainable designs that engage with behavior change strategies to design products, services, and systems that encourage the application and use of this behavioral theory (Bhamra & Lilley, 2015). As mentioned in the case study of Lilley and Lofthouse (2009) in Section 2.2, DfSB often

focuses on design students' approaches and strategies to change users' behavior in design education. Generally, studies focus on understanding the student's perception of sustainability.

As an established approach from designer perspective, Simon (1969) stated the capacity of designers to create change by transforming existing situations into preferred ones. In this regard, designers play a crucial role in shaping user perceptions and removing behavioral barriers (Wastling et al., 2018). However, behavioral approaches address the role of designers and products or services in influencing user behavior, as seen in studies on sustainable behavior. Table 2.3 also supports this view with a circular economy context. There is no perspective that shows the 'designer' aspect of behavioral design in the literature (Khadilkar & Cash, 2019). However, user-centered approaches may be useful for understanding behaviors of designer, especially in education. To understand the behavior of designers, it will be important to understand how they approach to the concept of sustainability. In this respect, understanding the designer's background is also a critical point in understanding the designer's perspective. Although Cross (2006) and Lawson (1979) brought up the design behavior of designers and Valkenburg and Dorst (1998) discussed the problem-framing approach of industrial design students a long time ago, comprehensive research is still needed on the sustainable behavior of designers and their design behavior in terms of sustainability.

There are various theories and frameworks in literature regarding behavioral studies from different fields including social and behavioral sciences, economics, and psychology. From a psychological perspective, the most established theoretical framework illustrating the factors that drive individuals' behavior is Ajzen's (1991) Theory of Planned Behavior model, which suggests that intention is a reasonable predictor of behavior. Important factors include attitudes, subjective norms, and perceived behavioral control. This model explains how various factors influence the target behavior. However, identifying the origins of behaviors is complex because it involves individuals' unobservable knowledge, beliefs, motivations, and desires (Fishbein & Ajzen, 2011). Figure 2.10 shows the factors that influence the achievement of actual behavior.

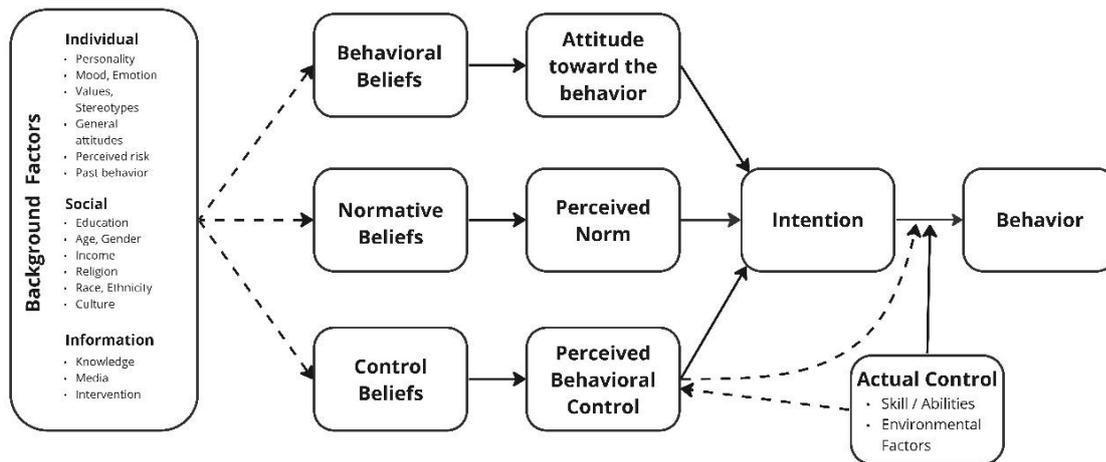


Figure 2.10 : Reasoned action framework adapted from (Fishbein & Ajzen, 2011).

According to this model, intention is the most predictive factor of behavior. However, knowledge, skills, and environmental factors also play an important role. The intention to perform a behavior is based on a combination of attitudinal, normative, and behavioral control considerations. The competencies mentioned in the previous section are also related to being able to implement the behaviors required to contribute to sustainability. Figure 2.11 shows the factors on social opportunities, personal enablers and sustainability competence for the sustainable behavioral change.

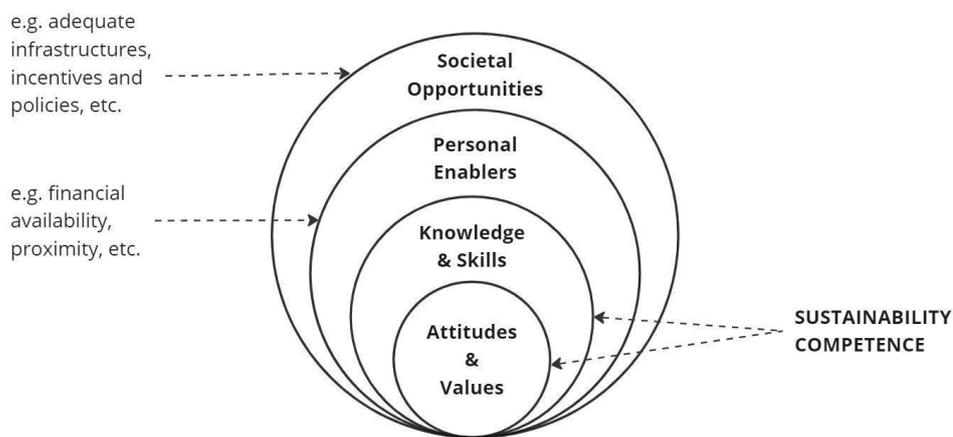


Figure 2.11 : Sustainability competencies and context for sustainable behavior, adapted from Bianchi's (2020) elaboration from (Rieckmann, 2012; Wilhelm et al., 2019).

For sustainable behavioral change, certain values and motivations need to be present. According to this model, effective behavioral change that will contribute to a sustainable transition is based on the development of knowledge, skills, attitudes and values, in other words, competence, as well as the existence of instrumental and

external factors (Bianchi, 2020). In this context, it will be important to understand designers' attitudes and behaviors towards sustainability, as well as developing competence in design education. However, financial, social, structural, or institutional barriers can be obstacles between behavioral intention and actual behavior (Eagle et al., 2016).

2.3.4 Designer professional identity in sustainability

Identity can be defined as a self-referential description that offers contextually relevant responses to queries such as "Who am I?" or "Who are we?" (Ashforth et al., 2008). From the professional identity perspective, it is expressed as personal qualities that define how people understand themselves professionally (Kunrath et al., 2020; Tracey & Hutchinson, 2016). In other words, it can be expressed as a dynamic understanding of professional responsibilities, actions, and values, including personal characteristics (Dall'Alba, 2009; Luehmann, 2007). To date, many researchers from different disciplines have expressed the concept of professional identity in various ways. As a most influential paper among the professional identity studies, Ashforth et al. (2008) define three factors for the professional identity formation (Figure 2.12).

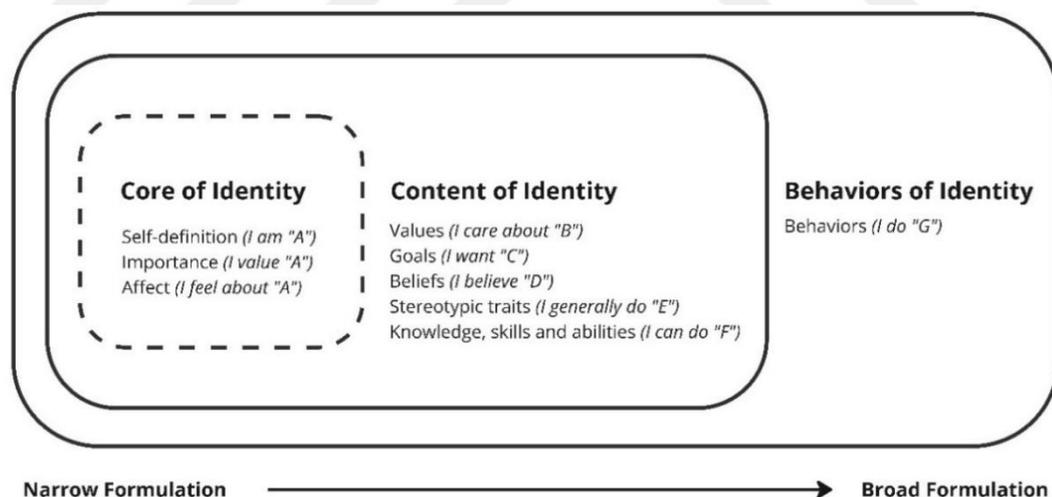


Figure 2.12 : Components of professional identity formation, adapted from (Ashforth et al., 2008).

According to Figure 2.12, three factors of the professional identity formation are the core of identity, the content of identity, and the behaviors of identity. The core of identity is expressed in three components. These are the self-identification component, the importance component, which shows the importance given to the profession as a part of the individual, the affecting component which shows how the profession affects

the individual or how it makes them feel. The content of identity includes values, goals, beliefs, stereotypic traits, know-how, skills, and abilities. The components in this section are distinctive but are influenced by institutional environments. According to Ashforth et al. (2008), the ring of the core of the identity is shown as dashed because attributes may not be fully expressed, be unclear, change, be inconsistent, be implicit, or be adopted without further implementation. The stronger the identity, the more it includes not only the tightly intertwined identity core elements but also the identity contents. Lastly, the broadest formulation of professional identity is behavior. It contains all the actions required for a typical professional identity. While the essence of identity and identity contents focus more on the internal processes of individuals, identity behaviors focus more on the associated actions of individuals, although these actions may be affected by circumstances in a certain context.

In the higher education literature, studies emphasized the role of education for professional identity development. Trede et al. (2012) reviewed the 20 articles from various universities to understand the role of education and its facilitator role. They stated that education provides transformative learning and brings together personal and professional values, but as a shortcoming, it does not focus on actions and practices of students. According to Dall'Alba (2009), professional identity necessitates not only the acquisition of knowledge and skills in education but also professional modes of being. In a similar sense, Clarke et al. (2013) state that professional identity development begins before starting a career and develops with the answers to the question of who I want to be. In design education, designer professional identity development begins with the start of the design education program, and develops with understanding, hopes, or dreams of becoming a professional (Baha et al., 2020). Although changes in fundamental identity characteristics develop slowly, professional identity continues to develop and reshape with new information itself (Tracey & Hutchinson, 2013). To date, concepts such as reflection have been frequently expressed concerning professional identity. In this regard, Schön's (1983) concept of reflection-in-action is appropriate for understanding identity development. The concepts of reflection-for-action and reflection-on-action refer to future-oriented action plans and in this sense are directly associated with design education. However, it's important to note that some students may try to think about what they want to see rather than revealing their true selves (Gray, 2014).

The importance of design precedents for reflections is also emphasized in the literature. Tracey and Hutchinson (2016) stated that the importance of design precedents in design education and propose that three pillars should be constructed in education for the formation of a professional design identity: beliefs, self-awareness, and design precedents. They also mentioned that these should be aligned with professional realities. These views point to the factors that influence behavior, as seen in Ashfort's model. Behaviors are the major factor that forms the professional identity. Understanding the formation and subsequent evolution of a designer's professional identity is crucial for comprehending and managing design behavior (Kunrath et al., 2016). For the development of a professional designer identity, designers need to know their responsibilities within the profession and how their professional abilities and skills affect their professional work (Hutchinson & Tracey, 2015). In one of the most recent studies of Kunrath et al. (2020), development of designer professional identity (DPI) was discussed under two elements in Figure 2.13.

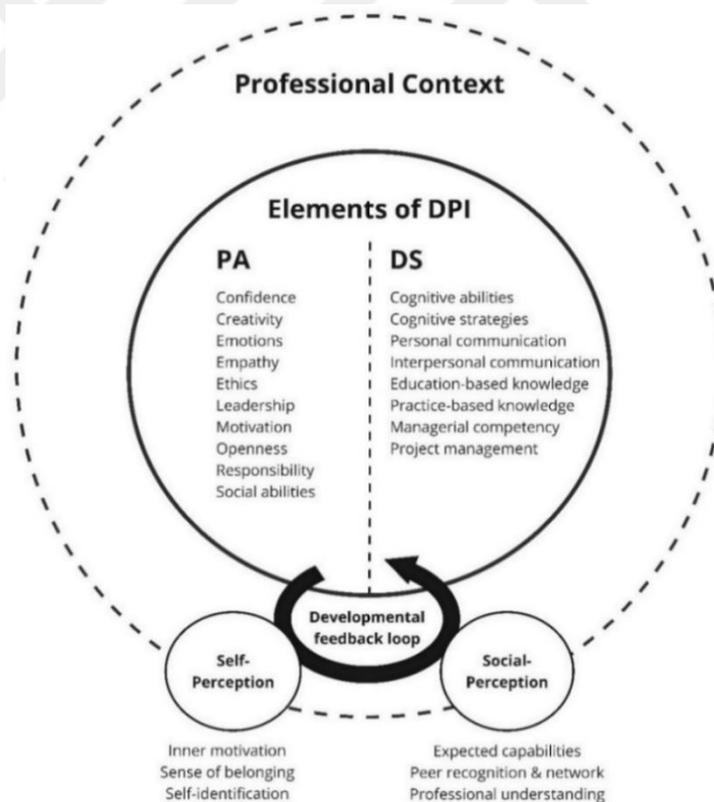


Figure 2.13 : Elements of DPI (Kunrath et al., 2020).

According to this model, personal attributes (PA) and design skills (DS) are the main element for the development of DPI. Personal attributes are expressed as self-confidence, creativity, emotion, empathy ability, ethical approaches, motivation,

leadership qualities, responsibility, social skills, and openness to different methods and applications that designers have. They are also related to personality and characteristics of designer (Dall’Alba 2009). Design skills are considered cognitive abilities and strategies, communication, education-based knowledge, practice-based knowledge, and managerial competencies. These design skills also represent the development of expertise (Lawson & Dorst, 2013). Additionally, the importance of both self-perception and social perception for DPI development is emphasized in the model. Self-perception focuses on internal motivations and self-definitions, while social perceptions are influenced by external stimuli. Developmental expectations, perceptions of professional norms, and knowledge acquired during education are effective in this perception. (Kunrath et al., 2020), these social perceptions formed by external stimuli constantly influence and change self-perceptions. Design education has an important role in encouraging harmony between these perceptions and improving the technical skills of designers (McDonnell, 2009).

Although the design literature discusses the development of the designer's identity, the formation of identity, and the roles of design education in this context, studies focusing on the identity development of the designer in the context of sustainability is quite limited. As indicated in the findings of the conference paper in Table 2.3, a lack of studies has been accessed in the context of the circular economy. Future designers need to understand their professional identities in the face of today's complex problems and their education should offer opportunities for personal beliefs and experiences that will affect their design actions (Tracey & Hutchinson, 2016). However, from a different perspective, design education should not only offer these opportunities but should also provide design students with the freedom to become designers and instill awareness of what it means to be a designer (Dall’Alba, 2009).

3. RESEARCH METHOD

In this chapter, the research approach used throughout the study, the data collection tools, the sample groups of the study, the data analysis methods and procedures are explained.

3.1 Research Approach

This thesis study has a phenomenological approach with the aim of uncovering and interpreting design graduates' understanding of the concept of sustainability, their perspectives, and the contribution of design education in alignment with the purposes of the study. The purpose of phenomenological research is to describe or interpret the individuals' lived experience in a way that can be used as a source of qualitative evidence (Mayoh & Onwuegbuzie, 2015). Thus, it aims to develop a more comprehensive understanding of individuals' experiences of a particular phenomenon through individuals' consciousness (Giorgi, 2009). All data was collected using a mixed methods approach in this study. First, qualitative data was obtained by gathering in-depth insights through semi-structured interviews. Then, to support this qualitative data, both quantitative and qualitative data were collected from the survey research with a larger sample group.

3.2 Data Collection

In this thesis study, data was collected using two main research methods. First of all, a pilot study was conducted to get an initial idea of the research direction and check the interview questions. Then, qualitative research data were collected through semi-structured interviews to collect more in-depth insights from the participants. To support the semi-structured interviews, a survey was conducted to collect both quantitative and qualitative data. All data was obtained from design graduates at universities in Türkiye.

There are studies in the developed countries referred to in Section 2.2.1.3 that show that sustainability is well-established in design education and that sustainability is reflected in policy, daily life, and education. In the context of Türkiye, sustainability is an emerging concept in design education and tend to focus more on theoretical and environmental aspects in their learning outcomes. Many studies have addressed this concept as well. As a developing country, it also tends to integrate the concept of sustainability not only in education but also in daily life and policy. However, according to the Climate Change Performance Index (CCPI) report (CCPI, 2024), Türkiye has significantly fallen short of its targeted climate projections in recent years, dropping ten places. This situation also indicates that conducting this research in Türkiye is crucial. Another reason for conducting the research in this context is the researcher's access to a larger professional network. This has allowed for reaching more professional designers and better analysis of the data concerning factors specific to the Türkiye.

3.2.1 Pilot study

The pilot study was conducted as a semi-structured interview with two interviewers to obtain preliminary information about the orientation of the thesis study and check the interview questions. Two semi-structured interviews were conducted face-to-face in the participants' working environment and in a private room. Interviews were conducted via voice recordings with the consent of the participants. Participants were selected from industrial designers who graduated from different state universities in Türkiye and had 1.5 years of professional experience at the same consumer electronics company. In practice, they were working on different types of product groups. In terms of education, one participant was continuing master education in industrial design. Table 3.1 shows the pilot study participant list.

Table 3.1 : Pilot study participant list.

| Participant Number | Undergraduate University | Graduation Year | Professional Background | Experience Year |
|---------------------------|---------------------------------|------------------------|--------------------------------|------------------------|
| Pilot 1 | Eskişehir Technical University | 2021 | Consumer Electronics | 1,5 years |
| Pilot 2 | Selçuk University | 2021 | Consumer Electronics | 1,5 years |

The researcher concluded the interview questions were stressful for the participants and included judgmental expressions. Based on how participants responded to the questions, answers that were taken out of context, and conversations that took place after the interviews. After the pilot study, the interview questions were revised so that sufficient and objective insights could be obtained from the participants, avoiding a judgmental attitude.

3.2.2 Semi-structured interview

Following the pilot study with two participants, semi-structured interviews were conducted with 18 more participants with revised interview questions (Appendix A and B). Avoiding judgmental expressions, a total of 15 interview questions were prepared under three main headings. The first section included warm-up questions related to the interviewee's educational background and professional background. The second section contained questions related understanding of sustainability and circularity concepts of participants and their daily routines. The last section was prepared with questions corresponding to the knowledge, competence, performance, action, and identity levels of the Miller pyramid, which Cruess et al. (2016) later adapted for “identity” level.

3.2.2.1 Semi-structured interview procedure

Initial contact with participants was made via email addresses, LinkedIn direct messages, and WhatsApp. Meetings were organized according to the available time of the participants. Before the planned interview, participants' approval was obtained through signed informed consent form documents (Appendix C) and archived by the researcher. For the meetings, the Zoom platform was preferred because it was used by the researcher through the university e-mail account as an official student, and video recordings and other interfaces were available to many participants. The interviews lasted approximately a minimum of 30 minutes and a maximum of 1 hour, depending on the length of the participants' responses. After each interview was completed, the researcher archived the Zoom recordings in folders specific to the interviewer.

3.2.2.2 Sample group of semi-structured interview

In line with the purpose of this thesis study, participants were selected from among industrial designers who graduated from industrial design departments of various universities in Türkiye. The undergraduate graduation years of the participant designers were between 2008 and 2019. To better understand the effects of education on professional practices, designers who have worked on or are currently working on design-related practices were specifically contacted. These participants were a group of designers with between 2 and 14 years of experience and different professional backgrounds. Their expertise included physical product design as well as digital product design. Physical product designers, also known as industrial designers, have experience in sectors such as consumer electronics, glassware, retail, furniture, defense industry, packaging, branding, bathroom and kitchen ceramic products, footwear, public space products, and automotive. Digital designers, on the other hand, were user experience designers, business analysts, and consultant designers working in sectors such as micro-software, food delivery, mobile communication, and finance. Table 3.2 shows the semi-structured interview participant list with details.

Table 3.2 : Participant list with detailed information.

| Participant Number | Undergraduate University | Graduation Year | Professional Background | Experience Year |
|---------------------------|---------------------------------|------------------------|----------------------------------|------------------------|
| P1 | İstanbul Medipol University | 2019 | Footwear and Retail | 3,5 years |
| P2 | Anadolu University | 2016 | Defense and Consumer Electronics | 8 years |
| P3 | İstanbul Medipol University | 2019 | Retail, Medical and Defense | 3 years |
| P4 | İstanbul Medipol University | 2019 | Bathroom and Kitchen Ceramics | 2 years |
| P5 | Kadir Has University | 2014 | Glassware | 5 years |
| P6 | İstanbul Technical University | 2020 | Municipality | 3 years |

Table 3.2 (continued) : Participant list with detailed information.

| Participant Number | Undergraduate University | Graduation Year | Professional Background | Experience Year |
|---------------------------|----------------------------------|------------------------|--|------------------------|
| P7 | Middle East Technical University | 2018 | Consumer Electronics and Micro Software | 5 years |
| P8 | İstanbul Technical University | 2021 | Consumer Electronics | 2 years |
| P9 | Yeditepe University | 2015 | Furniture and Glassware | 6,5 years |
| P10 | İstanbul Technical University | 2017 | Food Delivery | 6 years |
| P11 | İstanbul Technical University | 2017 | Glassware | 6 years |
| P12 | Anadolu University | 2016 | Public Furniture, Furniture, and Communication | 7 years |
| P13 | Middle East Technical University | 2008 | Retail, Packaging and Branding | 11 years |
| P14 | Middle East Technical University | 2008 | UX Consultancy | 14 years |
| P15 | Istanbul Technical University | 2017 | Marketing | 6 years |
| P16 | Mimar Sinan University | 2014 | Consumer Electronics Furniture, and Automotive | 6 years |
| P17 | İstanbul Technical University | 2015 | Consumer Electronics | 8 years |
| P18 | Middle East Technical University | 2014 | Consumer Electronics, Industrial Engine Services | 5,5 years |

3.2.3 Survey Design

A survey was conducted to support interview questions both qualitatively and quantitatively. Survey questions are parallel to the interview questions, but they also include open-ended questions (Appendix D). Survey questions were designed under four section. While the first section contains undergraduate education information such as the university from which the participant graduated, year of graduation, and

department of graduation, the second part contains educational information that the participant will answer if there is a master's degree or doctorate. Since master's or doctoral education is not the main focus of this study, participants were not set as "required" to respond to the questions in this section. The third section of the survey includes occupational information about the participants, such as years of experience, professional titles, and the sector in which they work. This section was needed to interpret the answers given regarding undergraduate education within the framework of a designer's professional identity.

Following educational and occupational information, the fourth section includes 11 questions regarding sustainability. In this section, questions are asked to understand the general understanding of the concepts of sustainability and circular design using the free association method. The sources of information that designers obtained about sustainability were asked using multiple selection methods. 5-point linear Likert scale questions where designers evaluate themselves are also included in this section. The adequacy of the materials presented regarding sustainability in design education is also asked of the participants with a 5-point linear Likert scale question. Finally, a multiple-choice grid question was included in the survey. This question contains 15 statements and a 5-point linear Likert evaluation. Participants were asked to evaluate the contribution of design education for these 15 statements. These 15 statements appeared in different orders in the survey link sent to each participant. Thus, the possibility of the first and last answers producing similar results was prevented. These statements are designed to correspond to the levels of knowledge, skill, competence, performance, action, and identity in Miller's Pyramid.

3.2.3.1 Survey research procedure

Survey questions were prepared via Google Forms. After the survey questions were prepared, artificial intelligence (AI) support was received to test the consistency of the survey questions in the context of the subject. In this context, the researcher preferred ChatGPT as an AI tool in the design of survey questions. ChatGPT is a text-based artificial intelligence tool widely used in creative industries, user research, user testing, and empathy building. To communicate with this artificial intelligence tool, a dialogue was initiated via a chat box in the web-based extension. First of all, the task of assisting the AI to test the researcher's questions was defined, and the researcher shared the

certain keywords in survey questions via the chat box. Support was received from the ChatGPT to create correct alternative expressions for certain words that may be difficult to understand by survey participants. Through a separate chat box, they were asked to design survey questions that could be asked within the scope of the research for this thesis and concerning the Miller Pyramid, regardless of the assistant position with artificial intelligence. In case the artificial intelligence created bias for the researcher, the final version of the questions was tested with two more real participants. One of these participants was a Ph.D. student, and the other was a senior industrial designer. As a result, the questions were revised and rearranged according to word and semantic mistakes. Some questions have also been eliminated.

The survey link was shared with potential participants via the researcher's and the advisor's LinkedIn posts, WhatsApp, Instagram direct messages, and LinkedIn direct messages. More than 250 designers were contacted within the scope of this survey, with the help of the researcher's instructors, and the researcher's connections in work and school circle. All of these connections provided a huge network of access to potential participants. As a result, a total of 188 participant designers with diverse university graduates and occupational backgrounds responded to the survey. However, 7 respondents were eliminated from the data. The undergraduate graduations of the participants excluded from the data were from mechanical engineering, electrical and electronics engineering, business administration, ceramics and glass, new media, and architecture programs. Thus, it was planned to analyze the data obtained from 181 participants.

3.2.3.2 Sample group of the survey research

Survey participants were industrial design graduates from various universities in Türkiye. Figure 3.1 shows the distribution of the universities where the participant designers received their undergraduate degrees.

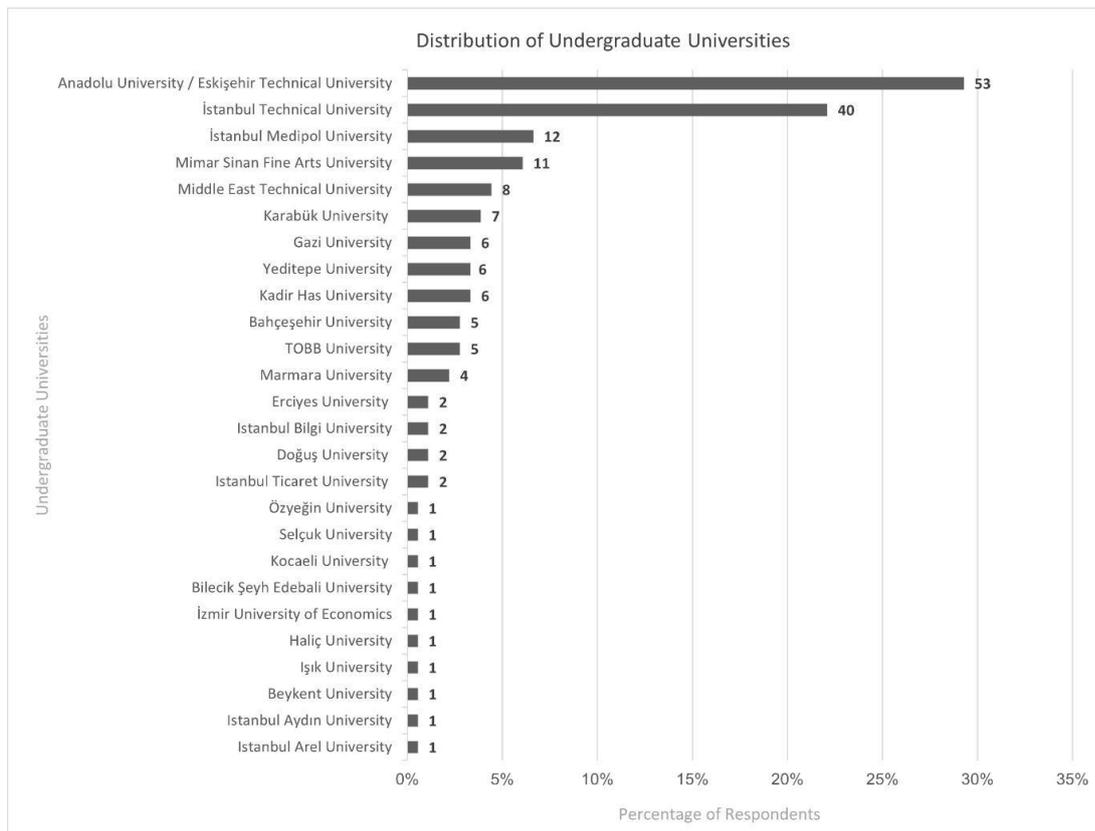


Figure 3.1 : A horizontal bar graph showing the distribution of undergraduate universities of participant designers.

According to survey findings, Designers who graduated from 26 different universities participated in the survey. Approximately 29.5% of the 181 participant designers were graduates of Anadolu or Eskişehir Technical University, and 22% of the participants were graduates of İstanbul Technical University. Design graduates from İstanbul Medipol University and Mimar Sinan Fine Arts University, who made up 6.5% and 6% of the participants, were nearly at the same frequency. Following these universities, 4.5% of the participants were Middle East Technical University graduates. There was only one participation from 10 universities. Some of these participants were graduates of Özyeğin University, Selçuk University, İzmir University of Economics, and Beykent University.

The undergraduate graduation years of the participant designers ranged between 2003 and 2023. Figure 3.2 shows the distribution of participant designers according to their undergraduate years, master graduation years, and doctorate graduation years.

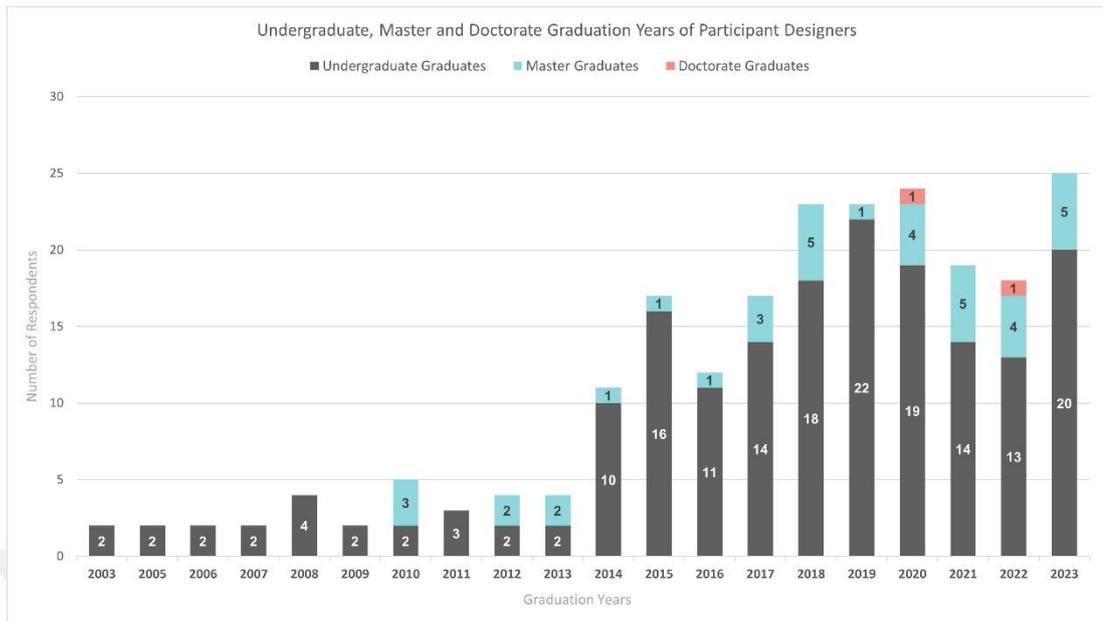


Figure 3.2 : A stacked bar graph showing the undergraduate, master's and doctorate graduation years of participant designers.

As seen in Figure 3.2, 12.2% of the participant designers were designers who graduated in 2019. Participants from 2020 and 2023 undergraduate graduates attended in nearly the same percentage. Undergraduate graduates in 2018 constituted 10% of the participants. Although variable rates are visible in the graph, the number of participants with undergraduate degrees in industrial design was the highest between 2014 and 2023. In the survey findings, 37 of the 181 participant designers also had a master degree, and 2 had a doctorate. Figure 3.2 also shows the distribution of master and doctorate graduation years of participant designer in addition to undergraduate graduation years. The same number of participant designers received master degrees, mostly in 2018, 2021, and 2023. As a result, 13.5% of the 37 participant designers had master degrees in these years. Approximately 11% of the 37 participant designers received their master degrees in 2020 and 2022. Only one designer received a doctorate in 2020 and 2022.

Almost all of the participant designers had sector experience in design field. Figure 3.3 shows the years of professional experience of the participant designers.

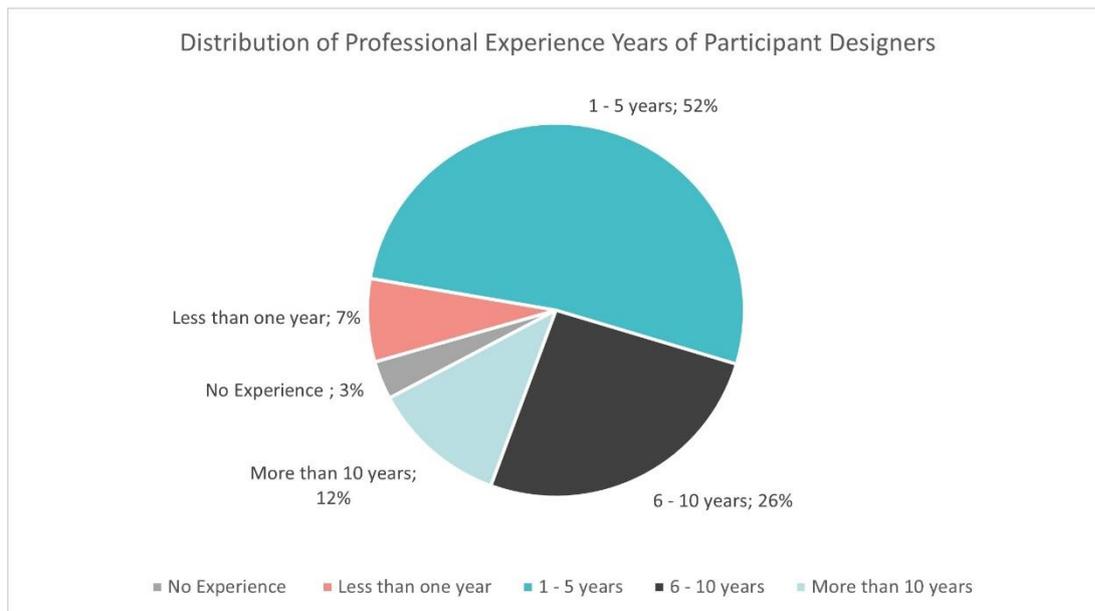


Figure 3.3 : A pie graph showing the distribution of professional experience years of participant designers.

According to the survey results, 52% of the participant designers had between 1 and 5 years of experience in the design profession. 26% of the participants had experience between 6 and 10 years. 12% of the participant designers had more than 10 years experience. Only 7% of the participant designers had less than one year experience in design. Additionally, 3% of the participant designers had no professional experience. These participants were included in the study because they had experience in intern positions.

Participant designers also had different professional titles and seniorities (Appendix E). 37 of the 181 designers who participated in the survey held the predominant title of "Industrial Designer" (Table A.1). 17 participant designers were "Product Designer," 11 participants were "Specialist Industrial Designer," and 10 participant designers were "Design Manager". In total, participant designers held 51 different professional titles. There were also participants with the same design expertise but different seniorities. Participant designers had various sector experience. Figure 3.5 shows the distribution of the sectors in which participant designers work.

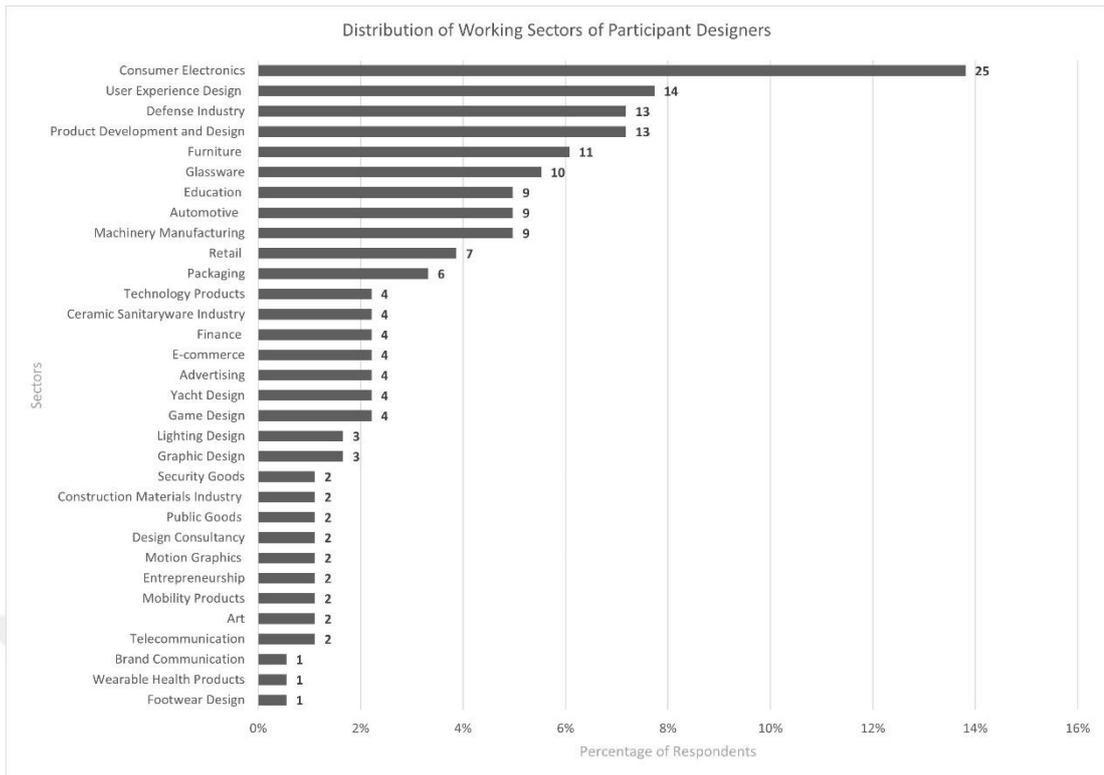


Figure 3.4 : A horizontal bar graph showing the distribution of the sectors in which participating designers work.

As seen in Figure 3.4, 13.8% of the participant designers had professional experience in consumer electronics and constituted the majority of the participants. Nearly 8% of the participants had professional experience in the field of user experience design. More than 7% of the participants were in the defense industry and the same percentage of participants were working on product development and design. Sector information stated by the participants as product development and design shows that designers work with many sectors. It can be said that these designers may be design office employees. More than 6% of respondents had experience in the furniture sector, while designers with glassware industry experience had almost a similar rate of respondents. Approximately 5% of the participants had sector experience in the education, automotive, and machinery manufacturing sectors. Following this, there was also a relatively similar participation from the retail and packaging sectors. However, less than 1% of the participant designers were working in the footwear design, brand communication, and telecommunication sectors.

3.3 Data Analysis

This thesis study includes a mix of data-driven and theory-driven analysis approaches. While the data-driven approach is obtained with the findings emerging from the analysis process, the theory-driven approach shows the findings obtained by taking the Miller pyramid as a reference.

Qualitative data from semi-structured interviews and survey research were analyzed using the thematic analysis method. Thematic analysis is a research approach that involves the identification, analysis, and reporting of recurring patterns, often known as themes, within a dataset (Braun & Clarke, 2006). This method effectively organizes and provides a comprehensive description of the dataset with a high level of detail. Table 3.3 shows the thematic analysis phases.

Table 3.3 : Phases of thematic analysis (Braun & Clarke, 2006).

| Phases | Description of the Process |
|-------------------------------|--|
| 1. Familiarizing with data | Transcribing data (if necessary), reading and re-reading the data, noting down initial ideas. |
| 2. Generating initial codes | Coding interesting features of the data in a systematic fashion across the entire data set, collating data relevant to each code. |
| 3. Searching for themes | Collating codes into potential themes, gathering all data relevant to each potential theme. |
| 4. Reviewing themes | Checking if the themes work in relation to the coded extracts (Level 1) and the entire data set (Level 2), generating a thematic ‘map’ of the analysis. |
| 5. Defining and naming themes | Ongoing analysis to refine the specifics of each theme, and the overall story the analysis tells, generating clear definitions and names for each theme. |
| 6. Producing the report | The final opportunity for analysis. Selection of vivid, compelling extract examples, final analysis of selected extracts, relating back of the analysis to the research question and literature, producing a scholarly report of the analysis. |

Due to the nature of thematic analysis, it was aimed to understand and interpret the patterns emerging in the qualitative data. This method also included the researcher's reflections and comments on the analysis process.

In addition to thematic analysis method, descriptive statistical analysis was used as a quantitative data analysis method to analyze the survey findings. In this way, the data

obtained from the survey research were tabulated, and interpreted. The frequencies of the findings were examined. However, insights from open-ended questions were included in the thematic analysis.

3.3.1 Data analysis procedure

Qualitative data analysis was conducted in parallel with the thematic analysis steps (Table 3.3). In line with the first phase of the thematic analysis steps, the data obtained from the interviews was tabulated and transcribed through Google Sheets for each participant separately. To easily read vertically the data related to the participants and questions after the transcript process, a Google Sheets file was created to contain the participants' numbers and university names in the first two columns, while the top row contains the interview questions (Appendix F). After the transcripts were typed on Google Sheets, the analysis phase was started on the Miro platform, which the researcher also uses professionally. Fundamentally, a 4-stage analysis process was conducted on the Miro platform.

First of all, a study board was created on Miro, and post-it notes tagged with participant numbers were created by the researcher. The reason for creating post-its tagged with participant numbers was to benefit from the Artificial Intelligence (AI) feature of the Miro platform. Thanks to the Miro AI feature, it was planned to group the post-its tagged according to participant insights as the next stage of the analysis. Question-based vertical readings were made on a Google sheet, and the prominent insights were marked. These marked insights were copied onto post-its with participant tags created in the Miro board. Thus, the vertical readings made via Google Sheets were re-examined and the data became more familiar. In summary, all insights was copied onto post-its tagged according to the number of participants on the Miro board. This process was repeated for each question (Appendix G). Figure 3.7 displays participant-number tagged insights as an example from the semi-structured interviews.



Figure 3.5 : An example of transferring question-specific insights to post-its tagged with participant numbers.

As the second phase of the thematic analysis, the tagged post-its were separated according to participant numbers with the Miro AI with “clustering with tags” command. In this way, participants' insights regarding the question were examined more easily. Another purpose of the participant clustering is to be able to quote the relevant participants in the findings later. At the same time, repetitive codes could be understood more clearly. Figure 3.6 displays an example insight clustering method with participant numbers tagged post-its.

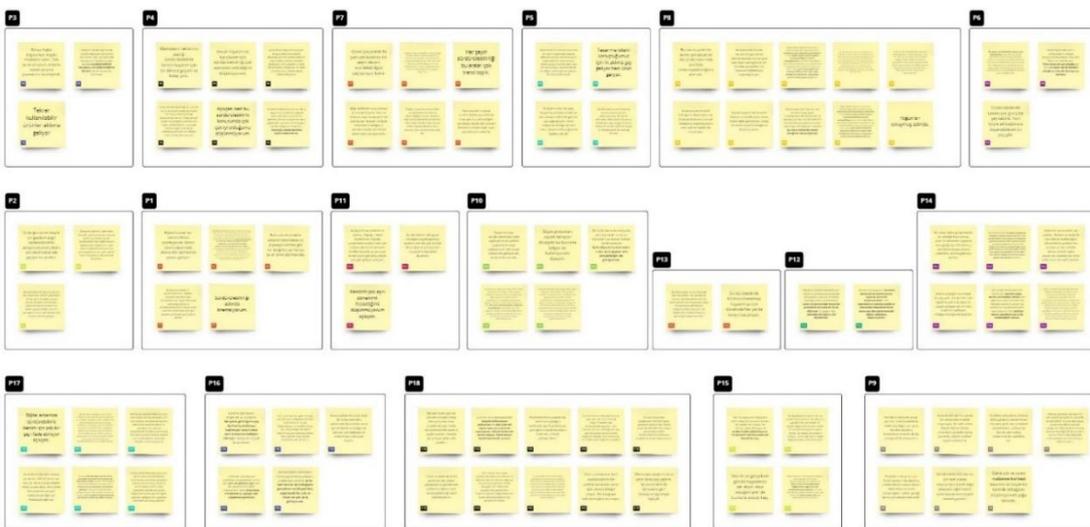


Figure 3.6 : An example of clustering participant insights with Miro AI support.

The method of clustering these insights by participant number was repeated for each of the interview questions. Then, the insights separated by participant number cluster began to be coded with different color highlights. Relevant codes were written near the relevant participant area and in boxes with the same frame color as those highlighted in the insights (Figure 3.7).

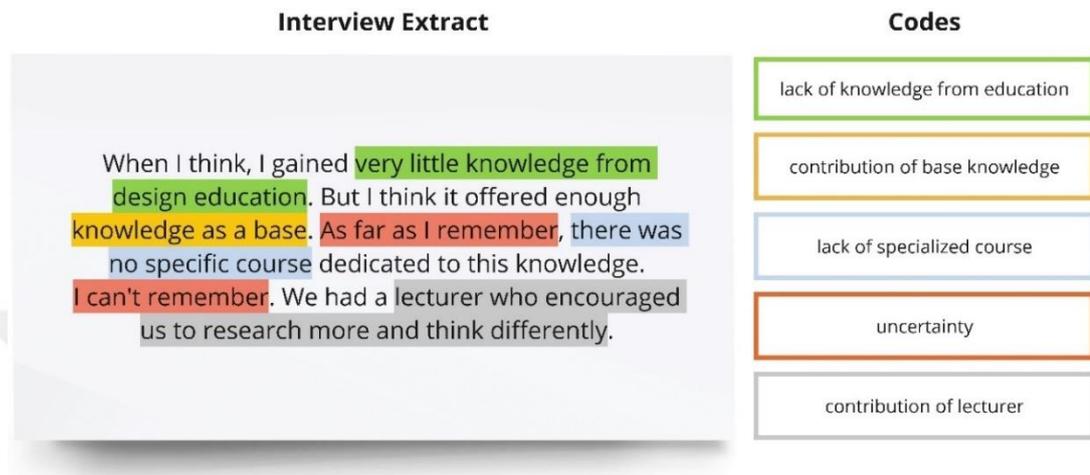


Figure 3.7 : Thematic analysis coding procedure.

Since the answers given by each participant to the relevant question could be seen at once, common codes could be understood more clearly. At the same time as the coding process, the Miro AI feature was used for expressions that were difficult to understand. In this sense, post-it containing the relevant insight were easily converted into the appropriate format, and alternative expressions were created with the "create user stories" command of the Miro AI feature. As a result, all generated codes were also clustered according to participant numbers for each interview questions (Appendix H). Figure 3.8 shows codes clustered by participant numbers as an example.

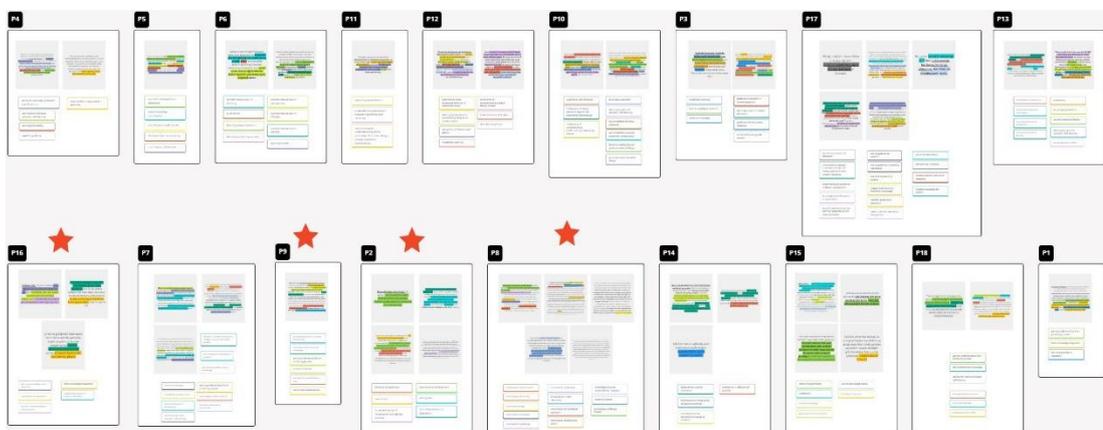


Figure 3.8 : An example of codes clustered by participant numbers.

This coding process also allowed the researcher to mark insights that could be quoted based on participant numbers. After the coding process, the codes created for each question were collected in one place. In the third stage of the thematic analysis, all generated codes were converted into post-it format to benefit from another Miro AI feature to reach sub-themes and themes. Thus, with Miro AI, the relevant codes were grouped with “clustering with keyword” command according to their interrelationships (Figure 3.9).

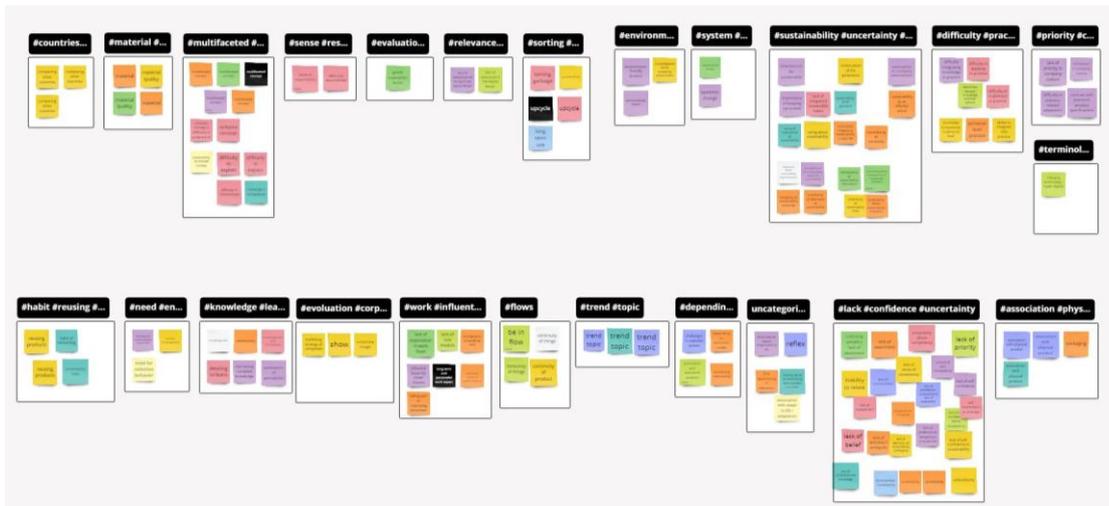


Figure 3.9 : An example of clustering codes with Miro AI.

Since Miro's AI feature groups the codes by associating them with keywords and sentence meanings, these grouped codes were rearranged by the researcher and the advisor's help. Few groups were merged or removed from the code pools. This process was repeated for each question (Appendix I). New codes were created with the resulting grouped codes, and the repetition numbers of these codes were indicated in parentheses.

In the fourth stage of thematic analysis, after subthemes and themes emerged, the themes were reviewed. The consistency of themes and subthemes was discussed with the advisor. Themes were checked for appropriateness to each research question and their relationships with the codes were checked. Accordingly, the codes in sub-themes have been changed.

In the fifth stage, the relationship of the themes with the sub-themes was checked again. The coherence of names of themes has been redefined in terms of semantic integrity. The relationship of the research questions to the themes was re-evaluated.

Finally, before starting the writing process, a thematic map showing sub-themes and themes was created on the Miro platform to better understand the structure of the findings. The interview extracts that were thought to be prominent by the researcher were planned to be given as quotes. However, since the interviews were conducted in Turkish, these quotes were translated into English. In addition, all quotations are numbered, and since there is no exact correspondence of Turkish expressions in English, the Turkish version of the quotations has also been included in the thesis study (Appendix J).

The quantitative analysis procedure began with transferring the survey data collected via Google Forms to Google Sheets (Appendix K). Pivot Tables were created for each data column in separate sheets, and appropriate data visualizations were initiated using these sheets. This process was repeated for a total of 30 different data columns. At this point, discussions with the advisor were held to determine which data visualization methods were suitable for each dataset. Column charts, horizontal bar charts, pie charts, stacked bar charts, word clouds, and clustered bar charts for comparison were preferred as data visualization methods. In general, percentage representations of numerical frequencies were used in addition to numerical frequencies.

Short-answer open-ended questions were analyzed by examining the responses of the 181 participants included in the analysis to better understand them. Similar or synonymous responses were grouped, and these organized insights were tabulated. The same process was repeated to open-ended questions where word-based responses. Word clusters obtained from questions aimed at word associations were visualized using word cloud visualization through the WordArt web-based software. This software also allowed easy access to word frequencies.

Following this data analysis process, which took a total of 1 month, the findings started to be documented. They will be explained in detail in the next section.



4. FINDINGS

Research findings include semi-structured interview findings and survey findings. Firstly, interview findings were analyzed in line with the thematic analysis and presented in the following sections. The survey findings were analyzed with descriptive statistical analysis and presented in related categories to support the interview findings. As a result, a total of 5 categories emerged to answer the research questions. All generated codes created a total of 15 themes and 17 sub-themes. All these categories are explained in detail in the following sections. Table 4.1 illustrates the entire structure of the findings chapter. Appendix L also shows the entire structure of the findings chapter in more detail, along with the emerging codes.

Table 4.1 : Categories, themes and sub-themes of findings chapter.

| Categories | Themes | Sub-themes |
|---|--|---|
| Designers' Sustainability Approaches | Sustainability as a concept | Abstract concept |
| | | Popular concept |
| | | Environmental concept |
| | Sustainability as a daily practice | Consumption practice |
| | | Environmental practice |
| | Sustainability as a critical view | Critics on conceptual clarity |
| | | Critics on economic and corporate realities |
| | | Critics on professional and personal dynamics |
| | Sustainability as a motivation | Extrinsic motivation |
| | | Intrinsic motivation |
| Designers' Knowledge Sources about Sustainability | Design education as a source | |
| | Online sources | |
| | In-company communication as a source | |
| | Immediate circle as a source | |
| Designers' Circular Design Approaches | Long-lasting design | Upcycle |
| | | Reuse |
| | | Lifecycle |
| | | Circularity |
| | Uncertainty | |
| Contribution of Design Education | Design projects and studies | |
| | Developing an understanding | Thinking |
| | | Comprehensive understanding |
| | | Self-criticizing |
| Designers' Competence, Behavior and Professional Identity | Designer competence in sustainability | |
| | Designer behavior in sustainability | |
| | Designer professional identity in sustainability | |

4.1 Designers' Sustainability Approaches

RQ1: How do design graduates conceptualize "sustainability"?

In response to research question #1, the findings regarding the understanding of how design graduates conceptualize sustainability are expressed in this category. In summary, the thematic map of this section is displayed in Figure 4.1.

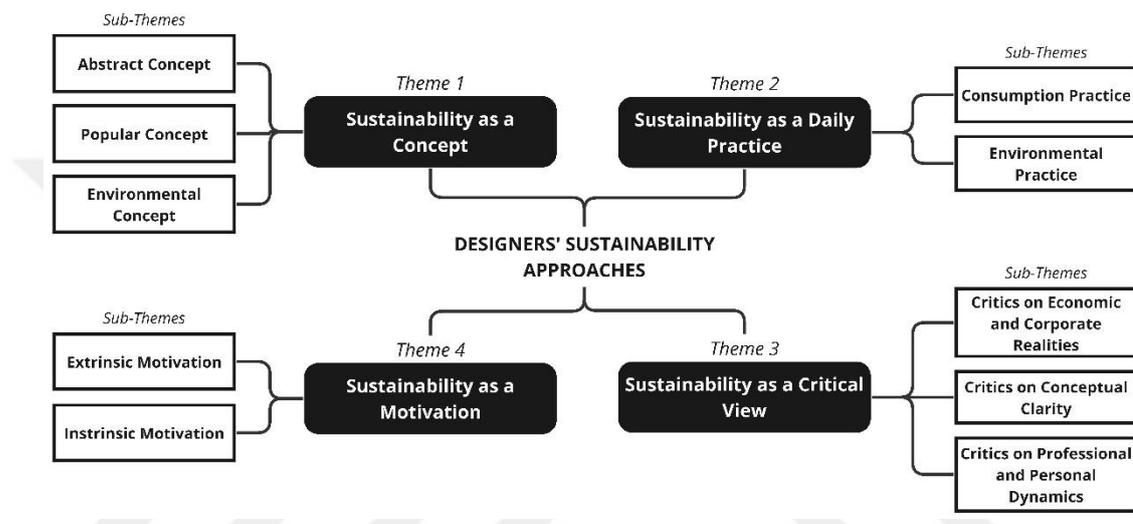


Figure 4.1 : Thematic map of designers' sustainability approaches.

In this category, 4 themes are expressed with their sub-themes. These themes are defined as “Sustainability as a concept”, “Sustainability as a daily practice”, “Sustainability as a critical view”, and “Sustainability as a motivation”. All of these themes are explained in detail, respectively.

4.1.1 Sustainability as a concept

In response to the research question #1, How do design graduates conceptualize sustainability? "Sustainability as a concept" emerged as the first theme. This theme explains the understanding of design graduates to the concept of sustainability, their perspectives on the concept, how this concept reflects on them, and which aspects of this concept they address. Under this theme, three sub-themes are revealed. These are explained as abstract concept, popular concept, and environmental concept. All sub-themes and codes under this theme are displayed in Table 4.2. The number of codes was given in parentheses.

Table 4.2 : Codes and sub-themes of “Sustainability as a concept” theme.

| Theme 1 | Sub-themes | Codes |
|-----------------------------|-----------------------|--|
| Sustainability as a concept | Abstract concept | Multifaceted Concept (9) Complex Concept (4) Changing Terminology (1) |
| | Popular Concept | Trend Topic (5) |
| | Environmental Concept | Environmental friendly Products (5) Reusing Approach (3) Upcycling Approach (2) Continuity of Things (4) Material Properties (4) Association with Tangibility (6) |

4.1.1.1 Abstract concept

This sub-theme reveals the design graduates’ understandings of sustainability as a “multifaceted” and “complex” concept. The code "changing terminology," which deals with sustainability in another term, was not a repetitive code, but it included in the findings as a point the researcher preferred to highlight. The revealed codes in this sub-theme are displayed in Table 4.3. The number of codes was given in parentheses.

Table 4.3 : Codes that form “Abstract concept” sub-theme.

| Sub-theme | Codes |
|------------------|---|
| Abstract concept | Multifaceted Concept (9) Complex Concept (4) Changing Terminology (1) |

Designers, under the code of the multifaceted concept, questioned the different meanings and dimensions of sustainability. The perception of this concept as broad yet intensive has also emerged in various expressions. Designers interpreted the concept of sustainability in terms of its social, economic, and environmental aspects, as well as in terms of career sustainability. Briefly touching on these different approaches, sustainability was expressed the ability of society to sustain itself, the sustainability of systems, basing this concept on systemic change, and sustainability at the organizational level. They expressed sustainability based on an economic model, often

interpreting it within the capitalist system, and expense of sustainable products with purchasing relationship.

Regarding the environmental dimension of sustainability, many designers stated they were knowledgeable. However, it emerged that understandings developed over time. Many designers expressed a designer's responsibility towards the environment, a sense of awareness, and intentions to be sustainable. The foundations of environmental awareness aspects of sustainability were often acquired during design education, which was another notable finding. Some design graduates discussed career sustainability in terms of being able to sustain their current situations, or continuing the work they are doing.

"Sustainability has two different meanings for me. Firstly, it's about whether the work I do can really change things and has a long-term purpose behind it; secondly, of course, it's related to the perspective on nature. Both are really present in my daily life, and the jobs I choose are always related to these aspects." (P15) [Q1]

When some designers were asked about their thoughts on sustainability concepts, they experienced uncertainty about how to approach the topic. There were participants who viewed sustainability as a concept that they had adapted to their lives and lived with. Others described it as a complex concept that is difficult to perceive, express, and communicate. Here, the code "complex concept" emerged intensively. The perceived comprehensiveness of sustainability also made it difficult for designers to express themselves. Findings suggested that referencing sustainability in relation to a project or practice could facilitate its communication.

"..it really is a difficult thing to explain and implement. It's very general. I mean, you can be sustainable in everything. This needs to be detailed further and applied to the work you do. That's why it makes more sense when you think about it on a project basis." (P16) [Q2]

As P16 mentioned, there is a need for more visible and tangible examples to facilitate the communication of sustainability. It was expressed that this concept should be a societal problem that needs to be discussed. In parallel, one of the designers emphasizing the complex aspect of sustainability notably associated the concept of sustainability with the "hyperobject" concept.

"There is a concept called hyperobjects, like internet capitalism. These are massive concepts, but we as humans can only understand the parts that we interact with. I think our efforts towards

sustainability, stemming from climate change and our climate anxiety, are also a bunch of hyperobjects. So, because the concept of sustainability is a hyperobject, it's very difficult to explain, discuss, and practice it easily.” (P8) [Q3]

Design domain contains many areas of expertise, and the complexity of the concept of sustainability makes it challenging to feel equipped in this regard.

4.1.1.2 Popular concept

This sub-theme reveals the findings that designers expressed with different tones. While some designers mentioned the trendiness of this concept in a more unwilling way, others expressed it in a more neutral manner, and some with more enthusiasm. The revealed code in this sub-theme is displayed in the Table 4.4. The number of codes was given in parentheses.

Table 4.4 : Codes that form “Popular concept” sub-theme.

| Sub-theme | Codes |
|------------------|-----------------|
| Popular concept | Trend topic (5) |

Some designers stated that they were exposed to the concept of sustainability due to its trendiness and thus became familiar with it. Others, like P13, mentioned that they encountered this concept frequently and expressed their satisfaction with this frequent exposure.

“The word 'sustainability' is incredibly present in our lives. Recently, it's appearing everywhere.” (P13) [Q4]

Other designers, considering the trend understanding of sustainability from a marketing strategy perspective, pointed out that many brands today market themselves as sustainable and indicated that in fact, they developed an understanding of the concept in this way. Another point is that this often-trendy concept within companies is not fully understood. Many designers have addressed this issue in more detail in the later parts of this thesis study. A participant has described their experience as follows:

“My foresight about sustainability is that currently, all around the world, I see everyone using this word, but no one really knows what it exactly means. I think this is a big problem.” (P16) [Q5]

It has been stated that sustainability is a frequently discussed concept, often addressed, and has intentions for implementation. It can also be mentioned that the internet and social media have triggered this trend. However, the effectiveness and tangible outcomes of initiatives related to this concept are unclear.

4.1.1.3 Environmental concept

This sub-theme reveals the environmental understanding of design graduates related to eco-friendly products, reusing, upcycling, sustainability, and material characteristics. The majority of designers stated that they could associate the concept of sustainability with more concrete, visible objects. The revealed codes in this sub-theme are displayed in the Table 4.5. The number of codes was given in parentheses.

Table 4.5 : Codes that form “Environmental concept” sub-theme.

| Sub-theme | Codes |
|-----------------------|--|
| Environmental concept | Environmental – Friendly Products (5) Reusing Approach (3) Upcycling Approach (2) Continuity of Things (4) Material Properties (4) Association with Tangibility (6) |

Designers predominantly interpreted the concept of sustainability as not harming the environment and ensuring that their work is beneficial rather than harmful to living beings and the planet. In terms of reuse, they interpreted sustainability more as using an object for an extended period. They also emphasized the aspect of upcycling, which involves transforming an object into something else for continued use instead of continuously consuming and discarding. They contemplated how an object could be used differently or made usable after a certain time has passed. However, they criticized that consumption habits do not validate this approach effectively. Essentially, they dealt with sustainability in terms of the ability to maintain continuity. As P13 indicated, there were also designers who considered this continuity or maintainability in terms of ensuring the continuity of generations or acting with future generations in mind.

“The first thing that comes to my mind is that we need to make an effort and take necessary actions to pass on the resources we currently have to the next generations in every way possible. I believe we need to act in this context.” (P13) [Q6]

As shown by the Word Cloud visualization in Figure 4.2, 6,5% of the total words associated with sustainability by participant designers were the word “environment”. More than 5% of the words were “nature” and about 4,5% of words were “recycling”. 4% of the total words were the word “green” and more than 3% were the words “cycle”, “transformation”, “material” and “product”. Nearly 3% of the words were "future" associated with sustainability. In general, the majority of participant designers expressed non-repetitive words.

4.1.2 Sustainability as a daily practice

In response to one of the research questions of how to design graduates conceptualize sustainability, another emerging theme is "Sustainability as a daily practice". This theme aims to understand how designers practically incorporate sustainability into their daily lives. Within the scope of this theme, designers were asked how sustainability features in their daily lives and what their related practices are. As a result, two main sub-themes emerged under this theme. These are consumption practice and environmental practice, and explained in detail under this theme, respectively. All sub-themes under this theme are displayed in Table 4.6. The number of codes was given in parentheses.

Table 4.6 : Codes and sub-themes of “Sustainability as a daily practice” theme.

| Theme 2 | Sub-themes | Codes |
|------------------------------------|------------------------|--|
| Sustainability as a daily practice | Consumption practice | Less Consumption (14) Waste-free Product Consumption (2) Quality Product Consumption (3) Consumption Criteria (4) |
| | Environmental practice | Sorting Garbage (8) Recycling (4) Long-term Use (6) |

4.1.2.1 Consumption practice

This sub-theme reveals the sustainability practices of designer graduates in terms of consumption. The repetitions of these codes have predominantly brought forward the code of "less consumption". Consumption criteria appear in a way that will influence consumption approaches and choices. Other codes related to the mode of consumption,

such as the consumption of waste-free products and high-quality products, have also emerged as defining codes for the sub-theme of consumption practice. The revealed codes in this sub-theme are displayed in the Table 4.7. The number of codes was given in parentheses.

Table 4.7 : Codes that form “Consumption practice” sub-theme.

| Sub-theme | Codes |
|----------------------|--|
| Consumption practice | Less Consumption (14) Waste-free Product Consumption (2) Quality Product Consumption (3) Consumption Criteria (4) |

Research findings predominantly showed that designers practice less consumption in their daily lives. This notion of less consumption also encompassed reduced consumption of textiles. Many participants specifically mentioned that they are careful about buying fewer clothes when it comes to textile purchases. In this regard, more need-focused consumption criteria regarding textile consumption emerged in the findings.

“I try not to buy too many products. Actually, I think this is the most sustainable behavior. If I don’t need it, there’s no need for it, or if certain things that are needed can be solved with simpler systems, then they might not be necessary either.” (P4) [Q8]

Similar to the needs-oriented approach mentioned by P4, another participant stated that the concept of cost per use into consideration when purchasing clothes. Here we can see that certain criteria are effective in the consumption practices of designers. P10 stated that it aims to keep consumption minimum but meaningful by focusing on the long-term use and long-term benefits of a product, taking into account the cost-per-use criterion.

“In every clothing choice I make, I try to consider concepts like cost per use. I strive to purchase fewer items, focusing on quality and longevity of use.” (P10) [Q9]

There were also more sensitive approaches regarding textile consumption, some of which draw attention to other environmental and social issues that affect textile consumption. P4, who considers the type of labor involved according to the material as a consumption criterion and consumes textiles based on this, expressed awareness of this issue as follows:

“I don't buy many clothes because I know they require a lot of effort. Different fabrics need to be cleaned in different ways, and I'm aware of the journey they take, often made by inappropriate labor, before reaching my country. I know about the chemical wastes that can be transformed into enzymes. I'm conscious of these aspects.” (P4) [Q10]

The material factor influencing textile consumption choices was again prominent for designers. Concerns about how much chemical content materials have, their logistic process and the uncertainties regarding their recycling encouraged the participant to consume fewer textiles. Overall, factors affecting designers' consumption practices include cost per use, meeting needs, considering labor, paying attention to materials, and even consuming based on following companies that advocate for sustainability. Another daily practice of designers aimed at reducing consumption, especially during grocery shopping, was reducing their use of plastic bags. Instead of using paid plastic bags at stores, they carry their cloth bags to reduce plastic usage. The motivations for this practice varied among participants. In addition to consuming less, another finding regarding designers' consumption practices was directed toward the consumption of waste-free products. The focus was on consuming products that would generate less waste. As P14 mentioned, the approach was towards consuming products that create less waste, are refillable, or can be upcycled for long-term use.

“For instance, since I live abroad, I try to buy things that produce as little waste as possible. Instead of buying bottled shampoo, I prefer refillable shampoos that I can put in glass jars and such. I give importance to these types of things. That's how I value it, other than that, I don't know. Actually, I haven't really thought much about this topic.” (P14) [Q11]

Besides P14's consumption orientation, it appears the designer has not considered daily practices about sustainability. However, the primary motivation for this participant's practice was the country they lived in. In addition consuming products that generate less waste, another finding was the consumption of quality products. P16 also mentioned consuming quality products, prioritizing durability and quality in their daily practices.

“Let me just say the first things that come to mind. For example, when I'm buying something, whether it's clothing or an electronic item, I generally try to buy more expensive but higher quality products so that I can use them for a longer period. Instead of constantly buying things, I end up spending less time shopping and can use the items for a longer duration. In the end, it becomes sustainable.” (P16) [Q12]

The purchase of durable or quality products is commonly associated with the sustainability of the product and has emerged as a preferred characteristic by designers in terms of consumption. Many participants also emphasized their efforts to consume products that can be used for a long period.

4.1.2.2 Environmental practice

This sub-theme reveals the sustainability practices of design graduates in terms of environmentally friendly approach, sorting garbage, recycling, and long-term use. The revealed codes in this sub-theme are displayed in Table 4.8. The number of codes was given in parentheses.

Table 4.8 : Codes that form “Environmental practice” sub-theme.

| Sub-theme | Codes |
|------------------------|---|
| Environmental practice | Sorting Garbage (8) Recycling (4) Long-term Use (6) |

The practice of sorting garbage was commonly mentioned as the first thing that comes to mind of designers. Designers have addressed the code of sorting of garbage in various aspects. In addition to the standard practice of sorting garbage by materials such as glass, plastic, and cardboard, different aspects such as disposing of oil waste separately and segregating food waste were also expressed. However, the motivations behind these practices vary.

“I don't pay much attention to separating garbage. For example, in the kitchen, I freeze things to prevent waste. I do this to make the items in the kitchen more sustainable because they spoil quickly.” (P1) [Q13]

P1 stated that did not show any behavior in separating garbages. However, the designer has certain practices specifically to prevent food waste. In this regard, it can be seen that sustainability in the case of food is addressed more sensitively in the designer's daily life compared to other types of materials. Apart from P1, the insights of the designer who thought that was not aware of food waste were revealed in the findings. However, these findings are not majority. Some designers indicated that they engage in waste separation to some extent, while others are very conscious and sensitive about

it. There were also designers who mentioned that they have adopted this behavior as a result of the behavioral interventions by the country they live in.

“Living in the UK, this is a necessity. In Türkiye, my understanding of sustainability was limited to giving leftover food to street animals. Here, everything is more organized. There are separate bags for food waste, cardboard, plastic, glass, etc. I can only buy these special bags in certain quantities and for certain fees. So, it's a matter of strict compliance. There's even a specific day and time for it. Hence, my perception of sustainability has shifted to a completely different level here.” (P17) [Q14]

P17, who previously lived in Türkiye, has spoken about the change in their life due to the different practices of waste separation in the country they currently reside in. However, the researcher observed that the consistency in practicing this in their daily life was due to a lack of personal motivation. This practice is more of a behavior enforced by the country's regulations and has become a necessity due to a changing relationship. The motivation behind another participant in Türkiye for waste separation emerged in a different form.

“I don't do much in terms of separating my garbage; I only sort it when I'm outside.” (P7) [Q15]

P7's motivation to separate and dispose of waste at home is understood to be low. However, the presence of different recycling bins in public spaces, or the influence of the surrounding environment, seems to motivate the participant to separate their waste for disposal.

Another prominent insight is recycling, which has emerged as a frequently mentioned practice among designers, often linked to the practice of waste separation. However, one participant has described recycling in a different sense, referring to it as upcycling.

“Even though I work at a glass company, I often don't go to a glass recycling point if there isn't one nearby. The only things I consider in terms of recycling are items that I think could be useful for another purpose, so I tend to keep them.” (P9) [Q16]

In this regard, another concentrated insight includes the practices of secondary use, long-term use, and upcycling. P9's lack of motivation for separation can be attributed to a lack of incentives in this area. Nonetheless, they have stated a general approach of sustaining the use of a consumed item for a long period in their daily life. Other

participants have also referred to this concept as long-term use. P7 has described their practice of extending the lifespan of products they use by taking sustainability measures in their own life as follows:

“Everything is sustainable. Even a piece of clothing has sustainability. For instance, when you don't wash a garment at excessive temperatures, or like it says inside jeans. When you turn them inside out and wash them, you're actually making them sustainable; you're extending its lifespan. I try to take such precautions. (P7) [Q17]

Participants who, like P7, consider long-term use at an individual level may also be motivated by financial reasons. The practice of long-term use emerges as a preference among designers both for its perceived economic benefits and for the purpose of being beneficial to the environment.

4.1.3 Sustainability as a critical view

In response to the research question of “How to design graduates conceptualize sustainability?”, another emerging theme is "Sustainability as a critical view". This theme mainly aims to understand how designers criticize sustainability. As a result, four sub-themes emerged under this theme. These are “Critics on conceptual clarity and implementation”, “Economic and corporate realities”, and “Professional and personal dynamics”. All sub-themes under this theme are displayed in Table 4.9. The number of codes was given in parentheses.

Table 4.9 : Codes and sub-themes of “Sustainability as a critical view” theme.

| Theme 3 | Sub-themes | Codes |
|---|--|--------------------------------------|
| Sustainability as a critical view | Critics on Conceptual Clarity | Vague of sustainability criteria (3) |
| | | Uncertainty of transparency (5) |
| | | Vague of comprehensive knowledge (9) |
| | Limitations of the implementation (12) | |
| Critics on Economic and Corporate Realities | Economic situation (5) | |
| | Corporate culture (6) | |
| | Marketing strategy (7) | |
| Critics on Professional and Personal Dynamics | Recognition of profession (6) | |
| | Systemic responsibility (8) | |
| | Personal commitment (11) | |
| | Professional competence (6) | |
| | | Vague of self confidence (6) |

4.1.3.1 Critics on conceptual clarity

This sub-theme reveals the design graduates' criticisms of the uncertainties and practices related to sustainability. It also highlights the difficulties encountered in addressing the concept of sustainability in design practice. Within this sub-theme, insights mention the uncertainty of sustainability and the limits of sustainability. The tangibility of outcomes in line with the transparency of sustainability is another point of criticism. The difficulty of integrating knowledge about sustainability into practice and the lack of comprehensive knowledge on the concept are also prominent insights. The revealed codes in this sub-theme are displayed in the Table 4.10. The number of codes was given in parentheses.

Table 4.10 : Codes that form “Critics on conceptual clarity” sub-theme.

| Sub-theme | Codes |
|-------------------------------|---|
| Critics on conceptual clarity | Vague of Sustainability Criteria (3) Uncertainty of Transparency (5) Vague of Comprehensive Knowledge (9) Limitations of the Implementation (12) |

The ambiguous aspects and limits of sustainability were a criticism frequently expressed by designers. When designers were asked during interviews how competent they felt themselves, these expressions particularly came to the fore. The blurred of what competencies sustainability truly requires within the profession and the conditions necessary for a situation to be fully sustainable were perceived as unclear by the designers. P6 expressed the lack of knowledge about how sustainable one can be as follows:

“I don't know how sustainable one can be, but of course, there are things in my personal life that I try to pay attention to.” (P6) [Q18]

It is apparent that P6 is committed to sustainability efforts in their personal life. However, they acknowledge a gap in their knowledge regarding the specific qualifications necessary to be fully proficient in sustainability. The uncertainty surrounding the limits of being entirely sustainable is highlighted by other designers as well. The ambiguity of being entirely sustainable and the previously expressed multifaceted nature of sustainability make the issue complex and challenging to understand. This complexity has made it difficult for designers to evaluate their own

proficiency in sustainability. Another participant emphasized the uncertainty of the conditions and environments in which being fully sustainable can be achieved.

“What exactly does a fully sustainable thing mean? Like, what are we able to sustain? Since these aren't very clear, it's like I'm competent but I'm not sure if there's a professional title for this yet, so that's why.” (P18) [Q19]

P18 highlighted that to define a state of complete sustainability, we must also know specifically what we are capable of sustaining. One of the most significant points made by P18 is the belief that sustainability does not encompass a field of expertise for evaluating competencies within itself. The designer assessed themselves as competent from their perspective but expressed that they could not find a solid basis for this belief in competence, also emphasizing the lack of specialized professionalism in the field of design.

The transparency of sustainability has emerged as another issue criticized by designers in the context of clarity of sustainability. Designers often associate transparency with companies' sustainability campaigns, criticizing these campaigns for lacking a basis in reality. One participant connected this issue with the capitalist system, criticizing the approach to sustainability in corporate campaigns as merely a marketing strategy and highlighting the lack of transparency in this matter.

“I think that things we assume or perceive as sustainable aren't really so in a capitalist system, unfortunately. Frankly, the efforts of companies - although I don't know the details in depth - seem to me more like promotions or show, to be honest.” (P11) [Q20]

P11 criticizes the transparency of sustainability initiatives, suggesting that sustainability is used by companies as a promotional element for economic gains, while also highlighting the uncertainty of the outcomes of these promoted sustainability initiatives. Another distinct approach to the critique of transparency is the ambiguity of information regarding how sustainable a product is, as expressed by P4.

“For product sustainability, because it's an important issue at my current workplace, but the thing is, I don't know how sustainable the products I use are, or what their carbon footprint is. Sometimes, I don't even want to know.” (P4) [Q21]

P4 has criticized the lack of information about how sustainable products labeled as sustainable truly are in our daily lives, such as their carbon footprint or their actual sustainability credentials. Interestingly, the designer lacks the motivation to obtain this information. The possibility of disappointment, if transparency were to be achieved, could be a reason for this lack of motivation to obtain information. Another designer questioned where the waste they separated for recycling ultimately ends up and highlighted the absence of transparency in this aspect.

“I put my daily household waste in a blue bag, but where do those go? I have no idea.” (P17)
[Q22]

P17 has highlighted the lack of knowledge of background in the recycling process within their sustainability practice, pointing out the information gap in this process. For many designers, the lack of transparency in sustainability is perceived as a significant problem. The lack of clarity and transparency in sustainability is seen to create difficulties in the implementation of designers' own practices. Some designers have expressed uncertainty about how much they can integrate sustainability into their design practice.

“When I think about sustainability in terms of preserving nature, I can call myself knowledgeable. However, how much I can adapt this to my design practice is a question for me.” (P7) [Q23]

P7 has identified herself as being knowledgeable about sustainability with an environmental approach but has expressed experiencing uncertainty when applying this knowledge to design practice. This points to a broader issue of designers' uncertainty about translating knowledge into practice, which could stem from not knowing how to implement or a lack of guidance. Research findings have revealed that the distinct requirements of designers' specialties can complicate this application. The views of designers working in the digital field are notably different from those of physical product designers. P14, as a digital product designer, has emphasized the lack of expertise in sustainability within their field.

“There is nothing like this in my job. Because I work in something very digital and fast-paced, and I don't think there is such an approach.” (P14) [Q24]

P14's critique highlights that the rapid adaptation required in the field of digital design makes the integration of sustainability challenging. This shows that designers working in the digital realm feel that sustainability issues cannot be accommodated within processes that demand quick adaptation. Repeating similar sentiment, P12, also working in the digital sector, discusses the absence of sustainability in their professional practice, emphasizing the rapid nature of workflows in digital processes.

“I don't think it holds a place in a professional sense. Especially after the digital sector emerged, it started to lose its meaning even more. I mean, there were other critical issues on that side.”
(P12) [Q25]

As a differing perspective, P12 indicates that the prioritization of criteria such as quality and production speed in different business models within their specialty makes focusing on sustainability more challenging. The complexity of sustainability, as perceived by designers, further complicates the integration of this concept into their practices and focusing on it. For physical product designers, the integration of sustainability into practice has been critiqued in relation to the specific industry they work in.

“We haven't had the opportunity in our projects yet. We always follow these kinds of research in terms of work, but we couldn't adapt much due to the sector we are in.” (P9) [Q26]

Many designers, as expressed by P9, follow sustainability issues within their respective sectors, yet they criticize that the sector in which they conduct their design practice is not sufficiently effective in addressing this issue or that suitable environments for sustainable practices have not been established.

4.1.3.2 Critics on economic and corporate realities

This sub-theme reveals the concept of "Critics on economic and corporate realities", which is one of the sustainability critics of designers. This sub-theme reveals the aspects criticized by designers regarding economic challenges and difficulties in corporate implementation related to sustainability. It draws attention to the relationship between sustainability and economic conditions and also highlights the impact of living conditions. Additionally, within this sub-theme, the approach to sustainability under corporate culture and the impact of design processes in organizations on designers are examined. Insights obtained from designers within this sub-theme have

mentioned marketing strategy. The influence of corporate culture has emerged as another point of criticism. Economic conditions are another insight within this sub-theme. The revealed codes in this sub-theme are displayed in the Table 4.11. The number of codes was given in parentheses.

Table 4.11 : Codes that form “Critics on economic and corporate realities” sub-theme.

| Sub-theme | Codes |
|---|---|
| Critics on economic and corporate realities | Economic Situation (5) Corporate Culture (6) Marketing Strategy (7) |

One of the criticisms among designers was the influence of economic conditions on sustainability. Many designers mentioned that the challenges brought by their living conditions make it difficult to maintain sustainable practices.

“I feel like being able to do things on a larger scale is parallel to my financial conditions.” (P6) [Q27]

P6 approached the topic of sustainability by directly linking to financial conditions, suggesting that initiatives with a greater impact are often contingent on the economic situation. Another designer mentioned the reason for the consumption of sustainable products in everyday life as due to the higher costs associated with non-sustainable products. Some designers criticized the relationship between sustainable products and economic conditions, particularly pointing out that the high cost associated with the material quality of sustainable products makes them expensive. This cost factor is not seen as an incentive for designers. Although many designers are interested and willing to buy such products, the prohibitively high prices often prevent them from making such choices. P3 has also shared their view on this matter from their own perspective.

“To be honest, I don't buy them, I prefer not to. Because sustainable products tend to be a bit more expensive than the regular ones. That's why I can't choose them.” (P3) [Q28]

In a contrasting approach, a designer whose economic conditions have improved emphasizes that they can now pay more attention to the background of the products they consume because they can afford sustainable products. This suggests that better

financial standing can enhance a designer's ability to engage with sustainability concepts in a more informed and conscious way.

“As my financial situation has improved a bit recently, when I buy a product now, I pay attention to where it comes from, who made it, what material it is made of, and how much water might have been used in its production.” (P4) [Q29]

These designer perspectives show that economic conditions have a strong connection to their choices regarding sustainability and the criteria for consuming sustainable products. In addition to these economic conditions, many participants have justified that the challenges of daily urban life and the hustle of the work environment are not conducive to taking sustainable actions. Reflecting on another concentrated insight, the criticisms related to corporate culture highlight whether the environment within a company is encouraging towards sustainability or not, which is frequently critiqued by designers.

“With both getting older and involving the work life, particularly in a global company, the concept of sustainability has begun to shift for me, taking on a different context.” (P8) [Q30]

Other designers who think like P8 have also expressed that the perception of sustainability has evolved with professional life and settled into different contexts. The change in perception with age, as mentioned by P8 and other designers, is another factor at play. However, there is an ambiguity in this area. Although the influence of corporate culture is often emphasized, the exact source of the change in perception toward sustainability may not be attributed to a single situation.

“Previously, I could genuinely consider questions like 'Which bag should I buy? Which one is more sustainable?' or advocate for consuming local foods. However, once I entered the work life, life's necessities turned into a struggle for survival for me.” (P8) [Q31]

Similarly, P8 emphasizes that their commitment to sustainability has waned with the impact of their professional life. This shift in the designer's views could be influenced by the attitude of the organization they work for or the lack of encouragement from their work environment. As previously mentioned by designers, the use of sustainability as a marketing strategy by companies to project a good image may have undermined the designers' realistic perspective on the subject. The nature of their job description and the expectations associated with it may also have led to a negative effect of the corporate culture on the designers.

“Sustainability is not a major focus in the action plan at my workplace. It is more often mentioned in words only, so I would say my expertise is below average because the workflow does not primarily expect me to target sustainability. The first consideration is whether the product fulfills its function, that is, the approach is to handle the product in its simplest form.”
(P2) [Q32]

P2 indicates that the internal expectations of their organization are more focused on the functionality of the product, and also discuss the intention to take action within the organization but point out the inadequacy in practice. The designer admits to feeling incompetent because they are unable to fully integrate the practice of sustainability into the business workflows. In addition to meeting the expectations within the company, the lack of appropriate briefings that would enable the designer to implement their sustainability practices within the organization is also identified as a major issue.

4.1.3.3 Critics on professional and personal dynamics

This sub-theme reveals the sustainability understanding as a critical view of design graduates regarding professional and personal dynamics about sustainability. It highlights the non-recognition of expertise in sustainability, the scarcity of exemplars to follow, criticisms of personal commitment, and the responsibility of systems. It also reveals deficiencies in professional competence and confidence about sustainability. The revealed codes in this sub-theme are displayed in Table 4.12. The number of codes was given in parentheses.

Table 4.12 : Codes that form “Critics on professional and personal dynamics” sub-theme.

| Sub-theme | Codes |
|---|---|
| Critics on professional and personal dynamics | Professional Recognition Deficit (6) Responsibility of Systems (8) Personal Commitment (11) Vague of Professional Competence (6) Vague of Self Confidence (6) |

Designers criticized the lack of recognition for their expertise in the field of sustainability, a phenomenon they perceive as multifaceted and complex. They highlight that examples of sustainability within their professional environment were

scarce. Consequently, designers often emphasize the lack of sustainable exemplars to guide their practices. This situation was expressed by P16 as follows:

“Everyone is trying to implement and explain sustainability from their own perspective, but I see very few people and very few jobs that can really explain and apply what it actually is.”

(P16) [Q33]

Despite the fact that sustainability is widely discussed and has become somewhat of a trend, as many designers have mentioned, the lack of encountering individuals who actually practice it in their daily work has been another subject of critical views. Designers, particularly those in the field of digital design, have noted that they never come across this concept in their work environment, which contributes to their feeling of inadequacy in this area.

“I don't feel competent. The reason is, I haven't encountered it. I believe that for a designer to feel competent, it's relate about experiencing it.” (P12) [Q34]

According to P12, the lack of attention to the concept of sustainability within their industry hinders their familiarity with this professionalism. Moreover, the absence of exemplars in this concept has led to the belief that they cannot develop competence in this area. P12 critiques the necessity of experiencing the concept to feel competent in sustainability and explicitly expresses their lack of expertise.

The idea of competence has also been mentioned by other designers. However, for some, this also encompasses a sense of lack of self-confidence regarding sustainability matters. Some designers have also interpreted sustainability practices as being time-consuming or exhausting activities. This perspective reflects a lack of commitment to sustainability due to the perceived burden of these actions. Another critical view was the inability to prioritize sustainability. In this context, P5 rationalized that time constraints or complex tasks prevent prioritizing sustainability, thus indicating a low commitment to the issue.

“I have plans in my mind, but some of them just don't come to fruition due to lack of time. I'm thinking about so many things, and I can't prioritize them.” (P5) [Q35]

Interview findings revealed that participant designers generally addressed their lack of competence in sustainability from a critical perspective. To support this perspective, a survey question was conducted with a larger group of designers. In the results of this

study, participant designers evaluated their level of competence. Figure 4.3 shows the self-assessment results of the designers from survey findings.

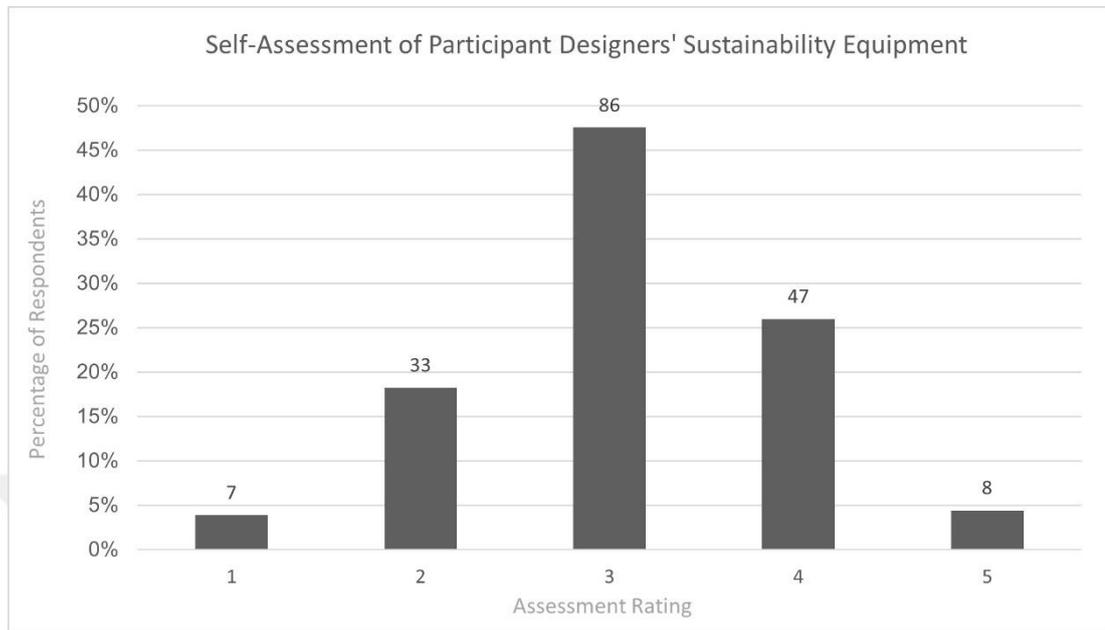


Figure 4.3 : A bar graph showing participant designers' self-assessments of being well-equipped for sustainability.

According to the survey findings, 47.5% of the participant designers rated their sustainability-related equipment as average. Only 4% of participants rated their equipment as very low. Conversely, 4.5% of participants rated themselves as highly equipped.

Within this sub-theme, another interview finding was expertise and efforts regarding sustainability are often unfairly attributed solely to individuals. Many designers stated that they tackle sustainability on a personal level and that their knowledge is confined to the individual level. However, some participants pointed out the futility of these individual efforts, emphasizing the need for systemic change to truly achieve sustainability.

“In my professional context, I want to look at this issue from a different perspective. As a designer or a person involved in production methodologies connected to consumer products, how can I use my knowledge and beliefs as a lever? It's clear that what I create and do alone won't be sufficient, but within an organization, perhaps I can initiate something that could snowball into something bigger, though this wouldn't be something I could do alone.” (P8) [Q36]

P8 believes that as an individual, the impact they can generate is limited. Nonetheless, the designer remains conscious of their skills, knowledge, and potential impact as a designer. Also, express a desire to create a shared awareness that can guide or influence a community, emphasizing the necessity for collective action. While pointing out the inadequacy of individual efforts, P8 also highlights the need for systemic change in different terms.

“Really, the mediums that could make a significant difference with their decisions are not taking those decisions.” (P8) [Q37]

The designer posits that the potential for change created by decision-makers can have a greater impact compared to the responsibilities attributed to individuals. Consequently, it is understood that there is a need for collective action and behavior to address sustainability.

4.1.4 Sustainability as a motivation

In response to the research question of how designers conceptualize sustainability, another emerging theme is "Sustainability as a motivation". This theme mainly aims to understand how designers’ motivations emerge towards sustainability. As a result, two sub-themes appeared under this theme. These are “Extrinsic motivations”, and “Intrinsic motivations”. All sub-themes under this theme are displayed in Table 4.13. The number of codes was given in parentheses.

Table 4.13 : Codes and sub-themes of “Sustainability as a motivation” theme.

| Theme 4 | Sub-themes | Codes |
|--------------------------------|----------------------|---|
| Sustainability as a motivation | Extrinsic Motivation | Government regulations (3) In-Company regulations (2) Sustainability mindset in Education (2) |
| | Intrinsic Motivation | Environmental consciousness (3) Willingness (6) General awareness (5) Sustainability engagement (2) Sense of responsibility (8) Personal value alignment (3) Lifestyle choice (3) |

4.1.4.1 Extrinsic motivation

This sub-theme highlights the motivational understandings of designers that emerge from external motivators. Within this sub-theme, government regulations, in-company regulations, and sustainability mindsets in education emerged as insights of design graduates. The revealed codes of this sub-theme are displayed in the Table 4.14. The number of codes was given in parentheses.

Table 4.14 : Codes that form “Extrinsic motivation” sub-theme.

| Sub-theme | Codes |
|----------------------|---|
| Extrinsic motivation | Government Regulations (3) In-Company Regulations (2) Sustainability Mindset in Education (2) |

Regulations of governments have emerged as the factor that keeps designers motivated to be sustainable. At this point, the opinions were that the behavioral interventions of the more populated countries motivated them to demonstrate sustainable behavior. However, the majority of designers also express these interventions as enforcing interventions.

“In the place where I live now, everything is more planned. Food waste, cardboard, plastic, glass - they all have separate bags. I can buy these special bags in certain quantities and at certain prices. It's incredibly enforced. There's a specific day and time for it. That's why the concept of sustainability has taken a completely different turn for me here.” (P17) [Q38]

P17 stated that it is obligatory to put the garbage for recycling purposes into separate bags due to the country they live in and that every citizen must do this practice. However, although the fact that these behavioral interventions are challenging motivators for the designer to continue this behavior, it is unclear whether the designer continues this behavior in line with personal values. Regarding the impact of the constraints imposed by the practices in the country of residence on motivation, another designer living in Türkiye expressed as follows:

“But this isn't something I've done on my own. For instance, when coffee sellers replaced plastic straws with paper ones, my usage decreased. Or when a charge was introduced for plastic bags, it also contributed. I already wanted to be sustainable, and these changes triggered me further.” (P1) [Q39]

We see that P1's main motivation is not to avoid paying for plastic bags. Although the designer already aims to be sustainable, noted that the behavioral intervention was actually encouraging. Other participant designer who previously lived in Türkiye but later continued to live in Europe emphasized that the country of residence makes it possible to exhibit sustainable behavior.

“I reflect on it, and being in Germany, I feel lucky. I can afford to be selective in certain aspects.” (P15) [Q40]

It is seen that encouraging sustainable products and practices in foreign countries or providing easy access to them helps designers living there develop a commitment to the sustainability concept. From another perspective, designers expressed their motivation sources through the interventions of the institution they work for.

“At my workplace, for instance, we don't use paper cups. In fact, there are no paper products anywhere, nor are there trash bins. Under everyone's desk are only sorting areas. When you drink something or open a packaged product, you're expected to dispose of it properly. I used to recycle these items myself, but now the company mandates this for everyone. We have these green practices embedded automatically.” (P10) [Q41]

According to P10, having recycling bins specific to each employee in the workplace, which will encourage them to separate material types, will encourage employees to throw the right materials to the right recycling points. The lack of use of paper products within the institution and even the absence of a common garbage bin prevent the use of paper by people within the institution. While the designer is already conscious, points out that the practices within the company motivate all other colleagues. In addition to all these behavioral interventions, a designer stated that the source of motivation in this regard started from design education.

” Even back then, at that earlier date, this issue was very important. There was talk that in the future, designers, particularly industrial designers with a focus on sustainability, would be more prevalent in the market. This made me think that sustainability would be an important factor in my competitiveness, so it became one of my priorities. This situation led me to conduct research on the topic.” (P2) [Q42]

The importance given to sustainability issues during the education and the fact that the educational environment had sufficient awareness on sustainability provided the initial motivation for the designer. Similarly, other designers mentioned their undergraduate

education as the place where they first considered the concept of sustainability and gained their first motivation in this direction.

4.1.4.2 Intrinsic motivation

This sub-theme highlights the motivational understandings of designers that emerge when sustainability becomes a perspective and lifestyle in the lives of designers in line with the adopted values. Within this sub-theme, environmental consciousness, willingness, general awareness, sustainability engagement, sense of responsibility, personal value alignment, and also lifestyle choices emerged as insights that highlight the intrinsic motivation of designers. The revealed codes of this sub-theme are displayed in the Table 4.15. The number of codes was given in parentheses.

Table 4.15 : Codes that form “Intrinsic motivation” sub-theme.

| Sub-theme | Codes |
|----------------------|---|
| Intrinsic motivation | Environmental Consciousness (3) Willingness (6) General Awareness (5) Sustainability Engagement (2) Sense of Responsibility (8) Personal Value Alignment (3) Lifestyle Choice (3) |

Although the adaptation of sustainability-oriented behaviors to lifestyles and seeing them as a lifestyle was expressed by relatively few designers, it emerged as a valuable insight. Designers who gave this insight often stated that their values also align with sustainability.

“In my personal decisions regarding sustainability in my life, there's nothing rigid or fixed that I do, but generally, I have some values, and I always try to create a lifestyle that aligns with those values. I try to make my decisions accordingly.” (P15) [Q43]

According to P15, we can see the designer did not present sustainable behavior in daily life but internalized the sustainability concept. It is seen that there are changes in the designer's lifestyle in line with these values and decisions. Another participant stated that adopted values regarding sustainability were also influential in career choices. The designer also mentioned that rejected many job offers from non-sustainability advocators companies.

Another designer who adopted sustainability as a lifestyle expressed as follows:

“I don't limit myself to just being a consumer who exhibits sustainable behavior. I don't dwell on that too much. I try to see it as a lifestyle approach.” (P18) [Q44]

Interestingly, like P15, P18 said that did not exhibit obvious sustainability-oriented behaviors in daily life. However, the designer stated that adopted sustainability-oriented values as a lifestyle.

Another designer expressed sustainability by addressing lifestyle adaptation:

“It evokes the idea of adapting something I need into my life and maintaining it. As long as I need it, I will continue to use it, and it will be beneficial.” (P19) [Q45]

According to P5, it is understood that perceiving sustainability as a lifestyle will ensure its continuity and that it will actually provide benefits only in this way. This is an important insight because although designers often explicitly state that they do not demonstrate sustainable behavior in their daily lives, they are more aware of the values of this concept and the impact it will have if it becomes a part of their lifestyle. In this regard, it can be deduced from other designer insights that thinking about the continuity of future generations is also a motivational element in adapting this idea to the lifestyle.

4.2 Designers' Knowledge Sources about Sustainability

RQ2: What are the knowledge sources of sustainability for designers?

In response to research question #2, the findings regarding what are the knowledge sources of sustainability for design graduates are expressed in this category. In summary, the thematic map of this section is displayed in Figure 4.4.

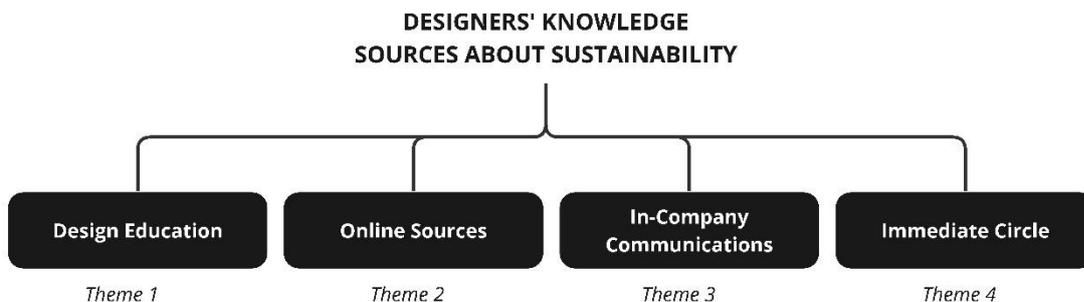


Figure 4.4 : Thematic map of the designers' knowledge sources of sustainability.

As seen in thematic of this category, 4 themes are expressed. These themes are defined as “Design education as a source”, “Online sources”, “In-company communication as a source”, and “Immediate circle as a source”. The codes that emerged from the participant designer insights and the formation of these themes are displayed in Table 4.16. The number of codes was given in parentheses.

Table 4.16 : Codes of “Design education”, “Online sources”, “Immediate circle” and “In-company communication” themes.

| Themes | Codes |
|--------------------------------------|--|
| Design education as a source | Undergraduate design education (9) Postgraduate education (2) Workshop (1) |
| Online sources | Social media (11) Trends (4) Desktop research (5) Blog posts (2) Online documentaries and videos (2) |
| Immediate circle as a source | Family (4) Close friends (2) |
| In-company communication as a source | Workplace (7) Company reports (2) Brand advertisements (3) Colleagues (3) |

4.2.1 Design education as a source

In response to the research question of “What are the knowledge sources of sustainability for designers?”, the first emerging theme is "Design education as a source". This theme mainly aims to reveal designers' perceptions of design education as a source of sustainability knowledge.

Most of designers stated that their source of knowledge on sustainability could come from design education. These knowledge sources also included in-class knowledge sharing. Participant designers also stated that the school of thought may also have an impact on the collective behaviors that occur in the classroom.

“I think the foundations for this were really laid during my design education. While some of my friends from different universities didn't have such concerns, all my classmates at my university had concerns about using materials efficiently and minimizing waste. These concerns were so deeply ingrained in us that they influenced our designs and every step we took.” (P10) [Q46]

P10 stated that collective behavior in the classroom is especially effective on sustainability considerations such as material use and less waste generation. Similarly, another designer emphasized that collective sharing in the classroom affects the acquisition of knowledge about sustainability.

“At the same time, the collective sharing that developed within the class also had an impact.”
(P6) [Q47]

Designers who work on sustainability in university projects stated that these project processes are a source of knowledge. Some designers stated that considering material selection as a critical point in model-making processes by instructors could contribute to sustainability knowledge. In parallel, it was stated that sustainability factors were addressed critically and that project processes that encouraged research were an important factor in designers' acquisition of knowledge.

“Even during my undergraduate studies, projects that incorporated details about sustainability received higher grades. So, conducting research in this direction seemed wise, and it contributed general awareness to me.” (P2) [Q48]

P2 stated that sustainability was considered as a grade evaluation factor and therefore, it became a more critical element for students to include sustainability in their projects at that time. It can be said that this situation encourages design students to learn more about this subject in depth. Some of the designers expressed this situation critically.

“In design education, sustainability was always discussed. But I mostly heard it as criticism, meaning when you design a product, it's often criticized for not being sustainable. Generally, the concept of sustainability remained somewhat undefined in my mind until I graduated.” (P1) [Q49]

According to P1's expression, critics of sustainability did not provide full knowledge about sustainability in education. For the designer, this concept remained at a more undefined level during the education period. The designer also states that understood this concept better much later. On the contrary, there were also participant designers whose perceptions about sustainability were clear during the education period. One of the participant designers expressed the knowledge acquisition as follows:

“In our projects in courses, I somehow had contact with these topics, I don't know. All of my project instructors, from time to time, shared their knowledge with us in some way with those

pollens. When the first course titled 'Sustainable Design' was opened at the university, I selected it immediately. I feel the impact of that course.” (P8) [Q50]

Similarly, other designers also expressed their instructors' questioning attitudes as a source of knowledge about the concept of sustainability. In addition to the knowledge gained from the instructors during the education period, they pointed out the problem-solving abilities provided by design education. In this sense, workshops on sustainability in the design education were also a source of sustainability knowledge. Another designer stated that first encountering this concept during the design education as follows:

“Sustainability was not our primary motivation at school, but it caught my attention when it was mentioned from time to time. There was a list of professional rules, like 5-10 things, and one of them was about ethical behavior for designers, and sustainability was mentioned there. I was introduced to this concept for the first time thanks to that source.” (P18) [Q51]

Although sustainability was not the main motivation at P18's university at that time, the designer was able to become familiar with the concept of sustainability with the knowledge about the ethical responsibilities of the design profession.

4.2.2 Online sources

In response to the research question of how are the knowledge sources of sustainability for designers, the second emerging theme is "Online sources". This theme mainly aims to reveal designers' perception of online sources as a source of sustainability knowledge.

In the research findings, social media emerged as a common source of knowledge among participant designers as an online resource. In particular, Instagram stood out among social media sources. In addition, blogs, and articles were also online sources. Another finding was that the topic of sustainability has become a source of knowledge thanks to its popularity in online channels. P10 expressed access to knowledge sources specifically through social media, especially on Instagram as follows:

“I follow these issues on social media, especially Instagram, through those who produce quality content. I can follow it constantly because it is included in my daily life.” (P10) [Q52]

P10's constant exposure to the sustainability concept on Instagram provided more permanent knowledge acquisition. Similarly, there were designers who learned from

videos or documentaries they watched online as sources of knowledge on this subject. In this context, designers also emphasized that the act of knowing in the design process is not permanent. One of the designers stated that apart from social media, public service announcements are also effective in obtaining knowledge. Apart from this, many designers also indicated the social media posts of corporations.

“Even major technology companies now regularly share posts related to sustainability on their social media pages or websites. I mostly learn about it from such sources.” (P3) [Q53]

According to P3, the source of knowledge on this subject generally comes from companies' social media pages and official sites.

As another point, designers stated that they generally use online resources in line with their own interests. Similarly, the popularity of the sustainability topic was a factor that enabled designers to regularly encounter this issue.

“If a topic interests me, I usually conduct my own research and gather information from the internet. Also, because sustainability has become very popular recently, you often come across products or items in stores with sustainability labels.” (P3) [Q54]

P3 not only acquired knowledge about sustainability through desktop research but also constantly encountered this concept in online channels, which enabled to gain knowledge about sustainability. In line with the interview findings, survey findings also supported these outcomes with a larger group of participant designers. Figure 4.5 shows the distribution of the sustainability knowledge sources of survey participants, and number of respondents for each horizontal bar.

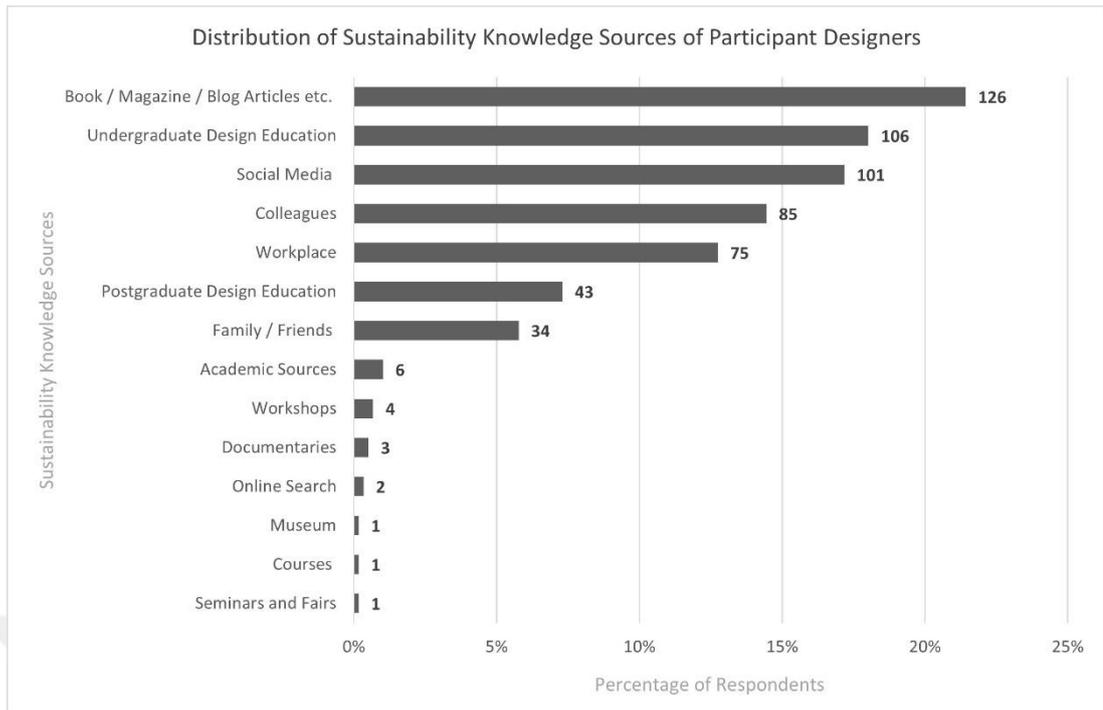


Figure 4.5 : A horizontal bar graph showing the distribution of sustainability knowledge sources.

According to survey findings, 21.5% of the participant designers expressed their knowledge sources about sustainability as books, magazines, and blog articles. Following this, 18% of the participant designers expressed their knowledge source as undergraduate design education. However, social media emerged as a source of knowledge nearly the same frequency as undergraduate design education.

4.2.3 In-company communication as a source

In response to the research question of how are the knowledge sources of sustainability for designers, the fourth emerging theme is "In-company communication as a source". This theme mainly aims to reveal designers' perception of in-company communication or in-company conversations as a source of sustainability knowledge.

In the research findings, designers stated that they generally gain knowledge from internal communications, internal company shares, and colleagues. Attendance at international design fairs is also a source of knowledge. Internal sharing was a point especially emphasized by some designers.

“At work, our new manager seems to care about this topic a bit more, so we hear about new developments through the varieties and links he shares. But honestly, i'm not very convinced by what is done or what we see, unfortunately.” (P11) [Q55]

On the contrary, it was also stated that visible practices within the company are more effective in informing many people about sustainability.

“In our workplace, there is one group that is interested in sustainability. People voluntarily came together to discuss how we can address sustainability more in our office. They made a lot of decisions, such as guidelines for the use of electronic devices and rules regarding not taking items and returning them.” (P15) [Q56]

According to P15's statement, it can be said that a team that works specifically on sustainability in the workplace makes sustainable behaviors more visible within the workplace, allowing people to become more informed and conscious about this issue. Although many designers mentioned more than one source of knowledge, one designer stated that the acquisition of knowledge in work life makes the knowledge on sustainability more detailed as follows:

“In my professional life, this topic has started to gain more detailed meaning for me. Because, for example, when you send something for production, it has a certain cost. You can reduce the cost by this much, it reduces plastic usage by this much, and increases it by that much, etc. When you learn this information, making something sustainable starts to make more sense in your mind.” (P16) [Q57]

We can say from the reference of P16's insight that in addition to many sources of knowledge, project processes, and workflows in work life also provide a more detailed understanding of sustainability.

4.2.4 Immediate circle as a source

In response to the research question of how are the knowledge sources of sustainability for designers, the third emerging theme is "Immediate circle". This theme mainly aims to reveal designers' immediate circle as a source of sustainability knowledge.

In the research findings, most of the designers stated that their first source of information about sustainability came from their families. Some designers stated that the sustainability of their family lives allowed them to encounter these practices at a very young age.

“I consider myself nourished by my family to some extent. My grandparents and two generations above me are still involved in farming, so I've been closely connected to this topic

since my childhood. I've always seen the importance of being self-sufficient and being mindful of consumption through them. (P6) [Q58]

Other designers with similar views stated that they approached the sustainability-oriented practices they saw in their families' lives more from the perspective of consumption or efficient use of resources. A designer stated that was familiarized with this concept at a very young age due to a family job.

“I already had some knowledge about sustainability in high school due to my father's job, which was related to chemical waste logistics. However, I learned more about how harmful it can be during my biomaterials course at university.” (P4) [Q59]

According to P4, their father's profession gave the first ideas about environmentally harmful materials. However, the designer stated that questioned the impact of harmful materials on the environment more in design education and was able to obtain more comprehensive knowledge in design education. Another important finding was the close circle of friends and interaction with this circle as a source of information about sustainability.

“When I have one-on-one discussions with someone, I tend to remember what they tell me. Most of what I've learned has likely come from personal interactions or work-related interactions. For this to happen, the people around me need to be knowledgeable. The more knowledgeable they are, the more I learn.” (P16) [Q60]

According to P16, knowledge is acquired by the interacted people in the immediate environment. However, the important point for the designer here is that this environment is of high quality. The designer expresses that the more knowledgeable or equipped the circle, the more learn from them on a subject. Similarly, gaining knowledge from close friends was also another finding. A designer stated that the pandemic period encouraged the friends to be more sustainable and that they acted together and learned from each other in this sense.

4.3 Circular Design Approaches of Designers

RQ3: How do design graduates conceptualize “circular design”?

In response to research question #3, the findings regarding the understanding of how design graduates conceptualize circular design are expressed in this category. In summary, the thematic map of this section is displayed in Figure 4.6.

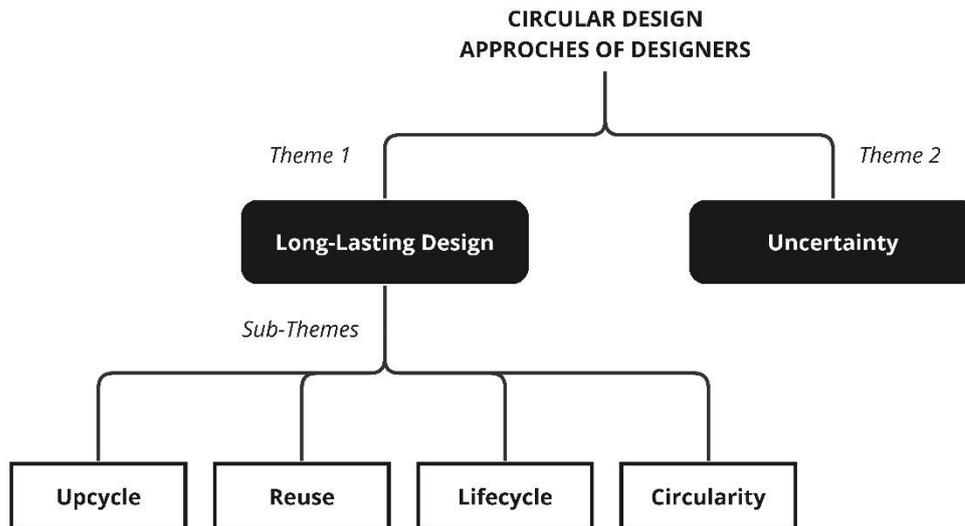


Figure 4.6 : Thematic map of designer’s circular design approaches: All themes link with sub-themes.

In this category, 2 themes are expressed with their sub-themes. These themes are defined as “Long-lasting design” and “Uncertainty”. All of these themes are explained in detail, respectively.

4.3.1 Long-lasting design

In response to the research question of “How do design graduates conceptualize circular design?”, the first emerging theme is "Long-lasting design". Four sub-themes emerged under this theme. The revealed codes of this theme are displayed in the Table 4.17. The number of codes was given in parentheses.

Table 4.17 : Codes and sub-themes of “Long-lasting design” theme.

| Theme 1 | Sub themes | Codes |
|---------------------|-------------------|--|
| Long-lasting design | Upcycle | Upcycle (12) Beneficial Design (4) Regenerated Products (2) |
| | Reuse | Reuse (3) Second Use (3) Product Life Extension (4) Inclusive Design (3) |
| | Lifecycle | Lifecycle (10) Sustainability of Production and Consumption (4) |
| | Circularity | Getting in the Loop (4) Circulation (3) Continuity (5) Circularity of Systems (2) |

4.3.1.1 Upcycle

This sub-theme reveals the concept of upcycle which is one of the designers' understandings related to the concept of circular design. Within the scope of this sub-theme, expressions such as upcycling, and reuse frequently emerged in insights. The revealed codes of this sub-theme are displayed in the Table 4.18.

Table 4.18 : Codes that form “Upcycle” sub-theme.

| Sub-theme | Codes |
|-----------|---|
| Upcycle | Upcycle (12) Beneficial Design (4) Regenerated Products (2) |

In the research findings, designers explained the concept of upcycling in different ways. Many of the designers did not familiar the circular design concept. However, they also interpreted the connotations related to this. P2 expressed the concept of circular design as something turning into a new thing when its life ends as follows:

“In fact, it seems to me like a concept that when something ends its life, it has to become something again.” (P2) [Q61]

Designers who interpret the concept of circular design in terms of upcycling generally interpret it as the transformation of the product into a new product after the end of its lifespan. This new product served a new purpose and could also take on a new form. In this regard, another designer expressed the transformation into a new product as the "renewal" of the existing product.

“The product disappears after the design and then the product is produced again in the same or better form in the same place where it was produced earlier.” (P16) [Q62]

This statement of the designer actually points to the efficient use of resources. However, it essentially emphasizes the renewal of old products through reprocessing operations and the creation of new products in this way. As a different view, P4 expressed this renewal concept and the transformation into a new product in a way that includes many different concepts.

“The design reminds us that the output obtained by the users will be used to re-create the product and to remain loyal to it even if this product becomes different. Let it evolve with

culture or something else, but whatever that design is, it still comes from the user. They take and create themselves.” (P4) [Q63]

P4 emphasized the reproduction of the product in different forms with the participation of users in the design processes. In this sense, the designer stated that thanks to co-design, users will develop products with the changing culture and thus adapt to the needs of the users. There were also designers who expressed the circular design approach with more benefit-oriented connotations. At this point, the beneficial design insight emerged. Since the concept of upcycling includes meaning such as turning unused or waste materials into something new that will be more beneficial, the benefit-oriented design approach was considered in line with the meaning of the concept of upcycling within the scope of the study.

“There should be all kinds of approaches, there is not just one solution, so I think a circular design in the circular economy. I think it's an approach that could work and an approach that could have potential if designers introduce it to companies or business owners.” (P18) [Q64]

P18 emphasizes that this benefit-oriented approach can also be beneficial for companies and businesses in production processes. At this point, the designer actually highlights the facilitating role of designers in communication. Designers who directly consider circular design as a multifaceted benefit in this context also commented on the point from this perspective.

“Being able to recycle or upcycle the product itself seems like a multifaceted benefit, so it's also sustainable.” (P1) [Q65]

At this point, the multifaceted benefit is expressed as both usefulness in the production processes of businesses and ensuring environmental sustainability. Designers often mention reusing when associating the concept of circular design with upcycling.

“I heard it for the first time. Let me tell you the first thing that comes to my mind right now. I perceived it as somehow the products or packaging we used were recycled and came to us in a different form. I don't know, is it true? It also reminded me of this, being able to use things over and over again.” (P13) [Q66]

Although it was a concept of P13 encountered for the first time, the designer was able to interpret the subject from the upcycling perspective. The designer did not clearly use the word upcycling but expressed the concept of upcycling with approaches such

as recycling and reusing waste by adding high value. These kinds of statements for the reuse concept are considered in more detail under the next sub-theme.

4.3.1.2 Reuse

This sub-theme reveals the concept of reuse which is one of the designers' understandings related to the concept of circular design. Within the scope of this sub-theme, expressions such as reuse, second use, product life extension, and inclusive design emerged in insights. The revealed codes of this sub-theme are displayed in the Table 4.19.

Table 4.19 : Codes that form “Reuse” sub-theme.

| Sub-theme | Codes |
|-----------|---|
| Reuse | Reuse (3) Second Use (3) Product Life Extension (4) Inclusive Design (3) |

As introduced in the previous sub-theme, reuse emerged as a concept that is often intertwined with the concept of upcycling. However, while circular design was associated with the concept of reuse, this concept was expressed with more concrete examples. This concreteness has been likened to reusing a certain product. Reusing or transforming something designed into something new was the first thought that came to the participant designers' minds under the concept of circular design. This approach is expressed as follows with an example from a participating designer's own practices:

“For example, if a box's life ended, then the purpose of the box after it is emptied may be something else. Something that sounds like it can be used comes to my mind, it calls me of it.”
(P14) [Q67]

P14 actually expressed the circular design approach as the second use. The designer even illustrated secondary use by using the cookie box as a jewelry box. Another perspective on reuse in the research findings was expressed as extending the life of the product. Although product life extension can be considered in relation to upcycle and circularity concepts, the findings in this study emerged mostly from the reuse perspective.

“At some point, since it is a material, it expires, but I would say that such a circular design extends the life of that thing, the raw material..” (P10) [Q68]

As P10 points out, it is generally expressed as changing the way a certain raw material is used, and also extending the life of raw material and thus extending product life. Another important insight was the concept of inclusive design that emerged under the concept of reuse. Although inclusivity is a concept that can be associated with many circular design concepts like circularity, it was interpreted by the researcher in relation to reuse in the study findings. Because inclusive design is, by its nature, a design approach that can appeal to broad audiences. Creating reuse options was considered by the researcher as an important concept in reaching broad audiences.

“I have no information about this at the moment. So, my thoughts and opinions stem partly from my education. The design process will never end and continues both physically and digitally. There is a much more circulatory process, especially in digital. In this process, the meaning of the concept of circular design can be expressed as the inclusive design of this process. I can expect there to be features of products that involve the future. I may have made up this definition because I don't know much about it right now.” (P12) [Q69]

P12 expressed the integration of an inclusive design approach into the design processes. Although P12 stated that had no knowledge of the circular design approach, the designer actually interpreted the subject as designing the circulatory design process in the designer’s profession in an inclusive way, including the future.

4.3.1.3 Lifecycle

This sub-theme reveals the concept of lifecycle which is one of the designers' understandings related to the concept of circular design. Within the scope of this sub-theme, expressions such as lifecycle and sustainability of production and consumption emerged in insights. The revealed codes of this sub-theme are displayed in the Table 4.20.

Table 4.20 : Codes that form “Lifecycle” sub-theme.

| Sub-theme | Codes |
|------------------|--|
| Lifecycle | Lifecycle (10) Sustainability of Production and Consumption (4) |

In the research findings, designers also interpreted the concept of circular design as the environmental impact of a product within its lifecycle. At this point, they touched upon sustainability in the stages involved in a product's life, such as raw material extraction, production, distribution, and waste management.

One of the designers interpreted the circular design approach in relation to the concept of lifecycle as follows:

“I guess it is a product lifetime. It can be upcycled after production and use, it can be used again for another purpose, or it can be recycled, and a design can continue completely after the product is released, from its packaging to its label.” (P1) [Q70]

Although P1's approach has a strong relationship with the concept of circularity as the continuity of the product, it was associated by the researcher with the actions within the product life cycle. Similarly, considering the applications within the product lifecycle from a sustainability perspective was expressed by P9 as a more complete design approach.

“Circular design expresses a more complete understanding of design. It evokes an association in my mind as a product cycle, in the sense of directing consumer behavior from the model to having the products produced, involving the stakeholders in a cycle and making everyone productive within that system in a beneficial way.” (P9) [Q71]

With this statement, the designer emphasizes benefit focus and efficiency within the product lifecycle. In this way, the designer focuses on efficiency in the process from production to consumption in the product life cycle.

Other designers, such as P9, also pointed to sustainability in the product life cycle, while also emphasizing a sustainable production and consumption approach.

“When designing something, we need to think about the lifespan of this design. How will what I produce be recycled after use? How can we bring this back into the cycle? We need to think about this first.” (P9) [Q72]

According to P16, before starting the lifecycle of a product, it is necessary to design the life cycle of that product correctly. Here, the designer emphasized that it is necessary to consider from the beginning what the product will become at the end of its lifespan. In fact, the designer argues that the methods of including this product in a product lifecycle should be considered starting from the design process. Here, we see

that the designer actually interprets the concept of circular design in the context of the circularity of the product.

4.3.1.4 Circularity

This sub-theme reveals the concept of circularity which is the last one of the designers' understandings related to the concept of circular design. Within the scope of this sub-theme, expressions such as circulation, getting in the loop, the circularity of systems, and continuity emerged in insights. The revealed codes of this sub-theme are displayed in the Table 4.21.

Table 4.21 : Codes that form “Circularity” sub-theme.

| Sub-theme | Codes |
|-------------|--|
| Circularity | Getting in the Loop (4) Circulation (3) Continuity (5) Circularity of Systems (2) |

As one of the circular design understandings, designers expressed the concept of circularity as getting in the loop. This understanding of getting in the loop is expressed as something whose lifecycle has ended, rejoining another lifecycle. In this regard, P2 expressed the following statement:

“I think it means recycling it or turning it into something else when its useful life is ended, you know, a cycle of it.” (P2) [Q73]

In this regard, P2 expressed staying in the loop as something whose lifespan has ended, finding life in another loop. There were also designers who interpreted getting in the loop as bringing the product back to life without creating an extra carbon footprint.

“I think that the product or whatever it is is somehow given a new life in a cycle, after it has completed its life, without creating any extra energy or a carbon footprint.” (P11) [Q74]

In parallel with P11's approach, other insights that express getting in the loop with a more environmentally friendly approach without creating an extra carbon footprint are among the insights that emerge as the state of something not turning into garbage after the end of its life. In this sense, P7 used the following statement:

“Circular design essentially means that a product does not become waste or become waste entirely at the end of its lifespan. For example, using batteries means creating something very harmful to nature, which reminds me of a non-circular design.” (P7) [Q75]

With this insight, P7 demonstrates that although the designer does not have sufficient knowledge of circular design, has a parallel understanding of circular design principles. In fact, starting the life of the product in a new loop without creating an extra carbon footprint or turning it into waste at the end of its life is quite parallel to the "upcycling" understandings of designers discussed previously. As a continuity of getting in the loop, circulation emerged in the research findings as another concept that designers often express in line with their circular design understanding. Insights in this direction expressed the understanding that something should be in constant circulation.

Similarly, many of the designers often expressed continuity as a circular design approach. This actually emerged as a parallel concept with the expression of circulation. However, continuity is generally expressed by designers as the continuity of a process.

“When I hear 'circular,' it seems like something that is constantly being repeated.” (P3) [Q76]

As the designer stated, circularity is perceived as the continuity of the loop. However, the designer is still not sure that has defined the circular design approach correctly. Another designer, who defined the concept of continuity as a world where nothing disappears, used the following statement:

“You know, it feels like a world where nothing is lost, similar to visualizations where nothing is lost.” (P10) [Q77]

According to P10, the analogy of a world where nothing disappears is a very dystopian analogy. From this expression, we see that the designer's circular design approach is related to continuity. Continuity was generally one of the concepts expressed by designers. There were also designers who interpreted this situation from a more holistic perspective. In this regard, some designers emphasized the circularity of the product within a system, and these insights reflected the continuity of loops. Similarly, another designer expressed this circularity of systems approach as follows:

“Systematically transforming a certain input into a certain output may also mean transforming that output into an input somewhere else.” (P17) [Q78]

According to P17, it is emphasized that a certain input getting in the loop should be transformed into an output so that it can be an input of another loop. The designer emphasized the criticality of this here and also drew attention to the importance of considering the concepts of circular design at a more system level.

4.3.2 Uncertainty

In response to the research question of “How do design graduates conceptualize circular design?”, the second emerging theme is "Uncertainty". This theme mainly aims to reveal the understanding of designers towards circular design concepts in terms of in terms of their ambiguity. Within this theme, there are relatively inconsistent approaches that designers respond to the circular design and the comparisons they express towards this concept. The revealed code of this theme is displayed in the Table 4.22. The number of code was given in parentheses.

Table 4.22 : Codes of “Uncertainty” theme.

| Theme 2 | Codes |
|----------------|-------------------------------------|
| Uncertainty | Vague of conceptual definition (15) |

In the findings, designers generally did not familiar with the circular design approach. In this context, some designers have expressed the circular design approach by comparing it with sustainability. Some interpreted the circular design approach as a more focused, well-grounded approach compared to sustainability.

“If we compare it to sustainability, I think this is a little better. It's a well-grounded subject. Because it's more focused.” (P16) [Q79]

Many designers actually expressed it as a design approach worth considering. There were also designers who considered a better design approach as one that opposed industrialization and randomness within systems. As a different approach, a designer took this approach as expanding the designer’s domain. However, compared to the sustainable design approach, some designers expressed the circular design approach more critically. P18 expressed the following statement in this regard:

As shown by the Word Cloud visualization in Figure 4.7, 4,5% of the total words associated with circular design by participant designers was the word “transform”. More than 4% of the words were “recycle” and nearly 4% of words were “reuse”. More than 3,5% of the total words were the words “waste” and “sustainability”, and nearly 3% of the words were “economy”, “material” and “repetition” words associated with the circular design concept. In general, the majority of participant designers expressed non-repetitive words.

4.4 Contribution of the Design Education

RQ4: How does design education contribute to designers in terms of sustainability?

In response to research question #4, the findings regarding the contribution of design education in terms of sustainability are expressed in this category. In summary, the thematic map of this section is displayed in Figure 4.8.

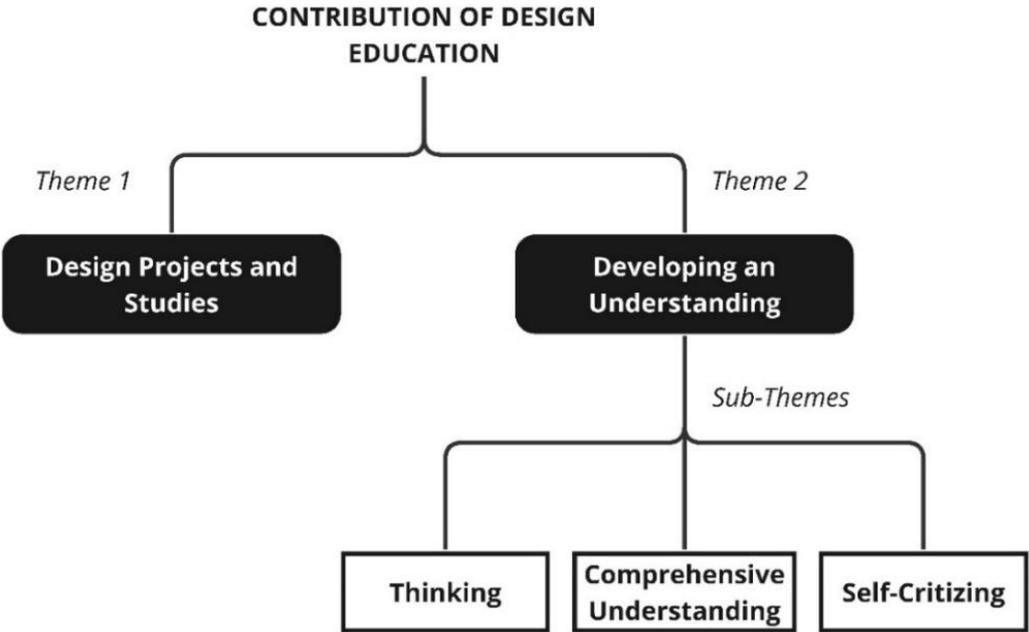


Figure 4.8 : Thematic map of design education contribution in terms of sustainability.

In this category, two themes and related sub-themes are expressed. These themes are defined as “Design projects and studies” and “Developing an understanding”. These themes and sub-themes are explained in following sections.

4.4.1 Design projects and studies

In response to the research question of “How does design education contribute to designers in terms of sustainability?”, the first emerging theme is "With design projects and studies". Firstly, this theme aims to reveal the contribution of in-course project processes in undergraduate design education in terms of sustainability. Secondly, it aims to reveal the contribution of studies attended by participant designers during undergraduate education. The revealed codes of this theme are displayed in the Table 4.23. The number of codes was given in parentheses.

Table 4.23 : Codes of “Design projects or studies” theme.

| Theme 1 | Codes |
|--------------------------------------|--|
| Design projects and studies | Basic design projects (7) |
| | Elective courses (4) |
| | Graduation Projects (2) |
| | Workshops (2) |
| | Waste materials in projects (6) |
| | Bio-based or natural materials in projects (4) |
| | Learning upcycle concept (4) |
| | Learning recycling (3) |
| Learning transformation of waste (4) | |

Designers generally referred to the projects they took during their undergraduate education and the processes of these projects while evaluating the contribution of design education in terms of sustainability. It was commonly revealed that the projects related to sustainability in design education were often conducted at a basic design course level. Basic design projects were often described by designers as projects made from waste, by-products, or natural materials.

“In the first year, we had a project in basic design course, we were asked to design a toy for children using only denim fabric, which was basically an 'upcycling' project. I only remember that. Now that you mention it, I realized it.” (P13) [Q81]

P13 mentioned creating a toy project using recycled materials in their first year. This statement is an example of the designer considering sustainability-related projects and connecting this to the basic design projects. While P13 did not comment on the contribution of this project in terms of sustainability, the designer realized during the interview that it was related to sustainability. It can be said that the designer primarily associated the concept of sustainability with the use of waste materials in the projects.

Similarly, other participant designers also pointed out the projects they made with materials left over from their basic design courses. In general, participant designers were unsure of the contribution of these projects to their understanding of sustainability.

From another point of view, a designer described a project they completed in a basic design course defining that ‘we create something out of trash,’ which reflects a certain attitude towards the educational approach to sustainability as being about transforming waste into something valuable.

“The only projects I remember, when I thought about them later, were “they are making us do things from thrash”. Especially in the basic design course, we were doing something about sustainability. They were always asking for something. But we never got such a detailed explanation of it. We did it and generally passed the course. I can give an example of this: a skateboard project or a bench project. I used cardboard, but it was not a waste. However, it was supposed to be made from waste.” (P1) [Q82]

P1 associated their sustainability-related projects with projects that were expected to use waste materials. However, the designer mentioned not realizing this expectation and not using waste materials, also criticizing the project process for a lack of necessary theoretical knowledge. It is indicated that the project did not contribute to their understanding of sustainability. Especially in first-year design projects, sustainability is addressed through the integration of waste usage. Besides projects, some designers also mentioned courses taken during their education that focused on sustainability. Designers who took such courses mentioned they selected them as elective courses. In this regard, a designer mentioned about a project from a fourth-year elective course on biomaterials.

“In the fourth grade, in the Biomaterials course, I wanted to make a speaker using Mycelium, a material that absorbs sound, in contrast to the material feature. In reality, I created mold, but I used the mold sparingly because it was the simplest and most accessible material. I mixed it with sugary water and placed Mycelium mold inside. The mold slowly grows and takes on the shape of the container. Later, you break it, and its life ends, and this was amazing to me. Because it grows on its own without any additional power, without a factory, and the product is formed.” (P4) [Q83]

According to the designer, the satisfaction of self-initiating and realizing projects was seen as invaluable. Alongside elective courses like biomaterials, many participants

also acknowledged that required material courses in design education provided them with insight and theoretical knowledge about materials.

Some designers pointed out the contributions of design projects in studio courses in terms of material use and upcycling focus. For instance, a designer discussed a design project related to secondary use that they undertook in their third year.

“In the third grade, lecturers were asked to think about the secondary use of a glass jar with a lid as a project with a company. There were many constraints. Generally, we couldn't find anything interesting, but at least we thought about it.” (P18) [Q84]

P18 commented on the challenging nature of project constraints, noting that generally, the outcomes were not entirely satisfying. However, they appreciated that the project encouraged thinking and questioning, which they considered to be a valuable contribution. Additionally, the designer evaluated the contribution of design education in this context as follows:

“Sustainability knowledge mostly came to me during my education, but most of this knowledge came from books. Projects gave me more insight. For example, how complex the topics are and how difficult it is to change people's behavior in this way. You understand this complexity a bit.” (P18) [Q85]

With this statement of the designer, we can see that sustainability knowledge is acquired theoretically from design education, but project processes contribute more insight into sustainability. At the same time, it is understood that the designer evaluates the contribution of the project processes on issues such as understanding complex processes and the difficulty of behavioral interventions. Similarly, another designer expressed the difficulty of creating behavioral change through a project in design education as follows:

“It was my last project before graduating, I think. It was a process where we had to think about how we could change behavior through a product, how sustainable it should be, how we define the person on the other side, what kind of behavior they exhibit, and how we can change it. It was related to global warming. But during that process, I read and drew things about how the ecosystem and the life cycle affect us or how we affect that cycle. I designed a project to prevent water pollution.” (P6) [Q86]

P6 stated that the project on behavior change, which aimed to tackle the theme of global warming, was a process that required a lot of thinking due to its broad scope. In

this sense, it has been encouraging for the designer to conduct research on behavioral change, as it is a process in which many questions are sought and required reading on this subject. As an important point, this encourages to designers for in-depth research on the relevant subject. In line with the insights obtained from the interviewed designers, it can be said that projects made in the 3rd grade and beyond are rarely considered as projects focused on the use of natural materials or waste use. It is seen that projects at this level of learning provide designers with insights such as understanding behaviors and complex situations.

In the interview findings, many of the participant designers defined the contribution of design education by associating it with the courses they attended and the project processes within the course. In general, the number of participating designers who took a sustainability-related course as a required course was very small pace. Participant designers stated that they usually tackle sustainability-related projects within the scope of basic design and studio courses. To support these interview findings, survey research was conducted with a larger sample group. In the survey findings, the percentage of design graduates who took sustainability-related courses in undergraduate design education is shown in Figure 4.9.

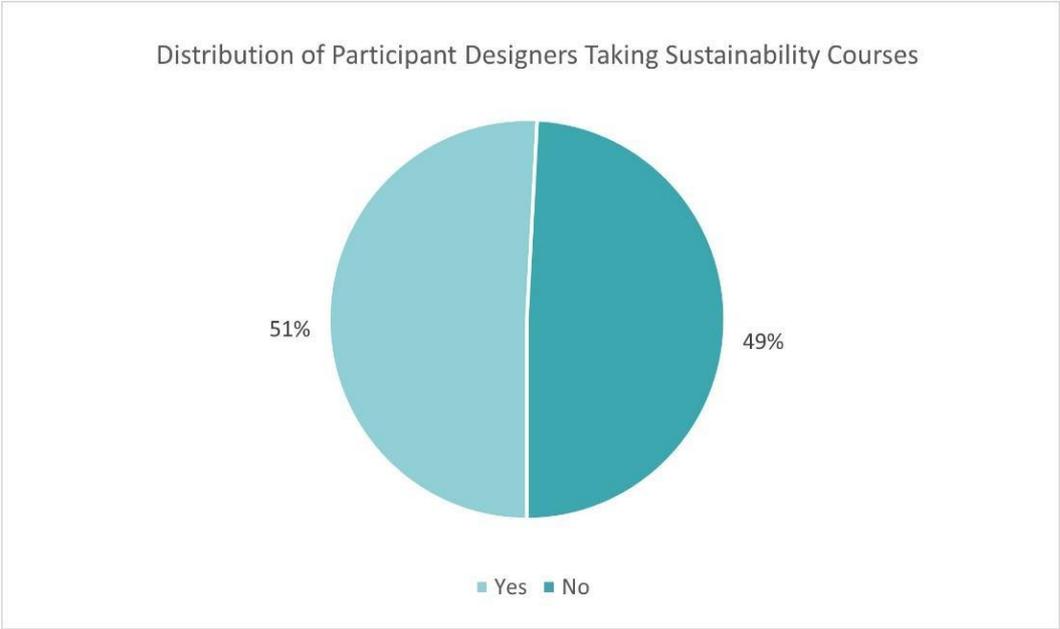


Figure 4.9 : A pie graph showing the distribution of participant designers taking sustainability courses.

According to the survey findings, it was revealed that 51% of the 181 participant designers in the survey had taken a course directly related to sustainability. This result

showed that almost half of the participant designers had taken a course on sustainability. In the interview findings, some participant designers also addressed and evaluated the concept of sustainability through workshops they attended during the education, rather than specifically on in-course project.

“When I was in the third grade, I participated in a workshop called 'zero waste.' We could work on whatever we wanted, but the motto was to design without producing any waste. It was really enjoyable because it challenged us and the satisfaction of finding something was unique.” (P10) [Q87]

P10 stated that the workshop attended during the education period was a process that needed to be carefully focused since it was a project aimed at creating zero waste. In this way, it seems that this workshop encourages different thinking. Some participant designers expressed the encouraging aspect of the workshops they attended from a different perspective.

“I attended a workshop called Circle Economics, I guess. I did a project about how can a ceramic be circular. If the products sold are broken, the broken parts are sent back by the customers. Ceramic is a non-recyclable material. For example, you crush the broken pieces, combine them with mud, and throw them into the mud, and the ceramic pieces create texture in that mud. In that respect, it was like an upcycling, that is, the object turns into texture. It contributed important things because before that workshop, maybe I didn't have that much of an idea about upcycling. But this may have been a phase for me. I probably learned it there for the first time in my education.” (P5) [Q88]

In line with the opinions of many designers, P5 encountered the concept of upcycling with a workshop project. Although the designer was not sure that the source of the insights on this subject is exactly from design education, stated that design education contributes important things in terms of providing the opportunity to participate in this workshop and get familiar with the concept of upcycling.

In the interview findings, it was revealed that the workshops attended during the design education process and the projects carried out within the scope of these workshops contributed greatly to getting familiar with the concept of sustainability and developing an understanding of this concept. To support these interview findings, survey research was conducted with a larger sample group. In the survey findings, the percentage of design graduates who were involved in sustainability-related projects or studies in undergraduate design education is shown in Figure 4.10.

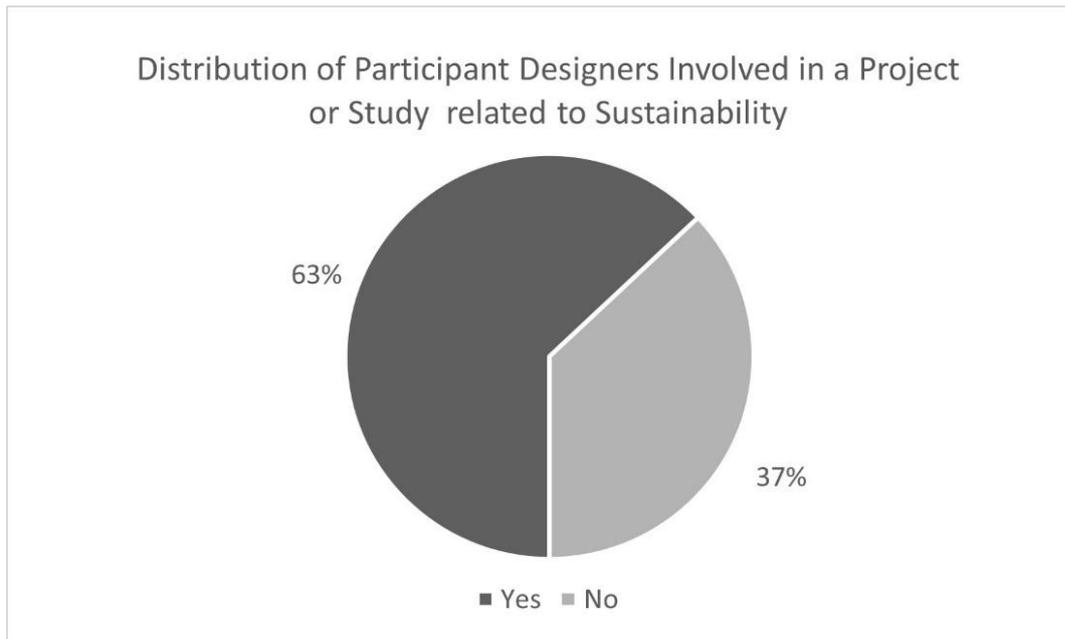


Figure 4.10 : A pie graph showing the distribution of participant designers involved in a project or a study related to sustainability.

According to the survey findings, it was revealed that 63% of the 181 participant designers in the survey had been involved in a project or studies related to sustainability outside the scope of design courses. 37% of the participant designers stated that they did not participate in a project or study in this direction. This result showed that the majority of participant designers had the opportunity to work on sustainability with the project or study. Approximately half of the 181 designers who participated in the survey stated that they had taken courses on sustainability (Figure 4.9). Considering this finding, it was concluded that the rate of involvement in sustainability-related projects or studies except was higher than course involvement.

Among the survey participants who took courses on sustainability, they also evaluated the contribution of this course. Participants who were involved in a project or study also evaluated the contribution of this project or study about sustainability. Participant designers made this contribution evaluation on a 5-point Likert scale in survey research. Figure 4.11 shows a comparison chart that includes the participant designers evaluating the contributions of sustainability-related courses and the contribution of projects or studies related to sustainability.

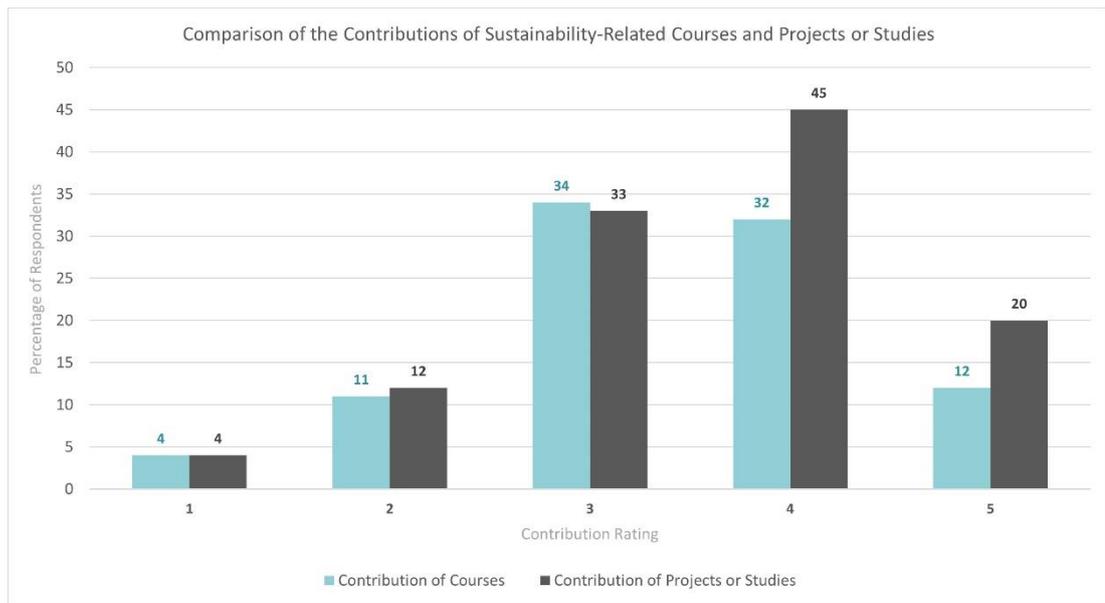


Figure 4.11 : A clustered bar graph showing the comparison of the contribution of design courses and projects or studies.

According to the survey findings, approximately 36.5% of the 93 participants who took sustainability-related courses from participant designers evaluated the contribution of the course at an average level with a score of 3 out of 5. Approximately 34% of respondents who took courses in sustainability rated it above average with a score of 4 out of 5. However, only 4% of the 93 participants who took a sustainability-related course evaluated the contribution of this course as very low with a score of 1 out of 5. Approximately 39.5% of the 114 participants involved in a project or study evaluated the contribution of the project or study they were involved in as above average with a score of 4 out of 5. However, 3.5% of 114 participants evaluated the contribution of this project or study as very low with a score of 1 out of 5. 93 survey participants who took courses about sustainability did not clearly express the contribution of this course as very high level. The percentage of those who rated contribution as average and above average was almost the same. However, 114 participants who were involved in a sustainability-related project or study very clearly expressed the contribution of these studies as above average. Approximately the same percentage of participant designers who took sustainability-related courses and were involved in a sustainability-related project or study evaluated the contributions of these courses or projects and studies as very low. All these results show that the contribution of sustainability-related projects or studies is more clearly above average than sustainability-related courses.

4.4.2 Developing an understanding

In response to the research question of “How does design education contribute to designers in terms of sustainability?”, the second emerging theme is "Developing Understanding". This theme aims to reveal the contribution of the understanding that design education brings to the designer. As a result, three sub-themes emerged under this theme. These are thinking, comprehensive understanding, and self-criticizing. The revealed codes in this theme are displayed in Table 4.24. The number of codes was given in parentheses.

Table 4.24 : Codes and sub-themes of “Developing an understanding” theme.

| Theme 2 | Sub themes | Codes |
|-----------------------------|-----------------------------|--|
| Developing an understanding | Thinking | Transformation in Thinking (8) Holistic Perspective (3) Contribution of Lecturers (8) Gaining Foundational Insights (6) Self-Learning Ability (11) Usage-Focused Approach (4) Uncertainty (10) |
| | Comprehensive Understanding | General Awareness (4) Resource Efficiency Awareness (2) Sense of Responsibility of Profession (3) Production Process Awareness (6) Expanding Project Scope (5) Dissatisfaction of Project Outcomes (4) Recycling Misconception (2) |
| | Self-Criticizing | Evolution of Perception (12) Vague of Sustainability-Focused Courses (11) Vague of Sustainability-Focused Projects (7) Vague of Primary Focus (7) Vague of Concern (5) Grade Concern (4) Vague of Guidance (7) Constraints of Design Process (3) Constraints of Curriculum (8) |

4.4.2.1 Thinking

This sub-theme reveals the contributions of design education by thinking aspect. Within this sub-theme, codes such as transformation in thinking, holistic perspective,

the contribution of lecturers, gaining foundational insights, self-learning ability, usage-focused and problem-solving approach, and uncertainty emerged. The revealed codes in this sub-theme are displayed in the Table 4.25.

Table 4.25 : Codes that form “Thinking” sub-theme.

| Sub-theme | Codes |
|------------------|---|
| Thinking | Transformation in Thinking (11) Contribution of Lecturers (8) Gaining Foundational Insights (6) Self-Learning Ability (11) Usage-Focused Approach (4) Uncertainty (10) |

While evaluating the contribution of design education in the context of sustainability, designers often emphasized its transformative aspect on thought. In line with this, P6 expressed the contribution of their education as follows:

“I think design education has already initiated the understanding of sustainability. It may have had a transformative effect, such as thinking. I think learning the things related to this one-to-one use in design education and learning what the trends are, how it is done, etc. really transforms a person into a different person. So it changes your lifestyle and perspective.” (P6) [Q89]

Design education has been stated by the designer to have a power that completely transforms thoughts on sustainability and even triggers an understanding of it. It is seen to have changed the designer’s life and even their lifestyle entirely. In addition to the transformative impact of education in terms of thinking within the sustainability context, it also enables a more holistic approach to design processes. At this point, trend research that covers design processes, learning processes related to usage, and learning processes related to production have been expressed as the intellectual contributions of design education about sustainability. In line with this perspective, P13 has interpreted the contribution of education to sustainability as granting the designer a more holistic viewpoint.

“Not only sustainability, but I think design education has had a very positive impact on every aspect of my life, as it has changed my perspective. Thanks to design education, you know a little bit about everything, and being aware of everything. You do not know everything completely, but you are somehow involved in everything. That's why I think we do a lot of

research. Afterward, I think it triggers that feeling of curiosity. I don't know. I guess this is what design education contribution.” (P13) [Q90]

According to P13, design education provides a bit of knowledge about everything and awareness of everything. Therefore, it actually enables one to be somewhat proficient and aware of every subject. This has been described as a factor that leads designers to extensive research. While the designer expresses the contribution of their education in the context of sustainability in this way, they are not entirely sure of its contribution to their current thought approach. Some designers, on the other hand, have stated that design education contributes to the development of a conceptual understanding of sustainability through the acquisition of fundamental knowledge.

“It didn't contribute actually, but let's say it did. It gives basic information, that is, it directs us to use sustainability, especially in the material usage aspect. It pushes you to use them.” (P3) [Q91]

According to P3, design education, with the basic knowledge it provides on sustainability, particularly directs the use of sustainable materials and encourages thinking. Another designer similarly expressed the contribution of design education to the acquisition of fundamental ideas.

“It gave me ideas based on resources and single things, and since I was interested in it, I traced the knowledge that design education gave me, so I continued.” (P10) [Q92]

Similar to P3, P10 also noted the directive effect of fundamental knowledge acquisition in prompting thoughts on sustainability. However, according to P10, the contribution of design education lies more in creating curiosity and encouraging self-directed learning. There were also designers who spoke of the contribution of education to sustainability in terms of the change in understanding through thought processes, specifically mentioning the contribution of instructors in classroom interactions. In this sense, a designer mentioned the potential contribution of their instructors' in-class dialogues.

“I may have learned something from the lecturers' statements. I don't want to be unfair to my lecturers.” (P12) [Q93]

According to P12, the contribution of education is not clear, but they anticipate that their instructors could have influenced their thought processes. It can be said that they recognize the effort of their lecturer in this regard.

Many designers acknowledged the contribution of their instructors. We can say that in-class dialogues, even if not specifically a course on sustainability, have been an element that influenced the thought processes for many designers. In parallel, another designer emphasized the awareness of their instructors on sustainability during the education process and thus acknowledged their contributions to the subject.

“During the time I was at that school, this was a much more infancy idea, and our teachers were aware of how complex a concept it was. I remember we talked about the relationship between social inequality issues and sustainability. So, frankly, it's not something I can ignore. Because, as I said, I don't think it would ever have interested me professionally in any way if I hadn't received this education. It gave me the end of a rope.” (P8) [Q94]

P8 has elaborated on how in-class dialogues, highlighted by their instructors, have triggered their self-learning processes. It can be said that not only dialogues about sustainability but also those surrounding social inequality issues have changed perspectives. By comparing design education with other disciplines, the contribution of design education to seeing the bigger picture in the context of sustainability was expressed as pushing to think about production and material processes, which many designers have mentioned before.

“For instance, a business administrator does not understand the complexity of production processes, where materials come from, etc. It is not easy to imagine, but we go to factories as designers, for example. We have always considered production processes in our projects. When we think about these things, we can relate more. As a designer, I think you can see the big picture.” (P18) [Q95]

According to P18, the uniqueness of being a designer lies in the ability to differentiate thought processes through a more holistic perspective. This holistic view enables one to think about production and usage processes, thereby fostering understandings oriented toward sustainability.

4.4.2.2 Comprehensive understanding

This sub-theme reveals the contributions of design education by comprehensive understanding. Within this sub-theme, codes such as general awareness, sense of responsibility, production process awareness, expanding project scope, dissatisfaction of project outcomes, and recycling misconception emerged in insights. The codes that have revealed these sub-themes are displayed in the Table 4.26.

Table 4.26 : Codes that form “Comprehensive understanding” sub-theme.

| Sub-theme | Codes |
|-----------------------------|--|
| Comprehensive understanding | General Awareness (4) Resource Efficiency Awareness (2) Sense of Responsibility of Profession (3) Production Process Awareness (6) Expanding Project Scope (5) Dissatisfaction of Project Outcomes (4) Recycling Misconception (2) |

When designers evaluated the contribution of education in the context of sustainability, they mentioned that design education creates general awareness. Some designers addressed this awareness in terms of the efficient use of resources. Some stated the educational environment and human interactions increased this awareness.

“It has made a very positive contribution to my awareness of sustainability. Not only the education we received, but also the impact of the people we encountered on us, and ultimately the environment I created there, also had an impact. I think one of the things that I'm glad I studied design for is just being aware of the concept of sustainability.” (P13) [Q96]

P13 has become aware of the concept of sustainability in design education. In this regard, designer graduates expressed the most important contribution of design education as gaining awareness of the concept of sustainability. P11 who understood the concepts of sustainability and even circularity thanks to her design education expressed her awareness as follows:

“I understood more or less what circular design, circular economy and sustainability mean, and I had the chance to understand the concept of upcycling and how upcycling differs from recycling.” (P11) [Q97]

P11 stated that understood the distinction between sustainability and circular economy, especially within the scope of the course the designer took during education. In addition to general awareness, the sense of responsibility is also revealed as an important contribution of design education. In this sense, design graduates stated that designers should be more sensitive about sustainability concerns. P15 expressed related opinions in this context as follows:

“But this is definitely an issue that we need to be very sensitive about. So if it won't be us, who will it be? I think designers, actually people like us, need to show and explain things to other people in Türkiye and offer that option.” (P15) [Q98]

It was stated that designers should guide, encourage, and offer options to people with this awareness of responsibility. On the other hand, another contribution of design education in terms of sustainability was raising awareness about production processes. This also emerged as a finding that affected general awareness.

“This part of design education is interesting. We received a lot of training on production processes. We never discussed sustainability from there, but then when I take steps on sustainability myself, I remember those issues.” (P18) [Q99]

P18 stated that the comprehensive knowledge of production processes obtained in design education became more meaningful as gained a perception of sustainability. It is seen that the designer did not associate the concept of sustainability with the acquisition of knowledge about production processes during the learning process in design education. However, other designers interviewed also stated that gaining knowledge about the production processes over time greatly affected their perspective on the products. As a similar thought, P7 expressed it as follows:

“When we design a product, you engage in such in-depth research on its production process, etc., before it is designed. When I finish my training, I start to imagine how and what stages many products go through at some stage. I think it might bring such a different perspective. But I think this is an aspect of us that we are not aware of, you have to think about the whole life of the product, it is not just a purpose of use. We are trying to find a product that will not be garbage in five years. But this is not explained as such. It is taught implicitly in education.” (P7) [Q100]

P7 evaluated the contribution of design education regarding to production process and even usage scenarios. According to the designer, these understandings are a feature

that designers are not aware of. These are understandings that are not given under the name of raising awareness in design education but have implicit aims for awareness.

The findings also revealed that designers aimed to expand the scope of project briefings provided in design education. This intention of the designers is associated with the research findings that design education contributes to consciousness about sustainability. In this context, the majority of designers stated that sustainability or circularity issues were not included in the briefings on the projects they handled. However, there were designers who went beyond the briefs and incorporated sustainability into their projects. P16 expressed this implementation as follows:

“I didn't do a project directly to make it sustainable or circular. This was not the main purpose of the project. I didn't have a project, but I thought about that part of the project myself. These aspects were not included in the project briefing.” (P16) [Q101]

Similar to P16, some of the interviewed designers also mentioned that they expanded their project briefs in terms of sustainability. Some even stated that they included sustainability issues in their project briefs, even though they were not expected to do so, and did detailed research on the subject they were interested in. Designers' intentional integration of sustainability issues into their projects may be an awareness provided by design education. We can say that the curiosity and self-learning tendencies that emerged in the previous sub-theme in "thinking" are also the contributions of design education.

4.4.2.3 Self-criticizing

This sub-theme reveals the contributions of design education by self-criticizing. Within the scope of this sub-theme, codes such as insufficiency of understanding, lack of sustainability-focused courses and projects, lack of primary focus and concern in education, and lack of guidance generally emerged in insights. In addition, constraints of the design process and curriculum were also mentioned. The revealed codes in this sub-theme are displayed in the Table 4.27.

Table 4.27 : Codes that form “Self-criticizing” sub-theme.

| Sub-theme | Codes |
|-------------------------------|--|
| Self-criticizing | Evolution of Perception (12) |
| | Vague of Sustainability-Focused Courses (11) |
| | Vague of Sustainability-Focused Projects (7) |
| | Vague of Primary Focus (7) |
| | Vague of Concern (5) |
| | Grade Concern (4) |
| | Vague of Guidance (7) |
| | Constraints of Design Process (3) |
| Constraints of Curriculum (8) | |

Design education has provided designers with the ability to critically assess themselves, offering opportunities to evaluate their understanding of design processes and to critique the design education they have received. Research findings indicate that designers often emphasized the insufficiency of their capacity to comprehend the concept of sustainability in their education. They criticized the lack of guiding information on this subject. Generally, a majority of participant designers stated that they had not worked on a sustainability-focused project or taken a course. However, at this point, many designers also expressed that they may not have realized during their education that the objective of the projects they received was aligned with sustainability.

P1 associated the lack of perception about sustainability in the education process with both age and student mood.

“I’ve always been very stressed about what I can do with waste. I had strained my mind about what I could do and how I could do it. This is partly related to the fact that I have a student mindset. You know, when I was that age, I didn’t pay attention to such a thing. I did not have such a perception. As I got older, I gained such a perception.” (P1) [Q102]

According to P1, the factors contributing to this insufficiency of perception are unclear. This lack of perception is also seen as a factor that diminishes the sense of awareness. However, as the designer expressed, we can say that the development of perception over time is related to the evolving and advancing thought process of the designer as they receive education. Similarly, another designer mentioned not even being aware of sustainability in their design education and did not feel the sufficient capacity to develop this awareness.

“Everything is so blurry but I can say one thing. So, as I said, I wasn't even aware of sustainability at that time. We were trying to solve a problem that I remember in the projects, and for this, we needed to find a problem. We didn't even know that yet.” (P16) [Q103]

Another point of criticism by designers was that when sustainability is included in projects, it is often not handled as a significant criterion and does not become the main focus. For designers, the quite inclusive nature of design processes and the intense pace meant a sense of time constraint. They mentioned that these limiting factors like time constraints made it difficult to apply sustainable design approaches within design processes.

“It's not something we pay much attention to. Because we design a product from a very comprehensive perspective. The process from initial research to final output is quite intense. That's why we didn't have time for this. That's why I can say that we ignore sustainability in projects in courses.” (P12) [Q104]

According to P12, appropriate project processes that would integrate sustainability into design processes are not experienced in design education. The intense design processes for a project, which are repeated for multiple projects within a term, also highlight time constraints in this matter. However, it can be said that the designer justifies these intense project processes as an obstacle. The difficulty of integrating sustainability principles along with these processes during the educational period may stem from the designer's sense of insufficient capacity. At this point, another insight is the criticism that designers do not access sufficient guidance and guidance information during their educational processes.

“Since it was not a priority, I did not receive any information at that time. How can a product be sustainable? For it to be sustainable, it should be something like what actions you need to take or what you need to do what exactly it is, and which parts it affects. So someone needs to guide you and show you and connect it to the real world. So, you could understand this at that time.” (P17) [Q105]

As P17 mentioned, in order to develop an understanding towards the sustainability concept during education, or perhaps in other words, to build a capacity for understanding, there is a need for guidance in education. It is seen that there is a need to show students the implicit subjects such as what actions need to be taken, how they should be taken, and what could or could not be sustainable. The information should

be grounded, relatable to real-world problems, and interpretable, which is among the expectations of the designer.

“It would be better if when I design a product, they required me to politely write a small paragraph about how it will be sustainable or what I would do for it. If I hadn't learned from my father or research, I wouldn't have known.” (P4) [Q106]

According to P4, making guidance on sustainability compulsory in educational processes was more important. In this way, the designer could experience the learning process practically, knowing which information they need to access and why. On this matter, other designers also criticized the aspect of sustainability that remains theoretical in education. The lack of active participation in learning processes was one of the insights that did not create lasting knowledge on sustainability.

In addition to these interview findings, a survey conducted with a larger group of participant designers support these insights. The sufficiency of the materials offered by design education in the context of sustainability was evaluated by the participant designers. Figure 4.12 shows relevant survey findings.

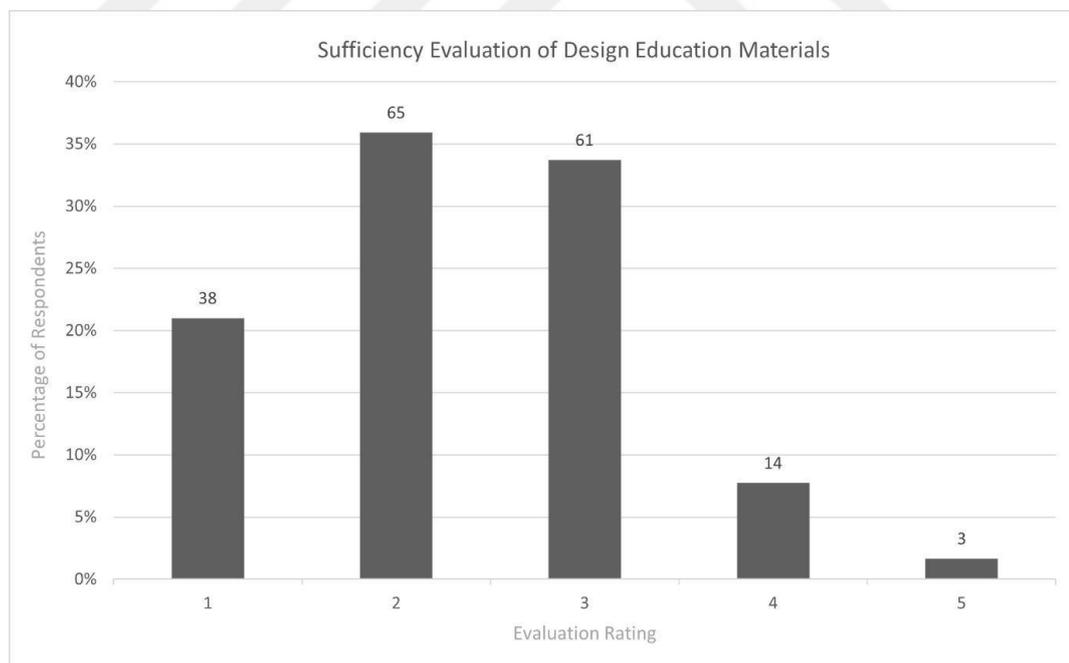


Figure 4.12 : A bar graph showing the evaluation of design education materials in terms of sustainability.

As seen in Figure 4.12, approximately 36% of participant designers evaluated the sufficiency of the educational materials offered by design education in the context of

sustainability as under average. Almost the same percentage of participants, with a rate of 34%, evaluated the educational materials offered by the design education as average. However, as seen in the survey findings, approximately 1.5% of the participants clearly stated that they did not find the educational materials offered by design education in the context of sustainability sufficient. In addition to the insufficiency of the understanding of design students criticized by the participant designers and the criticisms of sustainability initiatives in design education, another understanding that was emphasized was that sustainability is not seen as a criterion in education. In parallel, designers expressed sustainability as not being a grade evaluation factor.

“You can allow some factors to be left behind. Sustainability? Okay, but generally lecturers don't look at it and they don't give grades accordingly.” (P4) [Q107]

P4 criticized both themselves and their education by stating that sustainability was a concept overlooked in their projects due to the absence of concerns about grades. Similarly, other designers mentioned that although it was included in project briefs as a requirement, it was not treated as a primary priority. Designers from different periods addressed this issue according to their own education period. Some designers noted that while projects integrating sustainability factors did bring extra points, it was not considered a fundamental criterion in their education. Besides these insights, striking criticisms emerged about the general approach to sustainability in design education. Designers particularly pointed out that the concept of sustainability is not fully established in the field of design.

“Sustainable design is not a well-established field. You need to do something. There's nothing you can stand on. There is no accumulated knowledge or experience. You know, you're trying to find your way.” (P18) [Q108]

P18 pointed out the lack of sufficient grounding for incorporating sustainability into design processes. A criticism that the designers had insufficient knowledge on the subject actually pointed to the lack of guidance that other designers criticized. From another point, a designer also criticized the insufficient side of design education in terms of sustainability. P10 stated as follows:

“I think they can show a little more of the bigger picture in education. In other words, we could have addressed the climate crisis as the problem of the world and areas where a designer could

develop solutions in the future, and we could have addressed the refugee issue. Either we have ignored such things that society is very involved with and people are the focus of, or products can be designed for these anyway.“ (P10) [Q109]

The expanding fields of design practices require the adaptation of design education. The criticism that current problems and real-world issues are not sufficiently addressed in design education stands out strikingly.

4.5 Designers’ Competence, Behavior, and Professional Identity

RQ5: How does design education contribute to a designer’s competence, behaviors (performance + actions), and identity?

In response to research question #5, the findings regarding the contributions of design education to the designer in terms of sustainability are explained regarding the participant designers’ competence, performance, action, and professional identity development are expressed in this category. In summary, the thematic map of this category is displayed in Figure 4.13, in parallel with the Miller’s Pyramid levels.

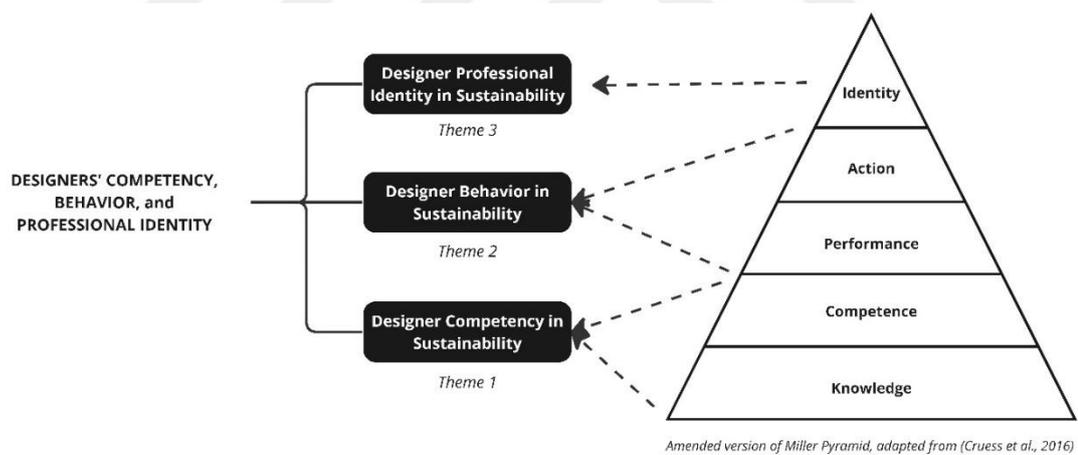


Figure 4.13 : Thematic map of designers’ competence, behavior, and professional identity.

In this category, 3 themes are expressed with their sub-themes. These themes are defined as “Designer competency in terms of sustainability”, “Designer behavior in terms of sustainability”, and “Designer professional identity in terms of sustainability”. All of these themes are explained in detail, respectively.

4.5.1 Designer competence in terms of sustainability

This theme is related to designer competency in sustainability with reference to Miller Pyramid levels of knowledge and competence. It also includes the skill, behavior, and attitude-related findings. The revealed codes in this theme are displayed in Table 4.28. The number of codes was given in parentheses.

Table 4.28 : Codes of “Sustainability competencies of designers” theme.

| Theme 1 | Codes |
|---|---|
| Sustainability competency of designers | Designer vision (6) |
| | Reasoning skill (8) |
| | Material knowledge (4) |
| | Awareness of things around (6) |
| | Awareness of the production process (6) |
| | Conscious consumption behavior (9) |
| | Ethical considerations (3) |
| | Recognizing design education contribution (6) |

In the research findings, to evaluate the contribution of design education to competency in terms of sustainability, designers commented on the effects of design education on changing their behavior in their lives. While designers evaluated the behavior-oriented competency contribution of design education, they also highlighted their competency in knowledge, skills, and attitudes in terms of sustainability. The most prominent findings were the attitudes exhibited with the designer's vision, reasoning skills, material knowledge and awareness, and conscious consumption behaviors. While some of the design graduates who participated in the interviews acknowledged the impact of design education on changing their behavior, some argued that the effect of design education as a source of their daily behavior was low. Others were also skeptical about design education as the source of their behavior.

From the broadest perspective, designers generally emphasize gaining designer vision when evaluating the impact of design education on their behavior. This was also expressed as gaining a designer perspective by some designers. In this regard, a designer expressed as following:

“I think you see sustainability issues more clearly as a designer. Because you're the one doing the work.” (P18) [Q110]

In this context, it was stated by P18 that the designer's perspective contributed by design education allows designers to perceive certain problems more clearly. Similarly, gaining a designer vision provides a diverse understanding compared to people who are not designer. One of the views on this was expressed by P17 as follows:

“If I were not a designer, I would think that I could at least have an impact on an individual level. However, because I am a designer, I believe that if we are doing something, it must be done and implemented on a large scale to be useful.” (P17) [Q111]

According to P17, the most important contribution to gaining a designer's vision is the awareness that it is necessary to go beyond individual benefit. It is expressed that the work done on a large scale will be more beneficial than the individual scale. Another opinion about design education creating a designer's vision is that it enables different thinking from a designer's perspective. In line with this, P5 confirmed the impact of design education on daily behavior and emphasized that became aware of the things around them from a designer's perspective.

“Perhaps it is necessary to have a designer vision to think differently. Yes, I think design education is something that affects my daily life a lot. I mean, because we are always in something. We are surrounded by things such as materials. You know, some people do these materials. It doesn't create itself.” (P5) [Q112]

In this sense, we can say that the designer's perspective encourages think differently. In general, in the interview findings, the fact that the designer's vision gained by design education creates a high perception, encourages different thinking, and increases awareness of the things around them emerged as factors that affect the behavior of the participant designers in their daily lives. In a study conducted with a larger sample group to support these findings, participating designers evaluated the impact of undergraduate design education on daily behavior in terms of sustainability. Figure 4.14 shows the findings of this evaluation.

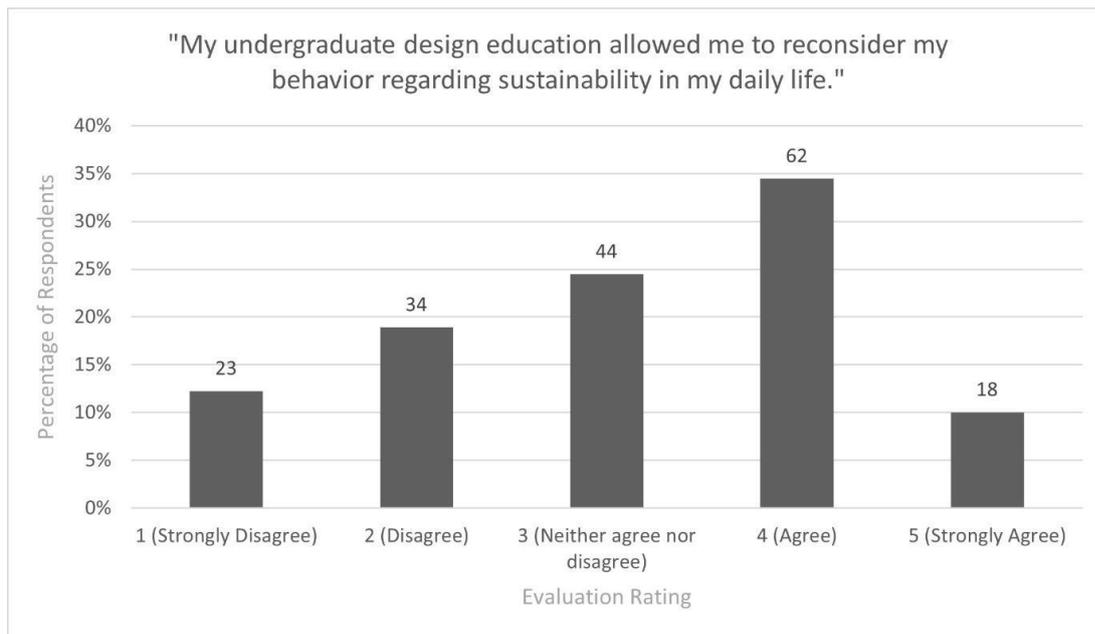


Figure 4.14 : A bar graph showing the contribution of design education in influencing behavior in daily life in terms of sustainability.

According to the survey findings, approximately 34.5% of participant designers agreed that design education influenced their daily behavior encouraging them to reconsider their daily behavior in terms of sustainability. Only 10% of the participants strongly agreed with this statement. The percentage of those who strongly agreed and strongly disagreed with this statement was almost the same. However, the survey findings, in parallel with the interview findings, showed that design education affects daily behaviors in terms of sustainability. At this point, the majority of designers mentioned the questioning skills, which they stated was another contribution of design education.

“If I had studied something else, I would have known about the existence of such a concept even later. Maybe I would be a less questioning person.” (P1) [Q113]

P1's statement demonstrates that the designer vision the designer gained through design education also contributed to questioning skills. In parallel with these discovering and meaning-seeking behaviors that express questioning and reasoning skills have also come to the fore. P2 expressed this situation as follows:

“When I walk in and see a design from a street vendor in a store or outside, I break it down in my mind and ask, how sustainable does this design look? What is the impact on the environment? I've always been thinking about these aspects. Of course, there are many components to this, such as how the worker who does it works or how it is done under what

conditions. So, in general, I think design education is an education that leads people to question.” (P2) [Q114]

Differentiating from questioning skills, reasoning skills can be expressed as the competencies of interpreting situations within a logical framework. In this regard, P2 stated that questions the environmental impact of the objects around from the perspectives of production, labor force, and sustainability. The designer thinks about this questioning skill within the framework of logic and interprets the effect of design education on behavior in this direction. In parallel with this statement, P8 also expressed reasoning skill as follows:

“When you come across a product that you think has an idea behind it, you start thinking unstopably. What will the potential effects of this be, what was the person who made this thinking while doing this, what is the person in front of me thinking about the purchasing decision right now?” (P8) [Q115]

According to P8, questioning what the person who designed any design was thinking while making that design is a behavior that the designer cannot stop. Similarly, P5 mentioned the reasoning skill that comes with being a designer.

“It could also be a behavior you did. You may also have a habit. You know, what does it turn into and how does it continue? Because I think design education provides that. It provides judgment. I think it would be great if everyone got it. Let's make everyone study design. It might make me think about things more thoroughly.” (P5) [Q116]

The designer emphasized that this reasoning skill allows one to question one's behavior and habits and to evaluate oneself accordingly. At the same time, the designer stated that had the opportunity to interpret the future sustainability of their behaviors and the future transformations of these behaviors by reasoning.

In the interview findings, participating designers often mentioned reasoning ability as a contribution to design education. Participants stated that their reasoning skills led them to think more comprehensively and question sustainability issues. It turns out that design education enables them to think about sustainability problems from a different perspective. In the survey conducted with a larger sample group, participating designers evaluated the contribution of design education to solving sustainability-related problems. The survey findings are shown in Figure 4.15, focusing more on the cognitive skills of the survey participants.

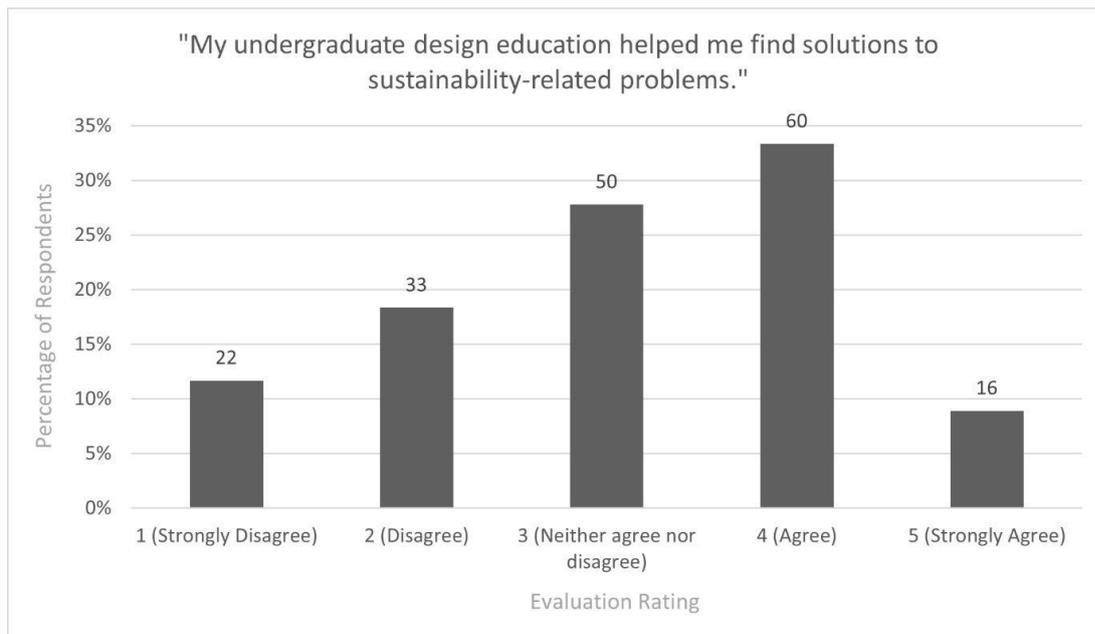


Figure 4.15 : A bar graph showing the contribution of design education in gaining the ability to provide solutions to sustainability-related problems.

According to survey findings, approximately 33% of participant designers agreed that design education contributes to solving sustainability-related problems. Approximately 28% of the participating designers neither agreed nor disagreed with the contribution of design education in this direction. However, only about 9% of participants strongly agreed on the contribution of design education. In general, the survey findings showed that the cognitive skills provided by design education contribute to solving sustainability-related problems. These results also supported the interview findings.

Other findings reveal that this reasoning ability also affects designers' material decisions in their design processes. In this sense, the contribution of design education as an element that affects the perspective on materials was evaluated by designers. P18 made the following statement in this regard:

“Maybe you don't always decide on the material, but at least you know the thing, that material comes from somewhere and you create a new product.” (P18) [Q117]

According to P18, it seems that design education affects developing an understanding of the background of materials. In this regard, although the designer states that cannot always make material decisions during project processes, we can say that questioning skills affect material decisions in the product creation process. Similar to P18's

opinion, many designers also stated that their material knowledge is provided by design education. When questioning the effects of design education on their behavior in general, designers primarily mentioned their knowledge of materials and their behavior towards materials. A designer expressed the impact of material knowledge acquisition after design education on professional design processes as follows:

“We were taking material courses, for example, how to recycle petroleum-derived plastic materials, which ones would not be recycled, thermoset plastics, etc. These, for example, created awareness in education. It helped me see sustainable products in my material selection in design.” (P2) [Q118]

As can be understood from P2's statement, the designer stated that was able to exhibit more conscious behavior in material selection with the material knowledge thanks to design education. It has been stated that gaining general knowledge about the recycling processes of material types also contributions of the design education.

Survey research conducted with a larger sample group to support these interview findings. In this regard, survey participants evaluated the theoretical knowledge that design education provides about sustainability. Figure 4.16 shows the survey findings.

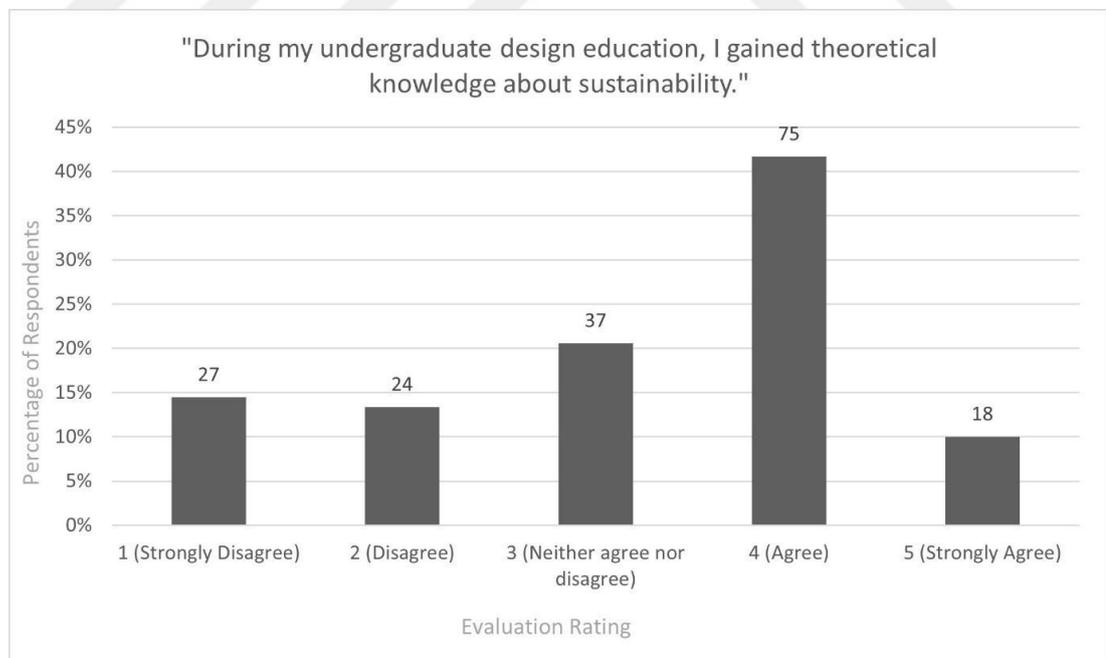


Figure 4.16 : A bar graph showing the contribution of theoretical knowledge about sustainability provided by design education.

According to the survey findings, approximately 41.5% of participating designers agreed with the contribution of sustainability-related theoretical knowledge provided

by design education. However, only 10% of the participants strongly agreed that design education contributes to theoretical knowledge regarding sustainability. Approximately 14.5% of the participants strongly disagreed with this statement. In general, the survey results showed that survey participants contributed to the theoretical knowledge that design education offers about sustainability. These results appeared to support the interview findings, but in the interview findings, the participant designers were limited to expressing the contribution of the education by associating sustainability with the material knowledge offered by design education.

These interview findings were also supported by the survey findings evaluating the contributions of the projects or studies (Figure 4.11). Participants evaluated the contribution of these projects or studies above average. Differently, in the survey conducted with the same sample group, participant designers evaluated the contribution of design education to knowledge acquisition through sustainability-related practices. Figure 4.17 shows the outcome of these survey findings.

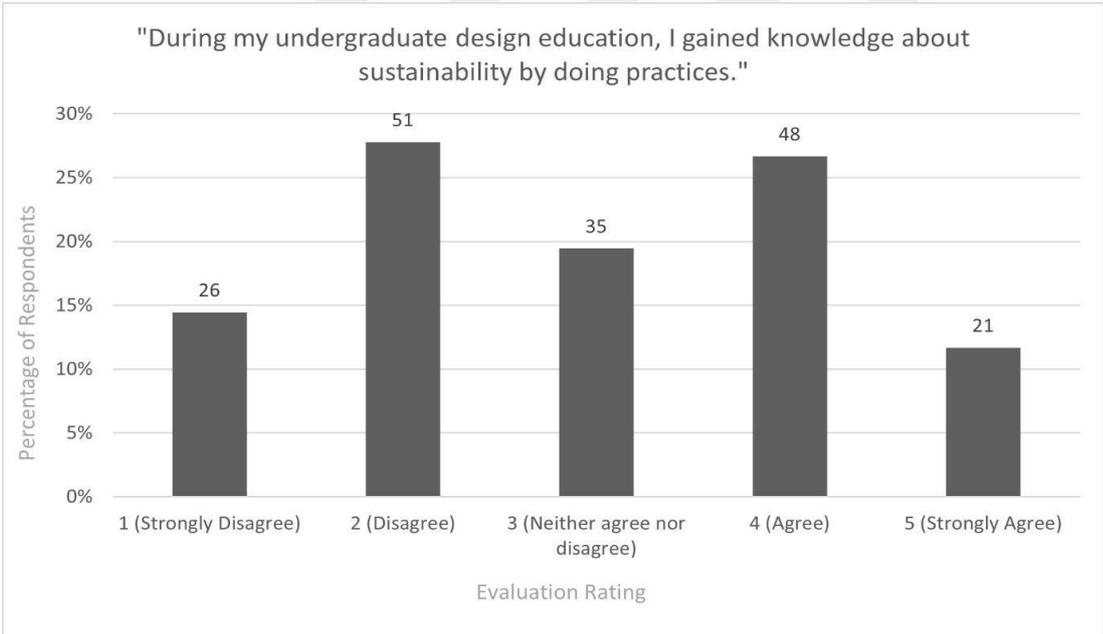


Figure 4.17 : A bar graph showing the contribution of practice-based knowledge about sustainability provided by design education.

According to survey findings, approximately 28% of participant designers disagree with the contribution of design education in gaining knowledge about sustainability through practice. A similar percentage of participants agreed with this statement. However, only about 14.5% of survey participants strongly agreed with this statement.

In general, in the survey findings, the contribution of design education in acquiring knowledge about practice-oriented sustainability was homogeneously divided into participants who agreed and participants who disagreed. However, the rate of participants who disagreed with this statement was relatively higher.

In addition to the awareness created by this material knowledge, designers emphasized conscious consumption behaviors as another contribution of design education. At this point, the designers evaluated the impact of the production and material knowledge they gained through design education and the knowledge about the process of product creation on their consumption habits.

“There is no benefit in acquiring many products. It is beneficial to have a useful product and when you look at a product, you think about how it is. This now becomes an automatic reflex. I wonder how it was done, and what was the project phase like. At the same time, you also see some products that people use in the design environment.” (P4) [Q119]

According to P4, the contribution of design education was expressed in acquiring conscious consumption behavior. In this sense, the designer stated that focused on consuming useful products as a reflex because, as other designers stated, the designer gained an understanding of the production and usage processes of products thanks to design education. Parallel to P4's expression, other designers also mentioned their behaviors toward conscious consumption. In this regard, designers stated that behaviors toward consuming need-oriented things developed with design education. P6 stated that education contributes to sustainable product consumption, similar to the acquisition of conscious consumption behavior through education.

“Of course, it did. Somehow it caused a change in my behavior. It may also be very minor. So, I try to choose more sustainable products, I think that is the most effective for me.” (P6) [Q120]

According to P6, design education can be effective in changing the designer's behavior, but the designer is not exactly sure that design education affects behavior. Many designers often did not make clear evaluation about the impact of their education on creating behavioral change.

“It didn't change my behavior, it wasn't too much of a thing that I was like, but it did cause something like this. In all my design decisions or any business decisions, I have become more reflexive about making my decisions in the light of design, like a button pressed in my brain. So it changed my behavior in such an indirect way but I was already aware of it.” (P10) [Q121]

In P10's statement, it is seen that design education does not affect their behavior visibly, but indirectly. Designers who were unsure about the impact of design education on designers' behavior generally could not give a clear answer regarding their competence. They could mostly interpret this issue as design education providing designers with the ability to act more consciously, or contributing to their competence in material knowledge. In terms of sustainability, a designer commented on the contribution of design education to the competence in their behavior as follows:

“I think the part about trying to extend the lifespan of something is something that a little more design education has contributed to me. Let me use less plastic, buy less packaging, or use degradable garbage bags. But do these have any relationship with design education? I'm not sure about that. I don't know the impact on behavior in my daily life. Maybe it did, but I may not be able to comprehend it. I may have normalized this too much.” (P14) [Q122]

Similarly, designers who thought that sustainability issues were not adequately addressed in design education were skeptical about the contribution of design education to competence on behavior. In a survey conducted with a larger sample group to support these interview findings, participant designers evaluated the contribution of design education to when sustainable behaviors should be demonstrated. Figure 4.18 shows the findings of this survey research.

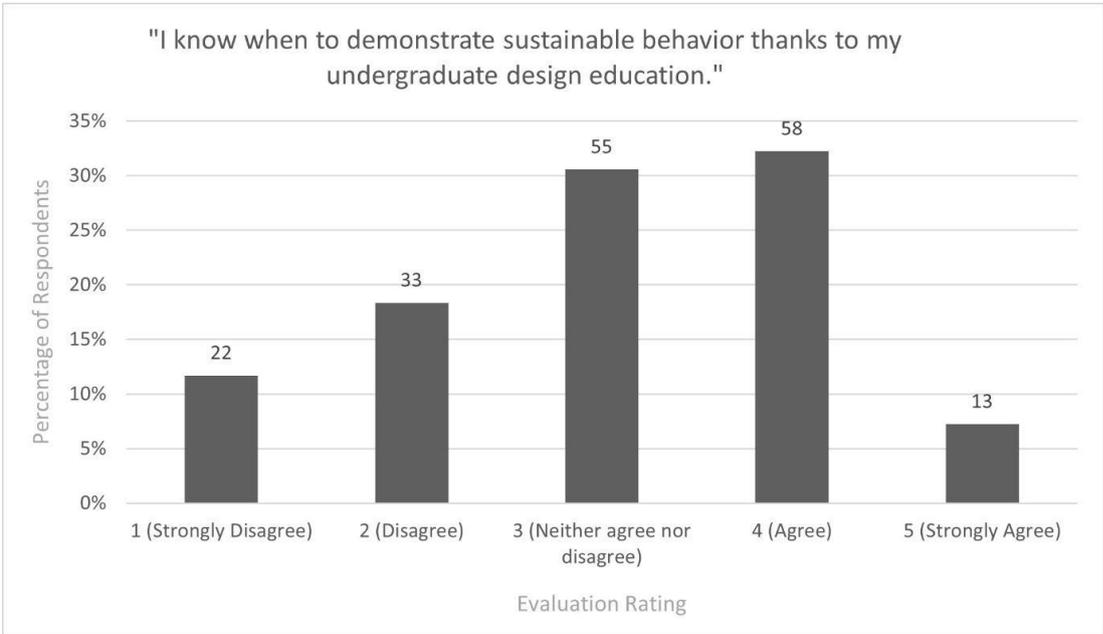


Figure 4.18 : A bar graph showing the contribution of design education to when sustainable behavior should be demonstrated.

According to survey findings, more than 32% of participant designers agreed with the statement that they know when to demonstrate sustainable behavior thanks to their design education. Almost the same number of participants neither agreed nor disagreed with this statement. However, only 7% of participant designers strongly agreed with this statement. Overall, survey findings showed that design education did not make a strong contribution to participating designers' competence in knowing when to demonstrate sustainable behavior. These kinds of findings also emerged in the interview findings. Particularly, interview participants emphasized that conscious consumption behavior was demonstrated thanks to design education. However, in the interview findings, many of the participants were skeptical about addressing design education as the source of the behavior.

In addition to the insights that design education provided about when sustainable behavior should be demonstrated, survey participants also evaluated whether they felt prepared to work on sustainability issues thanks to design education. This evaluation is also a finding that participants evaluate their professional competencies to work on sustainability issues. Figure 4.19 shows the relevant survey findings.

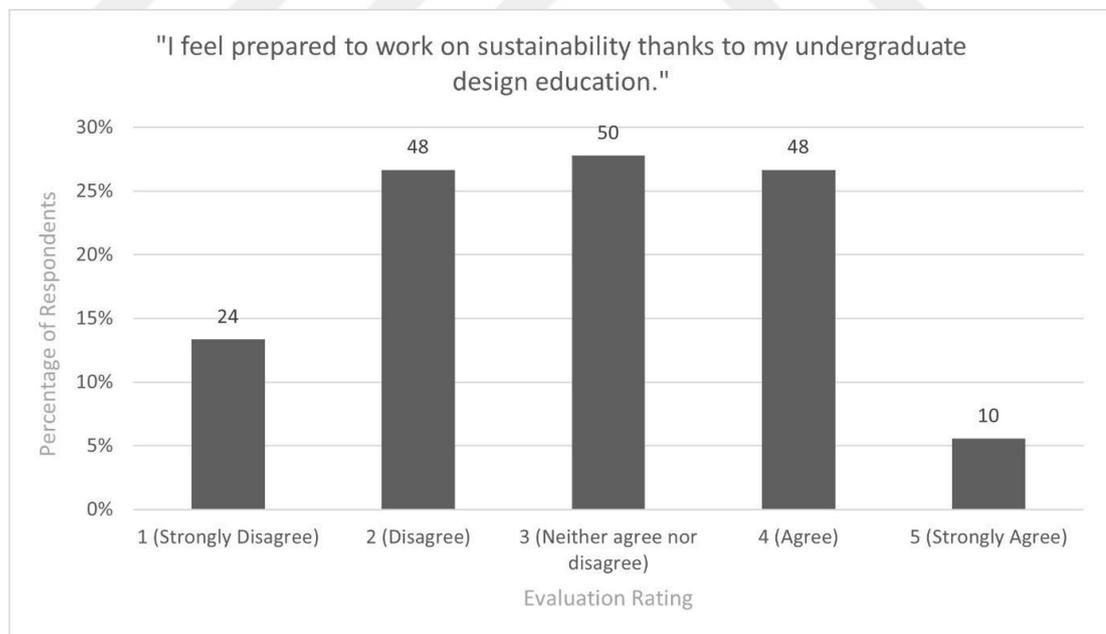


Figure 4.19 : A bar graph showing the contribution of design education to preparation for sustainability-related works.

According to the survey findings, approximately 28% of participants neither agreed nor disagreed with the statement that design education allows them to feel prepared to

work on sustainability-related issues. However, the same percentage of participants agreed or disagreed with this statement. At this point, it was seen that the survey data was distributed quite homogeneously. Taking into account the contribution of their design education, these results showed that the participant designers' evaluation of their competence was indecisive. However, the results also showed the participants' design education did not give them a strong sense of competence.

4.5.2 Designer behavior in terms of sustainability

This theme is related to the behavior of designers in sustainability regarding Miller Pyramid levels of performance and actions. The revealed codes in this theme are displayed in Table 4.29. The number of codes was given in parentheses.

Table 4.29 : Codes of “Behavior of designers in sustainability” theme.

| Theme 2 | Codes |
|---|--|
| Behavior of designers in sustainability | Influencing immediate circle (11) Influencing people with different views (6) Knowledge sharing (18) Influencing without insistence (4) Encouraging people (4) Lack of influencing effort and motivation (13) In- company hierarchy effect (7) Resistance shown by other people (9) Need for collective behavior (9) Lack of action (11) Individual level action (6) In-company idea sharing (7) Consensus building (3) Conflict with company interest (6) Lack of belief (5) Need for encouragement and opportunity (12) Effect of country of residence and lifestyle (5) |

The performance and action levels at the learner assessment levels in the Miller Pyramid were levels related to behaviors. Research findings regarding designers' performance included behaviors that designers exhibited in ways that influenced others. In the performance level findings, designers' attitudes in demonstrating sustainable behavior, the difficulties they encountered, and their criticisms of the situations they encountered are revealed. The findings regarding their actions included behaviors they implemented consciously in their life. In the action-level findings, the

designers mentioned their attitudes towards implementing and demonstrating sustainable behavior. They also expressed the factors that negatively or positively affect these actions.

In the performance-related findings, it was revealed that the designers' influence areas for behavioral change are mostly the immediate circle. In this sense, designers stated that they mostly guided their families or people in their close circle to demonstrate sustainable behavior. But most designers also had the urge to influence people with different views. Some even emphasized their desire to influence people, especially those who are not designers, to demonstrate sustainable behavior.

“When I think about this in a family environment, I feel an incredible urge to impress them. So the things they pay attention to and the things I pay attention to are incredibly different.”
(P6) [Q123]

Apart from close circle, designers also stated that they influence their colleagues. Designers' attitudes towards influencing their close circle regarding sustainability were generally focused on knowledge sharing. Some designers stated that they were able to share knowledge with like-minded people as well as designers who influenced people with different views. In their attitude towards creating behavioral change through this knowledge sharing, designers expressed their urge to share material knowledge, usage scenarios of products, and knowledge about the background of products. Similarly, a designer expressed how knowledge of the background of the products and knowledge of the materials created the urge to impress the people as follows:

“I start telling the backstory of things and people rise to it. I inevitably advertise sustainability. Because I know the process behind it or the material. When I tell the people around me about it, they also get excited. Because how would they know? They don't follow new products or materials as much as designers do.” (P1) [Q124]

According to P1, people who were not designers were more excited about this kind of information than designers because they did not have as much detailed information about the sustainability of products as designers.

Interview findings revealed that the material knowledge provided by design education, understanding of product usage scenarios, and knowledge about the sustainability background of the products affect the behavior of designers. In this regard, design

education has created an incentive for designers to influence them by sharing knowledge with their close circle, work environment, and especially with people who are not designers. In a survey conducted with a larger sample group to support these interview findings, participant designers evaluated the contribution of design education to influencing their environment with what they learned from design education. Figure 4.20 shows the survey findings.

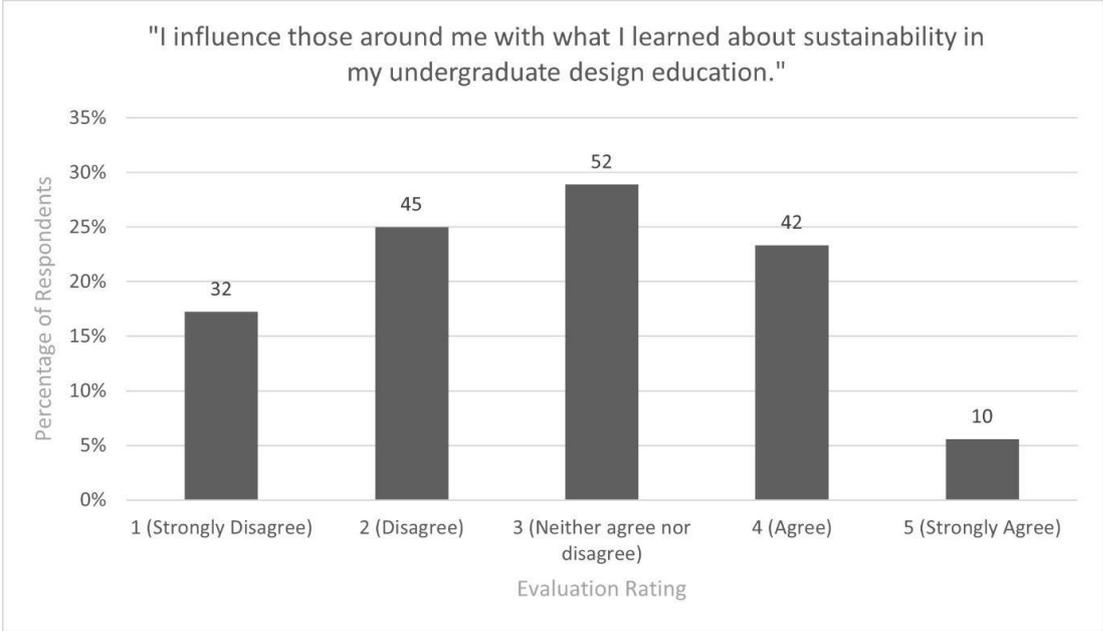


Figure 4.20 : A bar graph showing the contribution of design education to influence others towards sustainability.

According to survey findings, approximately 29% of participant designers neither agreed nor disagreed with influencing their environment with what they learned from design education. 25% of the participants disagreed with this statement. However, almost the same number of participants agreed with this statement. But clearly, the survey findings showed that only 5.5% of respondents strongly agreed with this statement. In general, designers' attitudes in order to influence the people around them to demonstrate sustainable behavior were to avoid insistence. The designers emphasized that they tried to influence the people around them and change their behavior without insisting on or judging them. In this regard, P9 stated as follows:

“Since I don't like to direct people too much, even if I encourage something, I share it in terms of information. I don't insist because I know those who haven't done it won't do it again.” (P9) [Q125]

Some of designers like P9, stated that takes an attitude of smaller and more fun approaches to create behavioral change.

“I like to combine such beautiful examples with design when necessary. I'm trying to make it fun, in short, I'm conveying this as let's be conscious.” (P16) [Q126]

In this regard, we can say that the designer tries to encourage people by avoiding insistence and associating them with more concrete examples from design.

Besides the designers who are enthusiastic about changing the behavior of the people around them or have an encouraging approach in this direction, some designers stated that they do not make any effort to influence the behavior of the people around them and do not have a guidance attitude. In this sense, a designer who has low motivation and criticized design education expressed the following statement:

“Do we believe that I can create impact? Yes, words are nice, I would like to cause a change in the behaviors of people, but who am I? Did my design education or the environment I lived in give me such self-confidence or the courage and tools to struggle with this?” (P8) [Q127]

P8 is a designer who has intentions of creating behavioral change, but the designer stated that could not access suitable environments and expertise was inadequate in this sense. In this regard, the designer criticized that design education did not provide this self-confidence sufficiently. In parallel with this point of view, some of the designers stated that they did not aim to change people's behavior or did not make any effort in this regard, and also pointed out the difficulty of changing people's behavior. The need for the right place and time was also emphasized by participant designers.

Designers often approach challenges of behavioral change interventions from different perspectives. One perspective was the difficulty of convincing people. As a parallel thought, a designer highlighted the difficulty of convincing people as follows:

“We learned about biomaterials and such, but maybe we needed to be given persuasion training or something. How do we create a change from state A to state B? It's such a difficult thing.” (P8) [Q128]

P8 pointed out the importance of persuasion ability in changing behavior and emphasized the importance of being able to persuade to create a change. The designer

even stated that in design education, first of all, it is necessary to gain competencies related to this.

While the interview findings focused more on designers influencing others with their behavior or behavior change interventions, survey research was conducted with a larger sample group to support these findings. In this regard, designers evaluated the contribution of undergraduate design education in demonstrating sustainable behavior. Figure 4.21 shows the survey findings.

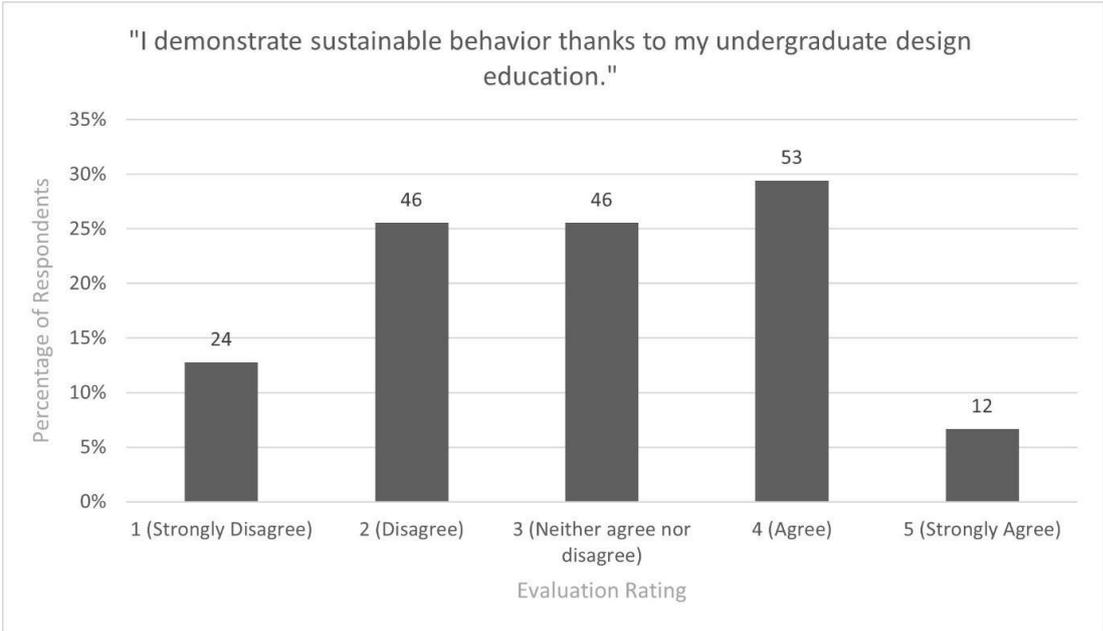


Figure 4.21 : A bar graph showing the contribution of design education to demonstrating sustainable behavior.

According to the survey findings, 29.5% of participant designers agreed that design education contributes to demonstrating sustainable behavior. Almost the same proportion of participating designers disagreed with this statement and neither agreed nor disagreed.

A different perspective on the challenge of behavior change interventions was the need for collective behavior. Designers argued that behavior change cannot easily occur in environments where the same behavior is not shown. In general, the inadequacy of behaviors at the individual level for changing behavior was also considered a demotivating factor.

“In general, my opinion is that if you easily tell people to do this, do that, this is harmful, this is beneficial, it will not change their behavior much. The same thing will happen with the

design you gave. We will say, 'Oh, that's right, it's nice,' etc., and then do it for one day or two, and then won't do it again the next day. Because this is a long-term thing. Culture, you, and those around you can manage to change people. That's why I don't make such an effort. (P16)
[Q129]

According to P16, to change a behavior, the people within certain culture in that environment had to make an effort. The designer mentions that does not make any effort to change people's behavior because cannot involve such an environment. Similarly, other designers stated that trying to create behavioral change individually would not be meaningful unless it was spread on a certain scale. Thoughts about the need for collective behavior also emerged within the company. Designers often emphasized that in-company hierarchies limited designers in creating behavioral change. Another finding that highlights the need for collective behavior is that behavioral change can be created more easily when people with sustainability expertise guide others. P14 expressed the following statement on this subject.

“I think it is necessary to be guided by people who have specialized in such things, so if this is a social transformation, of course, it will start with people who know these things.” (P14)
[Q130]

The designer emphasized that expertise can be a more effective guide in this sense to create social behavioral change. Another perspective on the challenge of behavior change interventions is today's circumstances. In this context, designers illustrated existing system regulations and the impact of today's working conditions and city life. They addressed the challenge of incorporating sustainability into a person's daily routine.

“It seems unfair to me to tell this to someone or to demand it from someone. This is a luxury right now. There are more priorities in today's conditions. The world may disappear in 60-70 years, but people cannot see the future yet. That's why it seems unfair to me to say.” (P17)
[Q131]

P17 stated that people's economic concerns and social problems are at the forefront, overshadowing sustainability issues. The designer also stated that the time and financial resources in a person's daily routine are not enough to sustainability concerns. Besides the problems people experience in their daily routines, another subject of criticism was the inadequate infrastructure of systems for any behavioral change.

In the action-related findings, designers generally stated that they did not take sustainability-oriented actions in their daily lives. Some designers who took action expressed their actions more on an individual level. Some stated that they intended to take action but could not. Some designers stated that had the intention of taking action.

“So, of course, my impact will benefit the world, but the impact I create is very little compared to corporations. There is also the mindset that an action I take individually may not have a sufficient impact, so there is also the mentality that I cannot save the world alone.” (P11) [Q132]

According to P11, individual actions are not effective enough compared to decisions taken by corporates on a much larger scale. In this sense, the designer has a lack of belief. In addition to the designers who thought like P11, some designers stated that they did not have enough environment and opportunity to take action. In this regard, designers generally stated that they could not take part in environments where sustainability issues are considered important.

“I think I am an observer rather than taking action. I couldn't think anything about sustainability, so I don't know, maybe it wasn't possible to take action. Maybe I haven't been in places that give opportunities to these.” (P10) [Q133]

P10 justified the lack of action as the environment did not allow the designer to do so. In this regard, not creating opportunities in design practices regarding sustainability was an issue that was seen as an obstacle to taking action. Designers addressed these opportunities in different dimensions. They discussed dimensions such as justification for the lack of action towards design practice, and designer's lack of initiative aligned with the interests of the companies.

“I haven't done anything sustainability-related like joining a community. I guess I mostly do things that I can do individually. I did not participate in an activist movement or marches for that matter. I can't fully match it with my work anyway. There may be some overlap on a project basis, but that has never happened either.” (P14) [Q134]

According to P14, it is difficult to take action for sustainability in projects because the project scopes are not suitable for sustainability integration. The designer stated that could not relate sustainability issues to design practice.

Interview findings revealed that almost all of the designers did not participate in a sustainability-related community in their individual or professional lives. Survey research with a larger sample group supported these interview findings. In this regard, participants evaluated the contribution of undergraduate design education to participating in a community related to sustainability in daily or professional life. Figure 4.22 shows the survey findings.

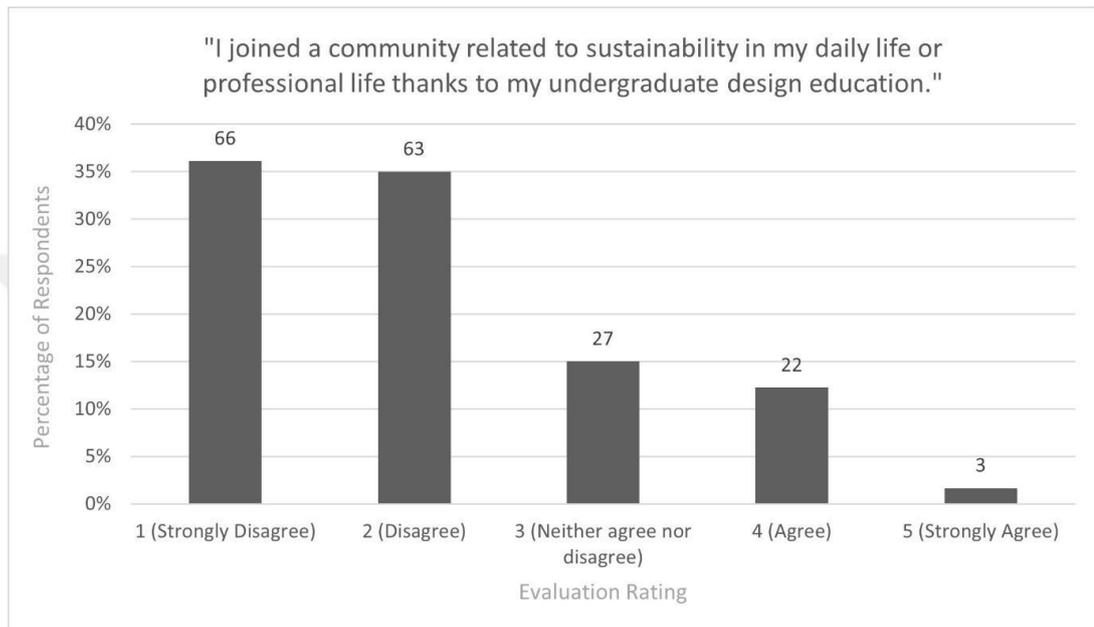


Figure 4.22 : A bar graph showing the contribution of design education to participation in communities related to sustainability in daily or professional life.

According to the survey findings, a very significant 36% of participant designers strongly disagreed with this statement. Almost the same number of participants said they disagreed. Only 1.5% of the participants strongly agreed with this statement. The survey findings clearly showed that the contribution of design education to involvement in a community is quite low. However, in the interview findings, the designers did not evaluate the contribution of design education. They expressed their actions by associating them with professional working environments. These findings showed that the contribution of design education did not stand out in this sense.

Similar to these views, designers especially those working in the field of digital design pointed out the difficulty of taking sustainability-related actions in their working practices. A designer working in the field of digital design justified this lack of action as follows:

“I didn't take action. So, I guess I am a bad designer, but since I have never encountered such a problem in the design field in which I specialize, I guess I don't need to find a solution to it.
“ (P12) [Q135]

P12 mentioned that was not looking for a solution to sustainability problems because the designer did not encounter any sustainability-related problems in the field of expertise. In this case, it caused no action in the designer's practice. Because of this behavior, the designer feels like a bad designer. Designers, who stated that they could not take action regarding sustainability in their design practices, stated that they generally tried to take action at an individual level in their daily lives.

In terms of design practice, it was revealed that designers who had experience in the consumer electronics, defense industry, or furniture industry, were trying to take in-company actions on sustainability, especially in terms of materials and assembly ideas. In the survey research conducted with a larger sample group to support participant designer insights on taking action in design practices, designers evaluated the contribution of design education to integrating the sustainability approach into design decisions. Figure 4.23 shows these survey findings.

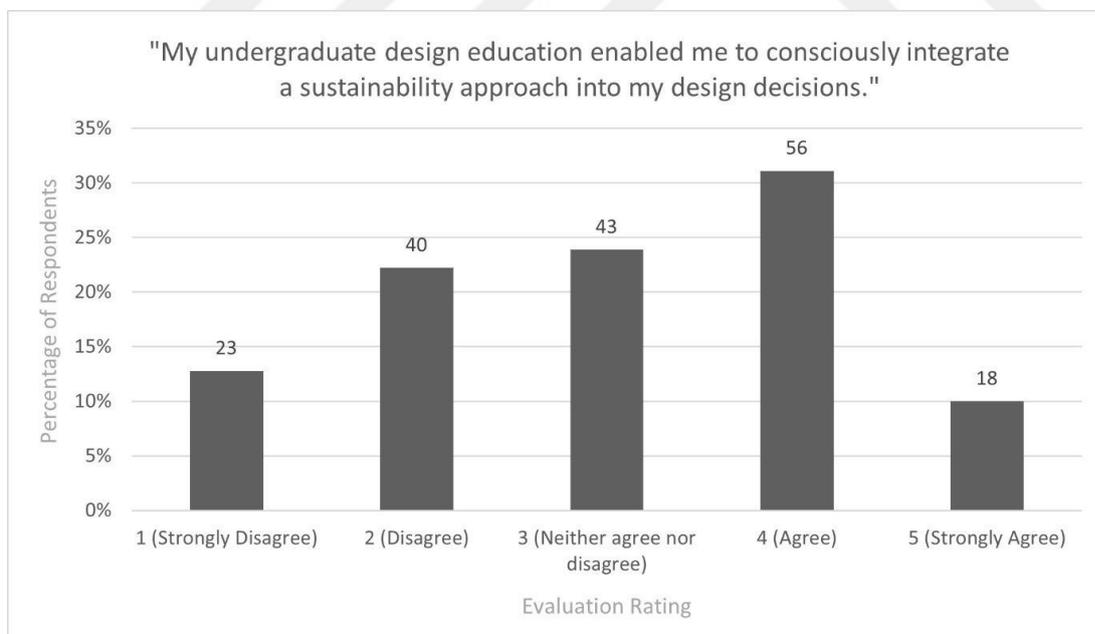


Figure 4.23 : A bar graph showing the contribution of design education to integrate sustainability approaches to design decisions.

According to survey findings, 31% of participant designers agreed that they were able to integrate sustainability approaches into their design decisions thanks to design

education. Nearly the same percentage of participants disagreed and neither agreed nor disagreed with the statement. Only 10% of the participants stated that they strongly agreed. However, approximately 13% of participant designers stated that they strongly disagreed with this statement. As a result, although many designers agreed with the contribution of design education to integrating sustainability approaches into design decisions, the percentage of participants who did not agree and those who neither agreed nor disagreed with this statement was also quite high.

At this point, internal hierarchy and the designer's initiative were emphasized as another difficulty in taking action mentioned by many designers. On this subject, P2 stated as follows:

“I think it can only be implemented in corporate companies, especially when it comes out as an idea from high managerial levels. Apart from that, when the idea came to me, it was about using less material or being easy to disassemble and assemble. In this way, I sometimes share suggestions on a micro scale, such as making it easy to de-assembly and easy to separate for recycling.” (P2) [Q136]

Although P2 still tries to show actions within the company, these remain only at the level of idea sharing. The designer has a belief that greater actions can only be taken by higher managerial levels. This stands out as a demotivating situation, especially for taking action within design practice. Similarly, some designers highlighted the limited designer agency in the company. Some of the designers argued the economic interests of the companies in terms of taking action do not coincide with sustainability.

“For example, we can do something to increase production efficiency. You know, the concern here is a bit financial. Of course, my suggestions must coincide with the interests of the company. Otherwise, companies do not attach importance to innovative ideas and thoughts in this type of business. However, I think it is not possible for a sustainable idea to be implemented. Because sustainability strongly relates to the cost in companies.” (P8) [Q137]

Even designers wants to take the lead by sharing ideas within the company, these ideas must be acceptable and coincide with the interests of the company. This appears as a demotivating situation for the designer to take action.

In a survey conducted with a larger sample group to support these interview findings, designers evaluated the contribution of design education in contributing to the spread of an idea about sustainability. Figure 4.24 shows the findings of these evaluations.

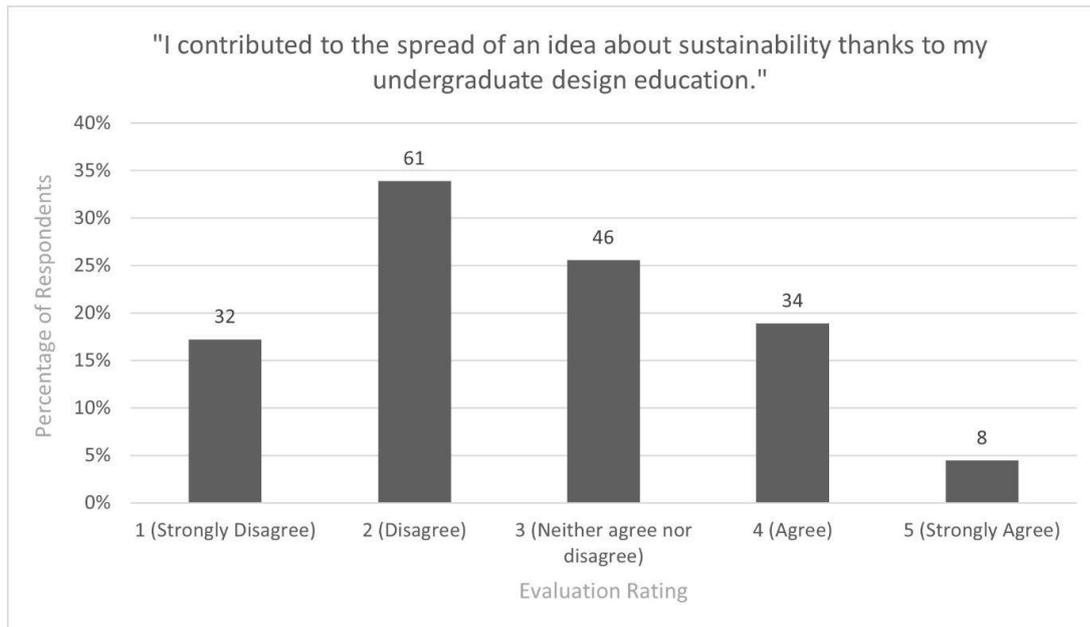


Figure 4.24 : A bar graph showing the contribution of design education to spread an idea about sustainability.

According to the research findings, approximately 34% of participant designers disagreed with the contribution of design education in contributing to the spread of a sustainability-related idea. Approximately 25.5% of the participants neither agreed nor disagreed with this statement. Only about 4.5% of participants strongly agreed.

As a result, the interview findings emerged in parallel with the survey findings. In the interview findings, designers evaluated their contribution to the spreading of an idea within the framework of their work practices. These findings revealed that they were generally unable to contribute to the spread of an idea. At this point, we can say that the dynamics of work practices get ahead of the contribution of design education. In the survey findings, participants mostly stated that their contribution to the spread of an idea was not due to design education.

4.5.3 Professional designer identity in terms of sustainability

This theme is related to designers' professional identity (DPI) in terms of sustainability regarding identity level of Miller pyramid. It include internalization of sustainability-related concepts, the feelings of being a sustainable designer, and designers' approaches to integrating sustainability principles into existing design practices. The revealed codes in this theme are displayed in Table 4.30. The number of codes was given in parentheses.

Table 4.30 : Codes of “Professional designer identity in sustainability” theme.

| Theme 3 | Codes |
|---|--|
| Professional designer identity in sustainability | Emotional Commitment (14) |
| | Self-awareness (12) |
| | Sense of conscience (6) |
| | Ethical responsibility (10) |
| | Identity transformation (7) |
| | Alignment with company goals (12) |
| | Lack of authority in decision making (12) |
| | Impact of company attitudes (8) |
| | Profession barriers (11) |
| | Lack of motivation (10) |
| | Uncertainty of identity source (5) |
| | Desire to benefit to the world (10) |
| | Feeling interact with world (4) |
| | Feeling well (11) |
| | Making interventions in the production and design processes (8) |
| | Designing long-lasting products (3) |
| | Intervention of behaviors of people (5) |
| | Example setting with behavior (3) |
| | Advertising sustainability (3) |
| | Raising awareness of people (5) |
| Making accessible and affordable products (5) | |
| Selecting right materials (6) | |
| Facilitating collaboration (5) | |
| Convincing decision makers (4) | |

To understand the contribution of design education within the scope of DPI development, designers evaluated how much they internalized understandings about sustainability. They explained their approaches, the challenges they encountered in internalizing sustainability, and the effects of these challenges on designer identity. When discussing their approach to internalization, designers often expressed their emotional commitment to sustainability. Many designers also pointed to self-

awareness. They emphasized that sustainability issues are also the ethical responsibility of the designer. Insights also emerged that designers were unable to fully internalize this as part of their designer identity or were unoriented in this regard. However, the belief that sustainability is a concept that should be internalized by designers has also been expressed. In this regard, P16 expressed an approach to internalizing the concept of sustainability with the designer's ethical responsibility, awareness, and commitment to sustainability.

“I feel remorse now. If I can implement it in design, I should implement it. Because it bothers me. It also depends on company projects, but I need to at least bring it up. I have to point out. I need to raise everyone's awareness. I need to spend some of my energy there. Because not doing something when you know it is a bad thing in general. You know, knowing what is right, I cannot remain silent or ignore it.” (P16) [Q138]

According to P16, regardless of the implementation percentage, sustainability was a concept that designers should assert in their design practices. The designer has a high sense of responsibility and has the motivation to guide people in this direction within the framework of design practices. Similarly, some designers addressed internalizing sustainability with an emotional approach and sense of responsibility.

“I approach it emotionally. I feel very responsible. In other words, even though I know the optimal truths, not being able to do it does not leave me at peace in my conscience. I have no authority in this regard, but my statements are also worthless. Because it is not taken into consideration at work.” (P2) [Q139]

According to P2, although the concept of sustainability seems to be internalized, the difficulties experienced by the designer in applying sustainability to design practices stand out. An example of this is the limited authority of the designer in the workplace. This situation creates an obstacle for the designer to adequately adopt this concept. Another prominent finding was that design practices within the company were demand-oriented. This was expressed by many designers as an obstacle to internalizing sustainability approaches.

“I'm not sure if there is such a special, original designer identity left when you work in a corporate company. In other words, I am directionless in this regard, as we work somewhat towards the demand, whatever the conditions require.” (P11) [Q140]

P11 has a directionless perspective on this concept. The designer continues design practices according to the demands and conditions within the company. This situation may have caused the designer's identity transformation. The notion that the designer's identity changes depending on the company they are dependent on was a finding expressed by many designers. In this sense, it turned out that working under a company and its profits prevented designers from embracing the concept of sustainability. On this subject, P17 stated as follows:

“I wouldn't describe myself as having internalized sustainability right now, but I'm already doing something opposite to sustainability in the field I work in. I work entirely on luxury.”
(P17) [Q141]

P17 considers that current design practice is the opposite to sustainability principles. Due to this job description, the designer states that cannot internalize the concept of sustainability. In this direction, the designer's identity transformation seems to have occurred. Designers who cared about sustainability and thought they had internalized it were also those who had difficulty associating sustainability with their design practices. Many designers expressed the difficulty of integrating sustainability into design practices. While they are keen to implement sustainability in design practices, company expectations still seem to be an obstacle. In addition to company expectations, the lack of a motivational work environment was also one of the factors affecting designers' adoption of the concept of sustainability. On this issue, P8 stated the following strikingly.

“The human mind does not want to follow the path it sees as resistant. We need extra motivation to overcome resistance. But when the people around you are demotivating, at work, and at the end of the day, I can recycle 9 plastic bottles a day if I want, I won't be able to save the damage you've done in your factory during the day. There will not be a change regarding the decision that you do not change with your production practice in the world. Because I don't feel like I can make any decisions, I'm not even myself when I go to work. I'm a person who has certain expertise. I no longer have my identity, so I don't even feel shame.” (P8) [Q142]

It is also understood from P8's statement that the roles assigned to designers by the companies they are affiliated with transform the identities of designers. It is seen that the designer's practices towards the companies have a significant impact on the designer's identity. In general, the interview findings demonstrated the participant designers' sense of responsibility toward internalizing sustainability, and emphasized

transformations of professional designer identity depending on their work practices. These findings reveal that the contribution of design education is more towards creating a sense of responsibility and self-awareness. In survey research conducted with a larger sample group to support the findings, the contribution of design education was revealed more clearly. Participating designers evaluated the contribution of design education to their internalization of sustainability principles. Figure 4.25 shows the findings of this evaluation.

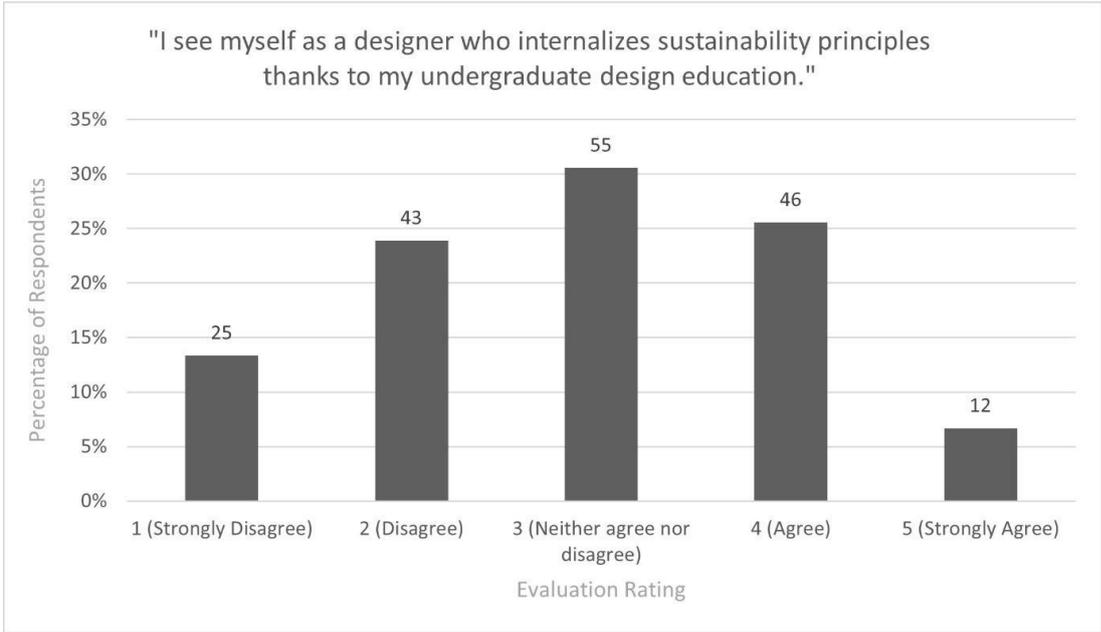


Figure 4.25 : A bar graph showing the contribution of design education in internalizing sustainability principles.

According to the research findings, approximately 30.5% of the participant designers neither agreed nor disagreed that they internalized sustainability principles thanks to design education. 25.5% of the participants agreed with this statement. However, approximately the same number of participants also disagreed with this statement. Only about 6.5% of participant designers strongly agreed with this statement. Although the survey findings showed that the participants neither agreed nor disagreed with the contribution of design education to the internalization of sustainability principles, the percentage of participants who agreed and disagreed with the contribution of design education was also very close to each other. However, the percentage of participating designers who strongly agreed with the contribution of design education in the results was the lowest. These results also emerged to support the interview findings.

Participant designers' internalization of sustainability principles is also related to their values and attitudes in this direction. In the survey conducted with a larger group of participant designers, the contribution of design education in designers' internalization of values and attitudes towards sustainability concerns was evaluated. Figure 4.26 illustrates the evaluation result and expresses the contribution of design education.

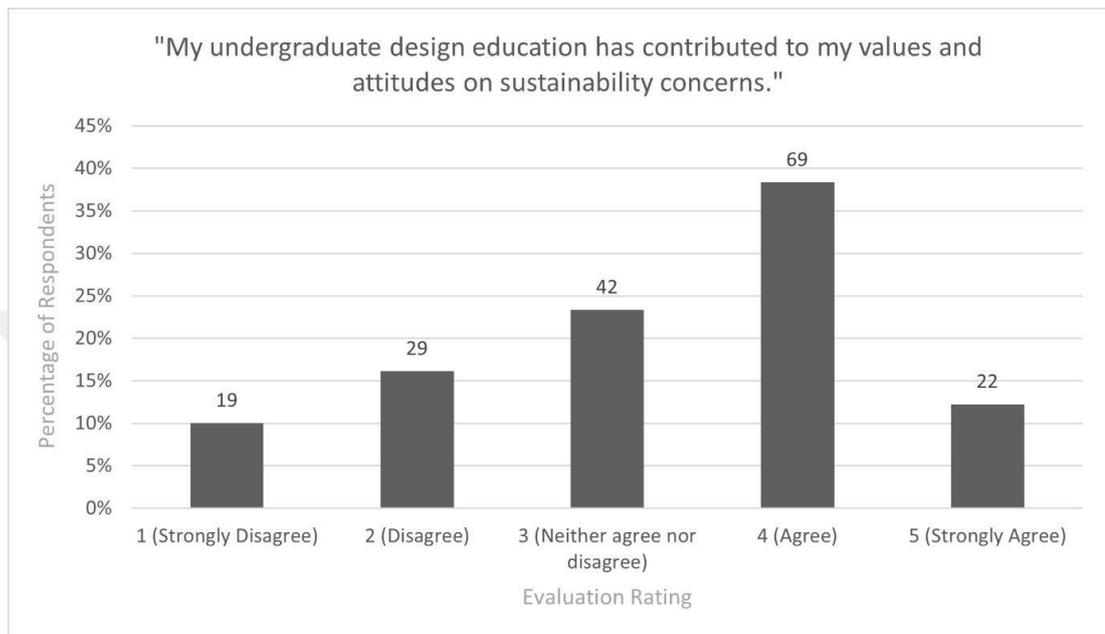


Figure 4.26 : A bar graph showing the contribution of design education to the acquisition of values and attitudes regarding sustainability concerns.

According to the research findings, more than 38% of the participant designers agreed that they acquired values and attitudes regarding sustainability concerns thanks to design education. Only 10% of the participants strongly disagreed with this statement. Although this result is not among the qualitative research findings, it supports these findings.

To better understand the designers' professional identity development in the context of sustainability, the designers also described the feelings of being a sustainable designer. They also expressed their approach in this direction. They addressed this subject with approaches such as providing benefits to the world, the power of designers to direct people, mastering the physical dimensions of environmental sustainability problems, interacting more with the environment, and being remembered well. A sense of proud and a feeling of peace of mind were other prominent findings. Some designers expressed feeling morally satisfied. Feeling in touch, feeling successful, feeling

sensitive, and being conscious were other emotions expressed by the designers. As an example of these insights, a few designers commented that being a sustainable designer felt cool.

“I would probably feel cool. I thought I had accomplished something difficult.” (P8) [Q143]

The designer justified this point of view by not being able to find experts in the field of sustainability as role models. In general, the feeling of inner peace emerged as a feeling that coincided with a sense of responsibility. In this sense, a designer expressed feelings about being a sustainable designer as follows:

“I would feel at peace in conscience or that I had fulfilled my responsibilities towards society at work.” (P14) [Q144]

A different perspective on the designers' feeling of being sustainable designers was expressed by keeping in touch, defined as feeling connected. A designer expressed the following statement on this subject:

“It made me feel like the center of the world was integrated with the environment I was in, breathing with it, moving with it, thinking with it. I mean, it's not like I'm designing something somewhere and it's going on very far and disconnected from me. It would continue to grow and live in my decisions from the moment it started with me. I used to think and feel that way.” (P10) [Q145]

While the designers generally described the feelings of being a sustainable designer, they also expressed the difficulties they may encounter in becoming a sustainable designer. These challenges were parallel to the designers' expressions in previous chapters. Similarly, issues such as demands and expectations in design processes, aesthetic-oriented design processes, the impact of company culture, and the need to address sustainability issues as a collective problem emerge as criticisms of designers.

In parallel, in survey research conducted with a larger sample group of participant designers to support these interview findings, survey participants defined the sustainable designer with open-ended questions. Figure 4.27 shows the density of adjectives that survey participants attributed to the sustainable designer.

LCA of design should be considered at the beginning of the design process. One of the designers expressed the importance of active participation especially in the production processes as follows:

“Especially if I make a production myself with the knowledge I have gained during the production process, I can actively integrate it. That is, it is possible if I make the products myself and take part in the production processes.” (P2) [Q146]

According to P2, the most effective way to integrate sustainability into practice is active participation in production processes. Most designers also approached the implementation of sustainability into their design practices in terms of materials of products. These were methods to reduce material use, make better material choices, choose natural or bio-based materials, and use accessible materials in their designs. Designing long-term products was another finding expressed by the designers.

The high price of sustainable products was also a finding previously expressed by designers. In this direction, they highlighted the purpose of making products affordable while commenting on their methods of integrating sustainability into their design practices. Designers also highlighted how behavioral interventions should be implemented while integrating sustainability into design practice.

“If we are going to protect nature without disturbing people, we must do it without making anyone hate us. Because then you will react. My only goal is to let him know that he is being watched, so he can do it without fear of anyone. I think it is necessary to set an example with behavior.” (P7) [Q147]

From another perspective, they stated that they may have the potential to influence people through exemplary behaviors. As another finding, the designers' approaches to integrating sustainability into their existing design practices was their consideration of sharing ideas within the workplace. In general, the designers also stated that they aimed to raise more awareness by promoting sustainability in the workplace with a mediatory method. They stated that they could only integrate sustainability more easily through a role that facilitates communication and interaction.

“For example, when I am developing an idea, I link something to my manager. In other words, we will gain users with a trend like this, and this will contribute to our business, or I should sell this differently so that they will buy it. If I want to have an impact, I adjust the balances on that scale according to everyone's preferences.” (P10) [Q148]

According to P10, mediatory attitudes come to the fore to convey ideas to the people. The designer considers that this is the only way to convince someone about the sustainability concept.

Facilitating collaboration between diverse disciplines was a finding that was considered important in integrating sustainability into practice. In this sense, the designers emphasized that they can practice sustainability most effectively if people from diverse disciplines gain awareness. A designer expressed the strategic aspect of experiencing sustainability better by providing collaboration.

“I think the designer's biggest duty is to work together and create the conditions, and at the same time, to create the infrastructure for this. It's not that I, as a designer, will make something sustainable, but as a designer, I need to find out how I can direct other people to make this product sustainable. Soft skills are needed. It seems like it's not about good design, but about managing human relations well.” (P18) [Q149]

According to P18, in order to make a product and the process sustainable, first of all, soft skills such as managing human relations well and providing interdisciplinary collaborations are required.

In general, all these interview findings revealed the contribution of design education to integrating the concept of sustainability into work practices in many ways. One of these was the understanding of the need to be the decision maker in the entire production process of the product. Since design education provides participant designers with a deep understanding of the product creation process, participants expressed the need to be involved in processes in which they cannot be decision-makers to integrate sustainable approaches into their work practices. Another contribution of design education was the material knowledge it offered. This revealed the idea of designers to integrate sustainability into their practices with a long-lasting product design approach. The suggestions offered by the participants to encourage users to use products in sustainable ways were to make the products more accessible and to create behavioral change with exemplary behaviors. This emerged as another contribution of design education to the participants. The approaches of being more mediators and facilitating collaborations with different disciplines emerged as the contributions of design education to the participants. In the research conducted to support all these findings, participant designers evaluated the contribution of design

education to their ability to integrate what they teach about sustainability into their work practices. Figure 4.28 shows the findings of this evaluation.

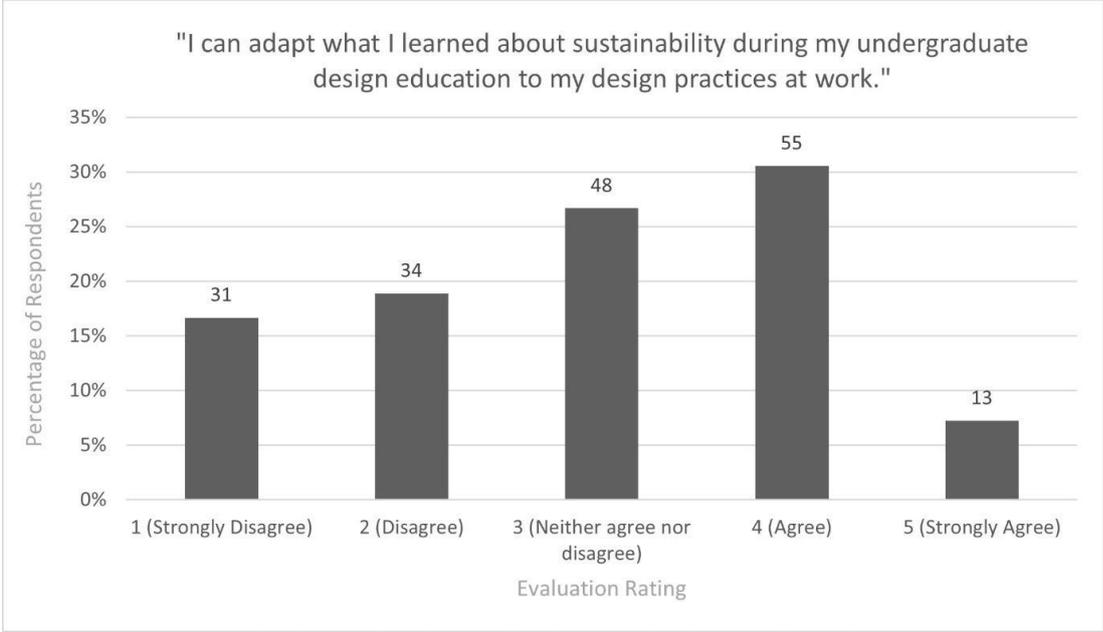


Figure 4.28 : A bar graph showing the contribution of design education to the ability to adapt sustainability knowledge to work practices.

According to the survey findings, approximately 30.5% of participant designers agreed with the statement that they were able to adapt what they learned in design education to their work practices. However, the percentage of those who neither agreed nor disagreed with this statement was relatively close to those who agreed. Although a large percentage of participant designers agreed with this statement, only 7% of participants strongly agreed. In this way, the survey findings also supported the interview findings.

In general, designers believe that sustainability should be considered a fundamental element in companies and expressed that they would like to work in companies that prioritize sustainability. Many designers expressed that they accepted the constraints of the sector in which they worked. Therefore, Designers expressed that they had a lack of enthusiasm in this regard P5 stated as follows:

“I may not have much of an impact because we work in a certain sector and therefore we have already accepted its effects. It feels like you wouldn't have a chance to make a change.” (P5) [Q150]

There is a belief in accepting the demands of the sector. One of the designers working in the field of digital design highlighted the constraints of the working industry as follows:

“There are much faster variables in the digital product than in the physical product, and these variables can hinder its sustainability. It would be a little more comfortable to work in a world where these are a little more clear. I guess I would try to identify these first.” (P12) [Q151]

According to the designer, the digital design process has a more dynamic process than the physical design process. This does not provide a useful process for addressing sustainability concerns. These uncertainties regarding the integration of sustainability into the digital design process also challenging for the designer. As a physical product designer, P2 stated that it would take a long time to integrate into design practice within the company and stated that design concerns are much different for the company as follows:

“It will take a long time to integrate it into my work at the company I work for. The concerns of the products I design do not belong to me. User expectations, product management demands, saleability and marketability, and separability from competitors are important. I can say that the products are designed taking into account parameters such as quality perception, price-quality balance, and usage.” (P2) [Q152]

P2 stated that projects that are beyond the designer's initiative include different concerns other than sustainability. In this case, it shows that the designer does not have an appropriate basis for implementing sustainability in design practices. In parallel, many of the designers expressed their opinion that they should first introduce sustainability to the companies they are dependent on to integrate sustainability into their design practices.

According to the participant designer insights in the interview findings, they were able to express their methods of implementing sustainability principles into their current work practices. The requirements at this point also varied depending on the sector of the participants. For some participants, integrating sustainability into existing work practices was perceived as challenging. All these methods and requirements revealed the approaches and perspectives of the participant designers to consciously integrate sustainability principles into their professional practices. It seems that design education contributes to the participant designers in this direction. In the survey

conducted to support these data, survey participants evaluated the development of designer identity and perspective on sustainability with considering design education contribution. Figure 4.29 shows the survey findings.

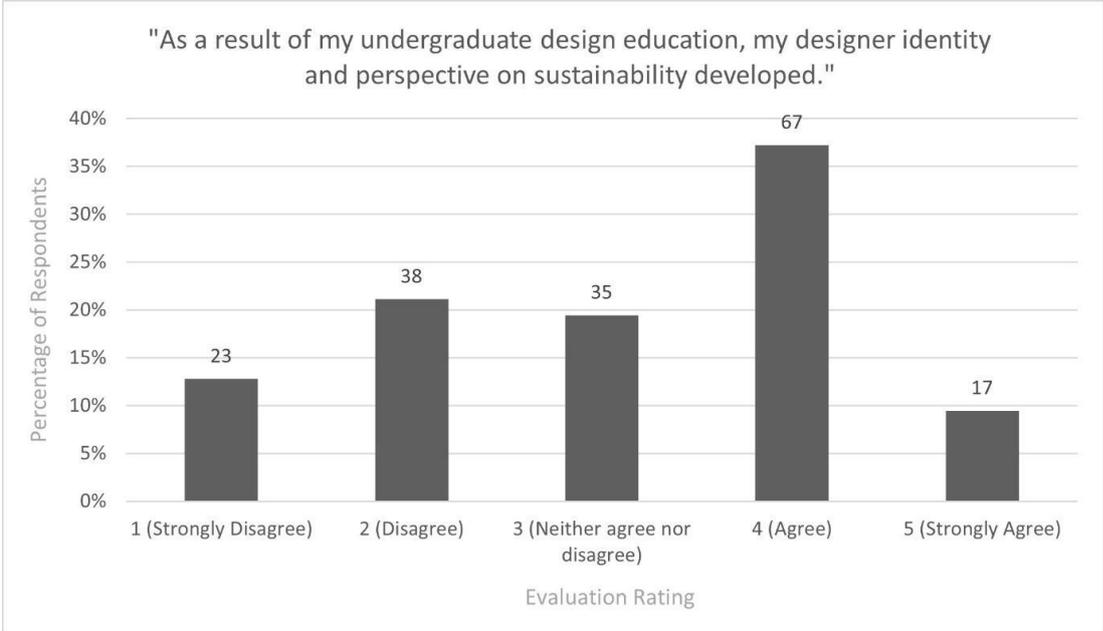


Figure 4.29 : A bar graph showing the contribution of design education in the development of designer identity and perspective on sustainability.

According to survey findings, 37% of participant designers agreed that design education develops a designer identity and perspective on sustainability. However, only 9.5% of participants strongly agreed with this statement. In parallel with the interview findings, the survey findings revealed the contribution of design education to the development of designer identity and perspective on sustainability.

All the findings obtained have been summarized in the next chapter, interpreted in the discussion section in light of the outcomes, and explained in terms of recommendations for design education and future studies.

5. CONCLUSIONS AND RECOMMENDATIONS

This chapter explains the overview of the thesis and answers each research question by summarizing the research findings. Then, it discusses the findings in light of the literature review. Subsequently, the limitations encountered during the research process are discussed. Finally, in light of all research findings, this chapter presents recommendations for design education and further research.

5.1 Overview of the Study

In this thesis study, the background information with self-motivation and purpose of the study served as the starting point by providing a suitable context in the introduction chapter.

In the literature review chapter, sustainability approaches in design and the relationship between the sustainable design and circular design were presented. In the following sections, design education and sustainability literature are presented with related 15 studies. Then, the courses included in the curricula of universities in prominent countries around the world and also Türkiye regarding sustainability is exemplified. In the continuing sections, Miller pyramid model is explained with the potential integration of this model into design education, and implications for designer competence, behavior, and professional identity corresponding to each level of the Miller pyramid in the context of sustainability.

In the research method chapter, to find answers to the research questions, 18 semi-structured interviews were conducted with design graduates and design practitioners. To support the findings of the semi-structured interviews, survey research was conducted with 181 participants. The majority of the survey participants included in the analysis were from various sectors and had different levels of professional experience. The qualitative research findings were analyzed using the thematic analysis method, and the quantitative research findings were analyzed using the descriptive statistics method.

In the findings, the analysis results are presented with 15 themes and 17 sub-themes as a mix of data-driven and theory-driven approaches. Survey results were tabulated and visualized.

This study contributes to a better understanding of the concept of sustainability among design graduates in Türkiye, aims to improve the communication of this concept in undergraduate design education and develop the competencies, behaviors, and professional identities of design graduates in the context of sustainability. Unlike studies that focus on the understandings of design students in terms of sustainability, it explores these understandings with a larger sample group and with graduates who have experience in design practice. It contributes to studies focusing on the knowledge, skills, and competencies of designers in the literature with a focus on sustainability and provides outputs on the sustainable behavior and professional identity development of designers. In addition to many sustainability-oriented studies at the master's level, this study focuses on undergraduate design education in Türkiye and provides insights to design educators, design professionals and further researches.

In parallel with the aims and phenomenological approach of this thesis study, the main findings regarding the main research question "How does design education inform the concept of sustainability?" revealed design graduates' diverse understandings from their conceptual approaches to motivational approaches towards the concept of sustainability. Based on the interview and survey findings, it was concluded that the understanding of the concept of circular design is mostly addressed with the concept of upcycling and transformation and related with the sustainability. However, design graduates' understandings differed, and it was concluded that more in-depth research on circular design was needed. Interview and survey findings revealed that the sources of knowledge about sustainability in daily life mostly come from design education, online sources, and social media. However, the knowledge provided by design education was perceived by design graduates mostly at the foundational level. Based on the interview findings, it was concluded that the contribution of design education to sustainability understandings was understood at the levels of thinking, comprehensive understanding and providing self-criticism. Other interview and survey findings indicated that the contributions of design education to levels of competence, behavior, and professional identity, and the challenges faced by designers, based on

the Miller pyramid regarding sustainability. Accordingly, the summarized findings were answered with the sub-questions in the following section.

5.2 Revisiting Research Questions

5.2.1 How do design graduates conceptualize ‘sustainability’?

In response to research question #1, interview findings were revealed four themes: Sustainability as a concept, sustainability as a daily practice, sustainability as a critical view, and sustainability as a motivation. Based on the interview findings, it was concluded that design graduates had an understanding of the concept of sustainability as an abstract concept, a popular concept, and an environmental concept. It was concluded that sustainability is perceived as a multifaceted and complex concept by design graduates. They stated that perceived sustainability as a popular concept because it is a trending topic they frequently encounter in daily life and it influenced their views in this way. It was also revealed that they associate sustainability as an environmental concept with material properties, recycling or reusing approaches. Survey findings also supported this view.

Based on the interview findings, it was concluded that design graduates conceptualize sustainability through their daily practices, primarily focused on consumption and environmental aspects, associate sustainability with reducing consumption and consuming high-quality products for long-lasting use, and garbage separation. They also conceptualize sustainability from a critical perspective, with clarity of the concept, economic and corporate realities, and personal and professional dynamics. They highlight the need for transparency, ambiguity of criteria, and uncertainty in outcomes, the relationship between economic situations and sustainability, and the need for professional expertise. These findings also highlight the views regarding design graduates feeling inadequate and their lack of self-confidence in matters of sustainability. In this regard, survey findings demonstrated that 47.5% of design graduates rated themselves as average in feeling equipped about sustainability. Lastly, based on interview findings, it was concluded that design graduates conceptualized sustainability through intrinsic motivations and extrinsic motivations. Internal motivations include environmental awareness, commitment, responsibility, and lifestyle choices, while external motivations include government regulations, company policies, and educational mindsets.

5.2.2 What are the knowledge sources of sustainability for designers?

In response to research question #2, interview findings were revealed four themes: Design education as a source, online sources, in-company communication as a source, and immediate circle as a source. The knowledge obtained from design education was expressed by design graduates through undergraduate, postgraduate education and workshops. Online sources expressed as social media, trends, desktop research, blog posts, and online documents. Social media emerged as a common knowledge source of design graduates in the interview findings followed by family or friends. Lastly, in the knowledge sources expressed with workplace communication, company reports, brand advertisements, and conversations with colleagues. In addition to these interview findings, survey findings both supported the interview results. 21.5% of the survey respondents indicated text-based sources like books, magazines, and blog articles, and undergraduate design education was expressed by 18% of respondents.

5.2.3 How do design graduates conceptualize “circular design”?

In response to research question #3, interview findings were revealed two themes: Long-lasting design and uncertainty. Design graduates expressed their understanding by relating it to concepts such as upcycling, reuse, lifecycle, and circularity. They emphasized the ambiguity of the concept and its relationship with sustainability. Based on the interview and survey findings, it was concluded that the concept of circular design was perceived by design graduates as a more grounded or focused concept than sustainability. However, their understanding varied. Survey results also supported these findings. Based on survey results, it can be said that circular design approaches are more focused on "transformation."

5.2.4 How does design education contribute to designers in terms of sustainability?

In response to research question #4, interview findings revealed two themes: Design projects and studies and developing an understanding. Design graduates expressed their experiences in compulsory and elective courses taken during their design education. It was concluded that sustainability-related projects were often associated with the use of waste materials. This was particularly exemplified in projects from basic design courses at the 1st year level. Elective courses focused on materials, compulsory material courses, and projects conducted in collaboration with companies

were noted for their contribution to knowledge on sustainability. In addition to projects and courses, in-class discussions, and the roles of lecturers in encouraging different ways of thinking emerged as significant contributions of design education. It was also revealed that the practice-based studies within the scope of these workshops enriched designers' understandings. Survey findings demonstrated that almost half of design graduates have taken sustainability courses, but a larger percentage of designers are involved in sustainability-related projects or studies. It is seen that design education contributes more to design graduates through projects or studies related to sustainability.

Based on interview findings, it was concluded that design education encourages self-learning, transforms thought, and provides a holistic perspective. It enhances awareness of professional responsibility, facilitates deeper thinking, and enables designers to develop their self-critique abilities. In this regard, graduates have expressed their evolving perceptions towards sustainability, critiquing their education with time constraints, lack of guides, and precedents. In this regard, survey findings support these findings by showing that the adequacy of design education materials is below average.

5.2.5 How does design education contribute to the designer's competency, behaviors (performance + actions), and professional identity?

In response to research question #5, interview findings revealed the contribution of design education, taking the Miller pyramid as a theoretical reference, under three themes: Designer competence in terms of sustainability, designer behavior in terms of sustainability, and designer professional identity in terms of sustainability.

Designer competence in terms of sustainability encompassed the designer's knowledge, skills, attitudes, and behaviors. Based on interview findings, it was concluded that design education contributes to designer vision. In this regard, survey findings demonstrated that design education contributed to reconsidering their everyday behaviors regarding sustainability. Additionally interview findings showed that design education provides reasoning and questioning skills. In parallel, design education was expressed helpful for solving sustainability-related problems in survey findings. Based on interview findings, material knowledge, awareness of using less material, types of materials, and recycling method knowledge are contributions of

design education in terms of knowledge. In the survey findings, it was revealed that almost half of the design graduates acquired theoretical knowledge about sustainability through design education, compared to the acquisition of knowledge based on practice. The other contribution of design education in terms of competence was revealed in terms of gaining awareness of the things around and acquiring ethical concerns. In the interview findings, it was concluded that design education's contribution to gaining conscious consumption behavior and encouraging behavior change, providing decision-making ability, and creating a reflex in attitudes regarding sustainability. Survey findings also supported these findings. Overall, many participants acknowledged the contribution of design education in gaining competence regarding sustainability.

Designer behavior in sustainability, encompassed insights into the performance and actions of design graduates. According to the interview findings regarding performance, it was concluded that design graduates exhibited behaviors aimed at influencing the behavior of those in their immediate environment. Design graduates expressed that these influential attitudes are facilitated through the transfer of knowledge and this knowledge transfer stems from the background knowledge on usage scenarios and material knowledge provided by design education. However, the survey findings demonstrated that design graduates neither agreed nor disagreed that they influenced people around them with what they learned in design education. Based on the interview findings, it was concluded that design graduates need the right environment, and maturity of the environment for behavioral change. Furthermore, it was concluded that there is a need for collective behavior rather than individual effort. Strikingly, the interview findings revealed that behavioral intervention towards sustainability is directly linked to the current economic situation and that it is difficult to effectively address these concerns in Türkiye. Another prominent finding from the interviews indicated the criticisms of design graduates that design education does not provide sufficient persuasive ability and confidence to create behavior change. On the other hand, survey findings showed that design education contributed to design graduates' ability to demonstrate sustainable behavior.

According to the interview findings regarding action, it was revealed that most design graduates intended to act but did not take any action such as joining a community regarding sustainability in their lives. Survey findings also supported this view.

Interview findings also indicated that the absence of environments that provide opportunities to take sustainability-focused actions and the lack of exposure to related problems did not motivate design graduates to act. From the perspective of design education contribution, survey findings showed that design education helps graduates consciously integrate sustainability approaches into design decisions. However, based on interview findings, the biggest barrier to integrating sustainability into design decisions was the influence of designer's limiting agencies within their organizations.

Designer's professional identity in sustainability focused on how designers internalize the concept of sustainability, their values, and attitudes towards it, how sustainable designer understood, and how they can integrate sustainability approaches into their current design practices. The design graduates' approaches to internalizing the concept of sustainability were revealed as a sense of awareness and a recognition of their ethical responsibility. The challenges in internalizing sustainability were expressed with demand-driven approaches within companies, workplace attitudes, and insufficient motivation. Based on this interview findings, it was concluded that these challenges led to a transformation in the designers' professional identity. However, in another survey findings, the contribution of design education to designers' values and attitudes on sustainability concerns was evaluated positively by design graduates. Design graduates expressed the meaning of sustainable designer, focusing on physical dimensions against environmental problems and interacting with the environment in the interview findings. Survey findings revealed that they perceived sustainable designers as sensitive, responsible, and conscious. These understandings may provide insights into the vision, awareness, and sense of responsibility gained by design graduates through design education.

As a prominent finding from the interviews, the understanding that best sustainability practices may be achieved by facilitating collaboration between different disciplines and ensuring interdisciplinary work. For this purpose, the need for managerial behaviors and facilitation skills was emphasized by the design graduates. Lastly, the survey findings revealed that most design graduates agreed with the contribution of design education to the designer's identity and perspective.

5.3 Discussion

As a common finding, understanding the concept of sustainability as multifaceted and complex has made it difficult for designers to understand and communicate with related subjects as Humphries-Smith's (2008)'s indicated earlier. Based on both interview and survey findings, the concept of sustainability is often associated with concrete concepts, the environment, and recycling activities by design graduates. However, the concept of sustainability goes much further than this; it is not only about environmental concepts but also includes social and economic dimensions (Bhamra & Lofthouse, 2007; Elkington, 1997; Geissdoerfer et al., 2017). Interestingly, the concept of circular design has emerged as a design approach that design graduates generally state that they are not familiar with its exact definition but can somehow predict its purpose. The literature findings also indicate that there is an unestablished research area and more than one definition of circular economy and design for the circular economy (Kirchherr et al., 2017). For this reason, it is difficult within the scope of this study to evaluate the understanding of design graduates. The critical views of design graduates towards the uncertainty in the limits of sustainability, which emerged in the interview findings, also emerged in the case studies given as examples (Küçüksayraç & Arıburun-Kirca, 2020). Factors influencing this perspective may be their understanding of the lack of precedents or expertise in this field. Boks and Diehl (2006) also stated that meetings with sustainability experts in design education encourage students in their studies.

Approaches to integrating sustainability concerns as a foundation in design education are also expressed in many related studies in section 2.2.1. Interview findings also indicate that courses on sustainability are more often offered as optional. Current curricula also support these findings. However, more detailed research into past curricula is needed. When the current situation is interpreted, it can be said that sustainability courses in the current curricula of universities in Türkiye are still generally offered as optional, more focused on environmental factors, and weak in offering opportunities to create expertise in sustainability compared to design education in prominent countries around the world in section 2.2.1.3. In this regard, expertise in sustainability, which cannot be provided in design education, also affects work practices (Faludi et al., 2023).

5.3.1 Revisiting Miller pyramid

When we consider the contributions of design education in the context of sustainability according to the levels of the Miller pyramid, Figure 5.1 illustrates these contributions corresponding each level.

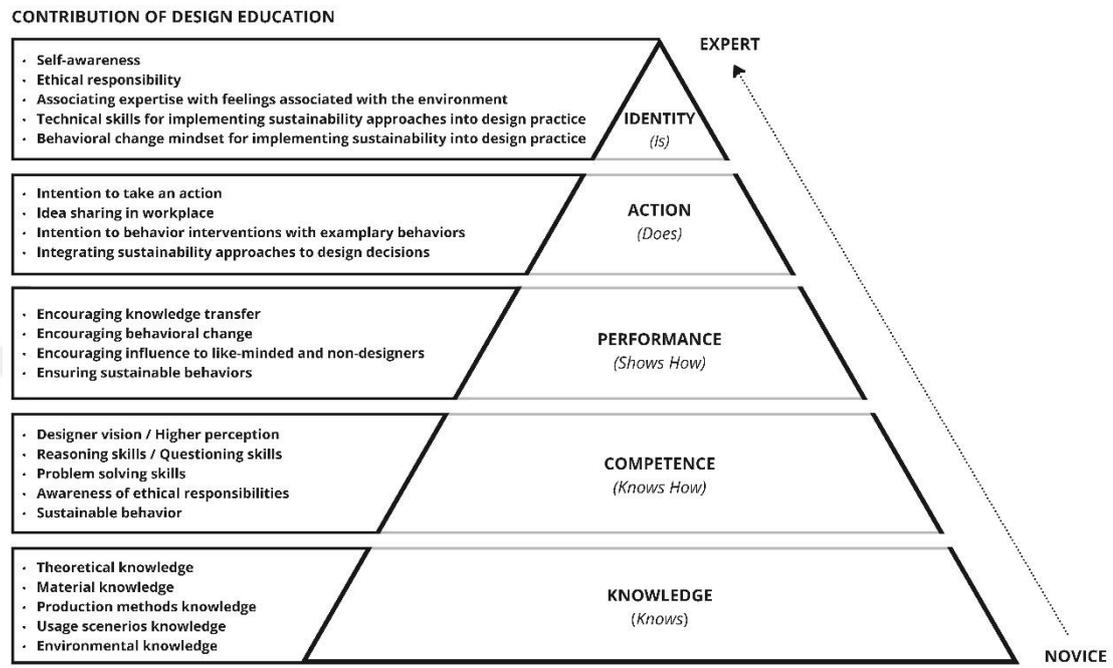


Figure 5.1 : Diagram showing the contribution of design education with revisiting Miller's pyramid (1990).

5.3.1.1 Contribution of design education at the knowledge level

Based on the interview and survey findings, the theoretical knowledge contribution of design education in the context of sustainability may have enabled design graduates to feel knowledgeable about the environmental dimension of sustainability. However, the interview findings revealed that this knowledge awareness was gained over time. It may be said that this situation makes it difficult for design graduates to evaluate the knowledge contribution that design education provides regarding sustainability. As pointed out by Turhan and Ünlü (2009), and based on interview and survey findings, practice-based knowledge in design education may be more effective in gaining perspectives on sustainability than the contribution of theoretical knowledge.

5.3.1.2 Contribution of design education at the competence level

Humphries-Smith's (2008) emphasized that design education should focus on the knowledge and skills required to integrate sustainability and become an expert

designer on sustainability. In this context, according to the interview findings, the high perception and designer vision provided by design education in Türkiye allows design graduates with the ability to criticize and reason about current situations as sustainability competencies. In the survey findings, although the contribution of design education to problem-solving skills in the context of sustainability and its contribution to demonstrating sustainable behavior is expressed by design graduates, in the interview findings, the reflections of these contributions of design education on design practice are perceived as unclear.

5.3.1.3 Contribution of design education at the performance level

The knowledge provided by design education is effective in its contribution to the performance level. Based on the survey findings, we can say that the awareness provided by this knowledge encourages sustainable behavior. Although the interview findings reveal that design graduates influence the behavior of people around them with this knowledge, this contribution of design education is not clear in the survey findings. The factors in this situation may be internal and external that affect the motivation of design graduates to create behavioral change. Lilley and Lofthouse's (2009) study at Loughborough University pointed out the knowledge needed for design students to create behavioral change. Although the interview findings of this thesis reveal criticism that design education does not provide sufficient self-confidence and persuasion ability to create behavioral change, it can be said that it provides the ability to reason about the skills and conditions required to create behavioral change.

5.3.1.4 Contribution of design education at the action level

Based on the interview findings, it can be said that design education at the action level provides an intention. However, as discussed in the literature, social and personal barriers affect behavioral intention and actual behavior (Eagle et al., 2016). Based on the interview findings, it can be said that design graduates expressed barriers such as the belief that individual influence will be insufficient to action towards sustainability, not being able to access environments that offer opportunities, and the association of sustainability with expensiveness in Türkiye. These kinds of factors also affect the actual behavior.

Designers working in various sectors participated in this thesis study. Interview findings strongly demonstrated that designer agencies in taking action within the

company varies by sector. Difficulties in taking action on sustainability have emerged, especially in sectors where aesthetics and function are at the forefront. It has been stated that sustainability initiatives are limited to sharing ideas and suggestions. An important finding of the interview is the differences of opinion between designers working on physical product design and digital product design in initiatives to take action within the relevant sectors. It can be said that designers working on digital product design have difficulty associating sustainability concerns with their design practices or integrating them into their practices.

5.3.1.5 Contribution of design education at the identity level

According to survey results regarding identity level, the self-awareness and sense of ethical responsibility acquired through design education, which also emerged in the interview findings, may have an impact on the internalization of values and attitudes towards sustainability among design graduates. When interpreted in the context of sustainability, Ashforth's (2008) model points to behaviors that encompass components such as beliefs, values, attitudes, knowledge, skills, and abilities that constitute professional identity, as well as performance and actions. However, it is stated in the literature that the focus on students' behaviors in design education is generally lacking (Trede et al., 2012). Accordingly, based on the findings from interviews, it can be said that the contribution of design education to the development of professional identity in terms of sustainability is perceived as ambiguous by design graduates. However, the presence of many sources influencing behaviors may have made it difficult for design graduates to evaluate the contribution of design education.

The designer's agency is also effective in demonstrating sustainable behaviors within the sector and integrating them into design practices. Based on the interview findings, it can be said that although the knowledge, skills, and awareness provided by design education encourage design graduates to integrate sustainability in their design practices, the barriers that arise on a sectoral basis transform the professional designer identity over time. In this context, it may be important to understand the perspectives of not only design students and graduates but also employers.

5.4 Limitations of the Study

The main limitations of this thesis study stem from its focus on sustainability as an ethical issue and within the scope of designers' responsibilities, naturally incorporating evaluations of understandings. Design graduates and design professionals may have altered the responses to the survey questions with an inclination not to create a negative impression and to look have awareness. This led to a limitation in semi-structured interviews apparently, where design professionals particularly showed hesitance in sharing their identities and perspectives. The fact that this thesis study does not focus on a comprehensive research on the learning outcomes of past sustainability-related curricula in design education in Türkiye makes it difficult to interpret the results, especially where survey participants who took sustainability-related courses evaluated the contributions of design education. In addition, the theoretical reference of the study to Miller's pyramid lacks previous examples of theory-driven implementations in the industrial design discipline, making the validity of these recommendations within the design discipline vague. Another limitation of the study is the focus of the interviews and survey on designers who graduated from industrial design departments in Türkiye, thus the findings are insufficient for making inferences about design education internationally. Lastly, the survey's sample group predominantly comprising designers working in specific sectors and including those practicing in graphic and digital design, as well as physical product design, has complicated the interpretation of professional identity, and designers agencies for the certain design practice.

5.5 Recommendations for Design Education

In line with the results of this thesis study, suggestions for future design education can be as follows:

- The contribution of design education to understanding can be more pronounced with more permanent and practice-based educational activities.
- The concept of sustainability can be presented in education in formats that are easier to understand and communicate to real-world problems.
- Design education can create awareness of possible workplace culture barriers.
- Adequate learning materials for sustainability can be provided in undergraduate design education.

- Design processes can be restructured to provide design students with opportunities to study on sustainability in their projects.
- Action plans can be made for design discipline to quickly adapt in line with the expanding professional branches in the context of sustainability.
- In the field of digital design, opportunities can be created to instill notions of sustainability in new professional branches.
- Design education can offer opportunities or programs that will create "sustainable design expertise."

5.6 Recommendations for Further Research

Recommendations for future research can be as follows:

- Further research can be conducted with an international scope.
- More detailed studies can be undertaken for each level of the Miller pyramid.
- In order to evaluate the knowledge and competence of design graduates about sustainability, further research can be conducted to understand the uncertainty of the limits of sustainability.
- Designers' potential interventions towards sustainability can be explored not only through design professionals but also through employers.
- Subsequent studies can be structured to evaluate how design students can be assessed in the educational process according to the stages of the Miller Pyramid in terms of sustainability.
- To adopt sustainability principles in professional identity development, more detailed research can first be conducted on the development of the designer identity.



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APPENDICES

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APPENDIX A : Semi-structured Interview Questions (Turkish)

Isınma Soruları

1. Hangi tasarım disiplininde mezunsunuz?
2. Hangi yıllar arasında eğitim aldınız?
3. Kaç yıldır tasarımcı olarak çalışıyorsunuz? İş tanımından biraz bahsedebilir misiniz? (Organizasyon türü, büyüklüğü vs.)

Günlük Rutinlere ve Anlayışlara Yönelik Sorular

4. Sürdürülebilirlik ile ilgili ne düşünüyorsunuz? Sürdürülebilirlik konusunda kendinizi ne kadar donanımlı hissediyorsunuz?
5. Gündelik hayatınızda sürdürülebilirlik nasıl bir yer tutuyor?
6. Sürdürülebilirlik ile ilgili mevcut bilginizi hangi kaynaklardan elde ettiğinizi düşünüyorsunuz?
7. Döngüsel tasarım kavramı sizce neleri ifade ediyor?

Tasarım Eğitimi Arkaplanına Yönelik Sorular

8. Tasarım eğitiminiz sırasında sürdürülebilirlik konusunda bir çalışmanız/projeniz oldu mu? Yaptığınız çalışmayı anlatabilir misiniz?
9. Sürdürülebilirlik konusundaki bilgi birikiminize aldığınız eğitim nasıl katkıda bulundu? (*Bilgi*)
10. Tasarım eğitimi sürd ile ilgili davranışlarınızı yeniden gözden geçirmenizi sağladı mı? Günlük hayatınızda davranışlarınızı değiştirmeye yönelik etkileri nelerdir? (*Yeterlilik*)
11. Tasarımcı olarak sürdürülebilirlik hakkında öğrendikleriniz ile çevrenizdekileri etkileme ve yönlendirme gibi tutumlarınız oluyor mu? Bu konuda ne düşünüyorsunuz? (*Performans*)
12. Sürdürülebilirlikle ilgili var olan bilginiz günlük hayatınızda/mesleki nasıl bir aksiyona yol açtı mı? (Bir topluluğa katılma, bir fikre öncülük etme, topluluk kurma, sosyal sorumluluk projelerine dahil olma, proaktif olarak bir girişimde bulunmak vb.) (*Aksiyon*)
13. Sürdürülebilirliğe yönelik olan anlayışlarınızı ne kadar içselleştirdiğinizi düşünüyorsunuz? Kendi tasarımcı kimliğinizi sürdürülebilirlik üzerinden nasıl tanımlıyorsunuz? (*Kimlik*)
14. Sürdürülebilir davranışlar gösteren veya tasarımlar yapan bir tasarımcı olmak size nasıl hissettirir? (*Kimlik*)
15. Tasarım pratiğinize sürdürülebilir tasarım yaklaşımlarını nasıl entegre edersiniz? (*Kimlik*)

APPENDIX B: Semi-structured Interview Questions (English)

Warp-up Questions

1. Which design discipline did you graduate from?
2. In which years did you receive your education?
3. How many years have you been working as a designer? Could you provide some information about your job description? (Type of organization, size, etc.)

Questions about Daily Routines and Understandings

4. What are your thoughts on sustainability? How knowledgeable do you feel about sustainability?
5. How does sustainability play a role in your daily life?
6. Where do you think your current knowledge about sustainability comes from?
7. In your opinion, what does the concept of circular design represent?

Questions about Design Education Background

8. Did you have any projects or studies related to sustainability during your design education? Could you describe a project you worked on?
9. How did your design education contribute to your knowledge of sustainability? (*Knowledge*)
10. Did your design education lead you to reconsider your behaviors related to sustainability? What are the effects on your daily life behaviors? (*Competence*)
11. As a designer, do you have attitudes that influence and guide those around you regarding sustainability? What are your thoughts on this? (*Performance*)
12. Has your existing knowledge of sustainability led to any actions in your daily life or professional life? (joining a community, leading an idea, building a community, getting involved in social responsibility projects, proactively starting an initiative, etc.) (*Action*)
13. How much do you believe you have internalized your understanding of sustainability? How do you define your designer identity through sustainability? (*Identity*)
14. How does it feel to be a designer who exhibits sustainable behaviors or creates sustainable designs? (*Identity*)
15. How do you integrate sustainable design approaches into your design practice? (*Identity*)

APPENDIX C: Informed Consent Form

Bilgilendirilmiş Onam Formu

İstanbul Teknik Üniversitesi Lisansüstü Eğitim Enstitüsü, Endüstriyel Tasarım Bölümü öğretim üyesi Koray Gelmez danışmanlığında 502191911 numaralı Seher Naz Ayhan Arda tarafından yürütülen “Tasarım eğitiminin tasarımcıya kazandırdığı kimliğin sürdürülebilirlik bağlamında araştırılması” konusundaki araştırmaya katılımınız rica olunmaktadır. Bu çalışmada katılımınız tamamen gönüllülük esasına dayanır. Lütfen aşağıdaki bilgileri okuyunuz ve katılmaya karar vermeden önce anlamadığımız herhangi bir şey varsa çekinmeden sorunuz.

Bu çalışmayla bağlantılı olarak elde edilen ve sizinle özdeşleşmiş her bilgi gizli kalacak, üçüncü kişilerle paylaşılmayacak ve yalnızca sizin izniniz ile ifşa edilecektir. Gizlilik, tanımlanmış bir kodlama prosedürüyle sağlanacak ve kod çözümüne erişim yalnızca çalışmanın sorumlusu araştırmacıyla sınırlı kalacaktır. Araştırma sonuçları tüm gizlilik ilkelerine uyularak sadece bilimsel çalışmalarda kullanılacaktır. Tüm veriler sınırlı erişime sahip güvenli ve şifreli bir veri tabanında tutulacaktır.

Bu araştırma ile ilgili herhangi bir sorunuz veya endişeniz varsa, lütfen iletişime geçiniz.

ARAŞTIRMACILARIN KİMLİĞİ:

Doç Dr. Koray Gelmez
İstanbul Teknik Üniversitesi
T: [REDACTED]
E: [REDACTED]

Seher Naz Ayhan Arda / Lisansüstü Öğrencisi
İstanbul Teknik Üniversitesi
T: [REDACTED]
E: [REDACTED]

Yukarıda açıklanan prosedürleri anladım. Sorularım tatmin olacağım şekilde yanıtlandı ve dilediğim zaman ayrılmaya hakkım saklı kalmak koşulu ile bu çalışmaya katılmayı onaylıyorum. Bu formun bir kopyası tarafıma iletildi.

Tarih:

Katılımcının Adı Soyadı:

İmzası:

e-posta: Telefon:

Figure C.1 : Informed consent form.

APPENDIX D: Survey Questions

Sorular Yanıtlar 188 Ayarlar

Bölüm 1/6

Yüksek Lisans Tez Çalışması Anket Soruları: Sürdürülebilirlik Bağlamında Tasarım Eğitiminin Profesyonel Kimlik Gelişimindeki Etkisi

Bu anket, İstanbul Teknik Üniversitesi Lisansüstü Eğitim Enstitüsü Endüstriyel Tasarım Lisansüstü Programı'nda yürütülmekte olan yüksek lisans tezi kapsamında hazırlanmıştır. Çalışmanın temel amacı tasarım eğitiminin tasarımcıların profesyonel kimlik gelişimindeki etkisini sürdürülebilirlik bağlamında araştırmaktır.

Anket soruları lisans mezuniyeti tasarım bölümlerinden olan, tasarım pratiğini profesyonel olarak sürdüren veya daha önce tasarım alanında herhangi bir sektörde çalışmış tasarımcılara yönelik hazırlanmıştır.

Katılımınız gönüllülük esasına dayalı olup verileriniz üçüncü kişilerle paylaşılmayacaktır. Sorulara vereceğiniz yanıtlar kesinlikle tarafımızca saklı tutulacak olup sadece akademik çalışma amacıyla kullanılacaktır.

Çalışmadan istediğiniz zaman çekilebilirsiniz.

Teşekkürler,
Saygılarımızla.

Araştırmacıların İletişim Bilgileri
Seher Naz Ayhan Arda | Lisansüstü Öğrencisi
Doç. Dr. Koray Gelmez | Tez Danışmanı

1. bölümden sonraki kısım Sonraki bölüme geç

Bölüm 2/6

Lisans Eğitim Bilgileri

Açıklama (isteğe bağlı)

Lisans eğitiminizi hangi üniversiteden aldınız? *

Kısa yanıt metni

Lisans eğitiminizi hangi bölümden aldınız? *

Kısa yanıt metni

Lisans mezuniyet yılınız nedir? *

Kısa yanıt metni

Figure D.1 : Sections 1 and 2 of the survey questions.

Lisansüstü Eğitim Bilgileri



Varsa lisansüstü eğitim bilgilerinizi giriniz. Yoksa diğer sayfaya geçebilirsiniz.

Yüksek lisans eğitiminizi hangi üniversiteden aldınız?

Kısa yanıt metni

Yüksek lisans eğitiminizi hangi bölümden aldınız?

Kısa yanıt metni

Yüksek lisans mezuniyet yılınız nedir?

Kısa yanıt metni

Doktora derecenizi hangi üniversiteden aldınız?

Kısa yanıt metni

Doktora derecenizi hangi bölümden aldınız?

Kısa yanıt metni

Doktora mezuniyet yılınız nedir?

Kısa yanıt metni

Figure D.2 : Section 3 of the survey questions.

Bölüm 4/6

İş Deneyimi Bilgileri ⌵ ⋮

Açıklama (isteğe bağlı)

Kaç yıldır profesyonel tasarımcı olarak çalışmaktasınız? *

Deneyimim yok

1 yıldan az

1 - 5 yıl arası

6 - 10 yıl arası

10 yıldan fazla

Diğer...

Hangi sektörde çalışmaktasınız? *

Halen çalışmıyorsanız en son çalıştığınız iş üzerinden cevaplayabilirsiniz.

Kısa yanıt metni

Çalıştığınız kurumdaki ünvanınız nedir? *

Halen çalışmıyorsanız en son çalıştığınız iş üzerinden cevaplayabilirsiniz.

Kısa yanıt metni

4. bölümden sonraki kısım 5. bölüme (Sürdürülebilirlik ...e İlgili Sorular) git ▾

Figure D.3 : Section 4 of the survey questions.

Sürdürülebilirlik İle İlgili Sorular



Açıklama (isteğe bağlı)

Sürdürülebilirlik deyince aklınıza gelen 3 kelimeyi yazınız. *

Kısa yanıt metni

Çalışmalarında sürdürülebilirlik konularına odaklanan bir tasarımcı sizce nasıl tanımlanan bir tasarımcıdır? *

Kısa yanıt metni

Sürdürülebilirlik konusunda kendinizi ne kadar donanımlı hissediyorsunuz? *

1 2 3 4 5

Donanımlı hissetmiyorum.

Oldukça donanımlı hissediyorum.

Döngüsel tasarım deyince aklınıza gelen 3 kelimeyi yazınız. *

Kısa yanıt metni

Sürdürülebilirlik ile ilgili mevcut bilginizi hangi kaynaklardan edindiğinizi düşünüyorsunuz? *

 Aile / Arkadaş Meslektaş Çalışılan Kurum Kitap / Dergi / Blog Yazıları vb. Lisans Tasarım Eğitimi Lisansüstü Tasarım Eğitimi Sosyal Medya (Instagram / Facebook / Twitter (X) / LinkedIn vb.) Diğer...

Figure D.4 : Section 5 of the survey questions.

Lisans eğitiminiz sırasında sürdürülebilirlik konusuyla ilgili bir ders aldınız mı? *

Evet

Hayır

(Evet ise) Bu dersin sürdürülebilirlik hakkındaki mevcut donanımınıza olan katkısını derecelendiriniz.

Bir projede veya çalışmada yer almadıysanız bu soruyu cevaplamayınız.

1 2 3 4 5

Hiç katkısı olmadı. Oldukça katkısı oldu.

Lisans eğitiminizde sürdürülebilirlik ile ilgili bir projede veya çalışmada yer aldınız mı? *

Evet

Hayır

(Evet ise) Bu projenin veya çalışmanın sürdürülebilirlik hakkındaki mevcut donanımınıza olan katkısını derecelendiriniz.

Bir projede veya çalışmada yer almadıysanız bu soruyu cevaplamayınız.

1 2 3 4 5

Hiç katkısı olmadı. Oldukça katkısı oldu.

Tasarım eğitiminizin sürdürülebilirlik konuları ile ilgili size sunduğu materyallerin yeterliliğini derecelendiriniz. *

1 2 3 4 5

Hiç yeterli değildi. Oldukça yeterliydi.

Figure D.4(continued): Section 5 of the survey questions.

Tasarım eğitiminizin aşağıdaki ifadelere ne derecede katkıda bulunduğunu *
değerlendiriniz.

Aşağıdaki ifadeleri lisans eğitiminizi göz önünde bulundurarak cevaplayınız.

| | 1 (Kesinlikle katılmıyorum) | 2 (Katılmıyorum) | 3 (Ne katılıyorum ne katılmıyorum) | 4 (Katılıyorum) | 5 (Kesinlikle katılıyorum) |
|---|--------------------------------|-----------------------|---|-----------------------|-------------------------------|
| Lisans eğitimim sırasında sürdürülebilirlik hakkında öğrendiklerimi tasarım sürecime adapte edebiliyorum. | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Lisans eğitimim sayesinde sürdürülebilirlik konularına yönelik çalışmaya hazırlıklı hissediyorum. | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Lisans eğitimim sırasında sürdürülebilirlik konuları hakkında uygulamalar yaparak bilgi sahibi oldum. | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Lisans eğitimim sayesinde sürdürülebilirlikle ilgili bir fikrin yayılmasına katkı sağladım. | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Lisans eğitimim sırasında sürdürülebilirlikle ilgili teorik bilgiler edindim. | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Lisans eğitimim sayesinde ne zaman sürdürülebilir davranışlar göstermem gerektiğini biliyorum. | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

Figure D.4(continued): Section 5 of the survey questions.

| | | | | | |
|--|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|
| Lisans eğitimim sayesinde kendimi sürdürülebilirlik ilkelerini benimseyen bir tasarımcı olarak görüyorum. | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Lisans eğitimim sayesinde sürdürülebilir davranışlar gösteriyorum. | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Lisans eğitimim sonucunda sürdürülebilirlikle ilgili tasarımcı kimliğim ve bakış açım gelişti. | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Lisans eğitimim sürdürülebilirlikle ilgili gündelik hayatımdaki davranışlarımı yeniden gözden geçirmeme olanak tanıdı. | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Lisans eğitimim sürdürülebilirlik konularındaki değer ve tutumlarıma katkıda bulundu. | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Lisans eğitimim tasarım kararlarıma sürdürülebilirlik yaklaşımını bilinçli olarak entegre etmemi sağladı. | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Lisans eğitimim sayesinde günlük hayatımda / meslek hayatımda sürdürülebilirlikle ilgili bir topluluğa katıldım. | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Lisans eğitimimde sürdürülebilirlik hakkında öğrendiklerimle çevremdekileri etkiliyorum. | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Lisans eğitimim sürdürülebilirlik ile ilgili problemlere çözüm üretmemde yardımcı oldu. | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

Figure D.4(continued): Section 5 of the survey questions.

TEŞEKKÜRLER



Çalışmaya olan katkılarınız için çok teşekkür ederiz. Gönder butonuna basmayı unutmayınız. Herhangi bir sorunuz veya çekinceniz olursa istediğiniz zaman iletişime geçebilirsiniz.

Araştırmacı İletişim Bilgisi:

Seher Naz Ayhan Arda | Lisansüstü Öğrencisi

Figure D.5 : Final page of the survey questions.



APPENDIX E: Professional Titles of Survey Participants

Table E.1 : Professional titles of survey participants.

| Professional Titles | Number of Respondents |
|---------------------------------------|-----------------------|
| Industrial Designer | 37 |
| Product Designer | 17 |
| Specialist Industrial Designer | 11 |
| Design Manager | 10 |
| Senior Industrial Designer | 9 |
| UX / UI Designer | 9 |
| Specialist Product Designer | 7 |
| Specialist UX / UI Designer | 5 |
| Research Assistant | 5 |
| Lead Product Designer | 4 |
| Packaging Designer | 4 |
| Intern Industrial Designer | 4 |
| Graphic Designer | 4 |
| Founder Industrial Designer | 3 |
| Associate Industrial Designer | 2 |
| Lead Industrial Designer | 2 |
| Senior Specialist Industrial Designer | 2 |
| Design Director | 2 |
| Freelance Industrial Designer | 2 |
| Yacht Designer | 2 |
| User Experience Researcher | 2 |
| Lead UX / UI Designer | 2 |
| Marketing Designer | 2 |
| Service Designer | 2 |
| Pattern Designer | 1 |
| Accessory Designer | 1 |
| Assistant Professor | 1 |
| Teaching Assistant | 1 |
| Product Development Specialist | 1 |
| Mechanical Design Engineer | 1 |
| Retail Concept Designer | 1 |
| 3D Modeling Specialist | 1 |
| Senior Product Designer | 1 |
| Marketing Manager | 1 |
| Project Manager | 1 |
| Senior Lead Industrial Designer | 1 |
| Senior Lead Product Designer | 1 |
| CMF Designer | 1 |
| Design Architect | 1 |
| Specialist Graphic Designer | 1 |
| Art Director | 1 |
| Senior Design Strategist | 1 |
| Creative Technologist | 1 |
| Interaction Designer | 1 |
| Artificial Intelligence Designer | 1 |
| User Experience Manager | 1 |
| Creative Designer | 1 |
| Visual Communication Designer | 1 |
| 3D Artist | 1 |
| UX Consultant | 1 |
| Senior UX / UI Designer | 1 |

APPENDIX F: Transcripts of Semi-structured Interviews

The image displays a Google Spreadsheet interface used for tabulating semi-structured interview transcripts. The spreadsheet is oriented vertically on the page. It features a grid of cells, with the top row containing column headers and subsequent rows containing text from interview transcripts. The text is dense and appears to be organized into columns, likely representing different segments or themes from the interviews. The spreadsheet interface includes a toolbar at the top with various editing tools and a sidebar on the left.

Figure F.1 : Tabulating of semi-structured interview transcripts via Google Spreadsheet.

APPENDIX G: Insight Post-its Tagged with Participant Number

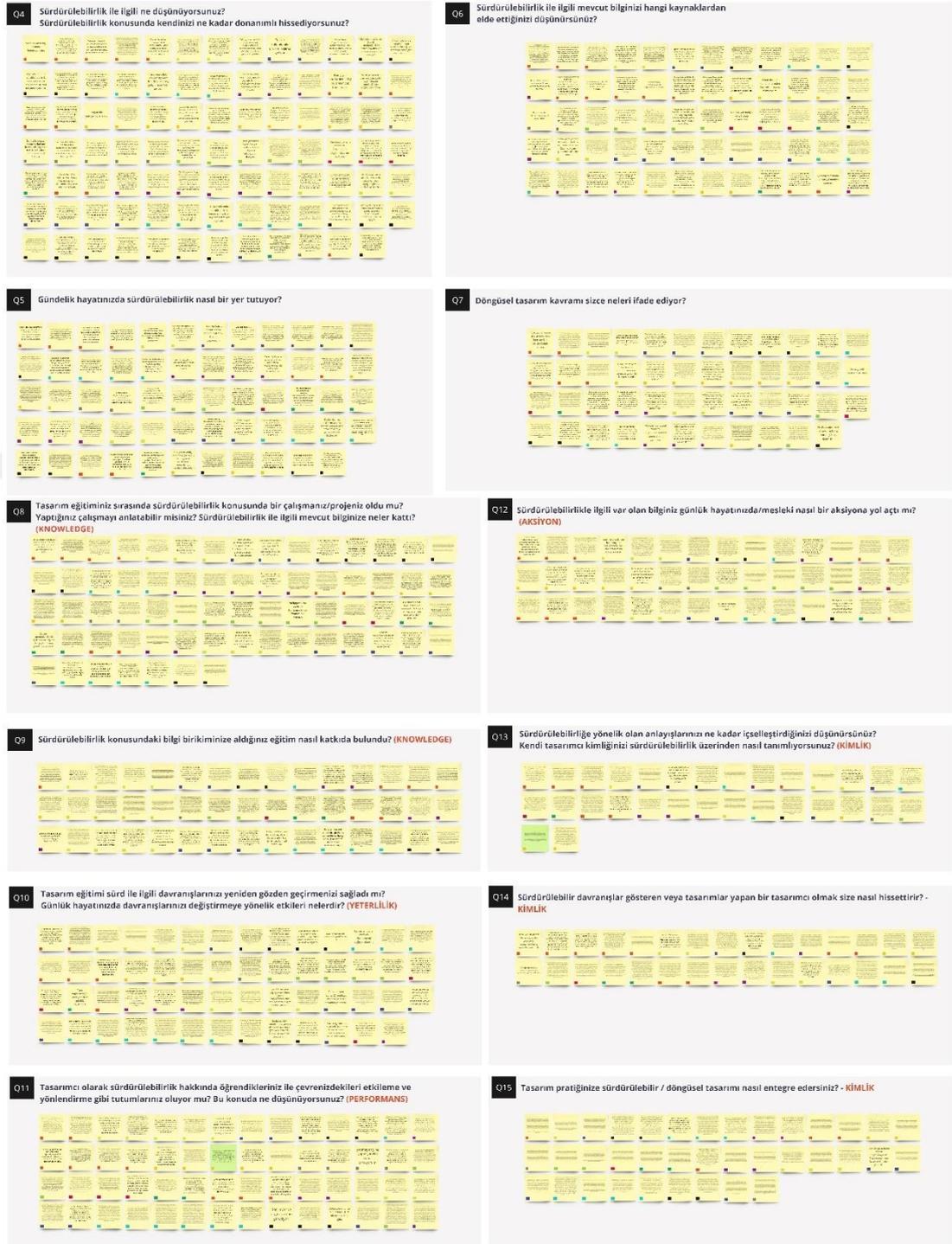


Figure G.1 : Transferring insights onto participant number-tagged post-it notes.

APPENDIX H: Clustering Insights by Participant Numbers

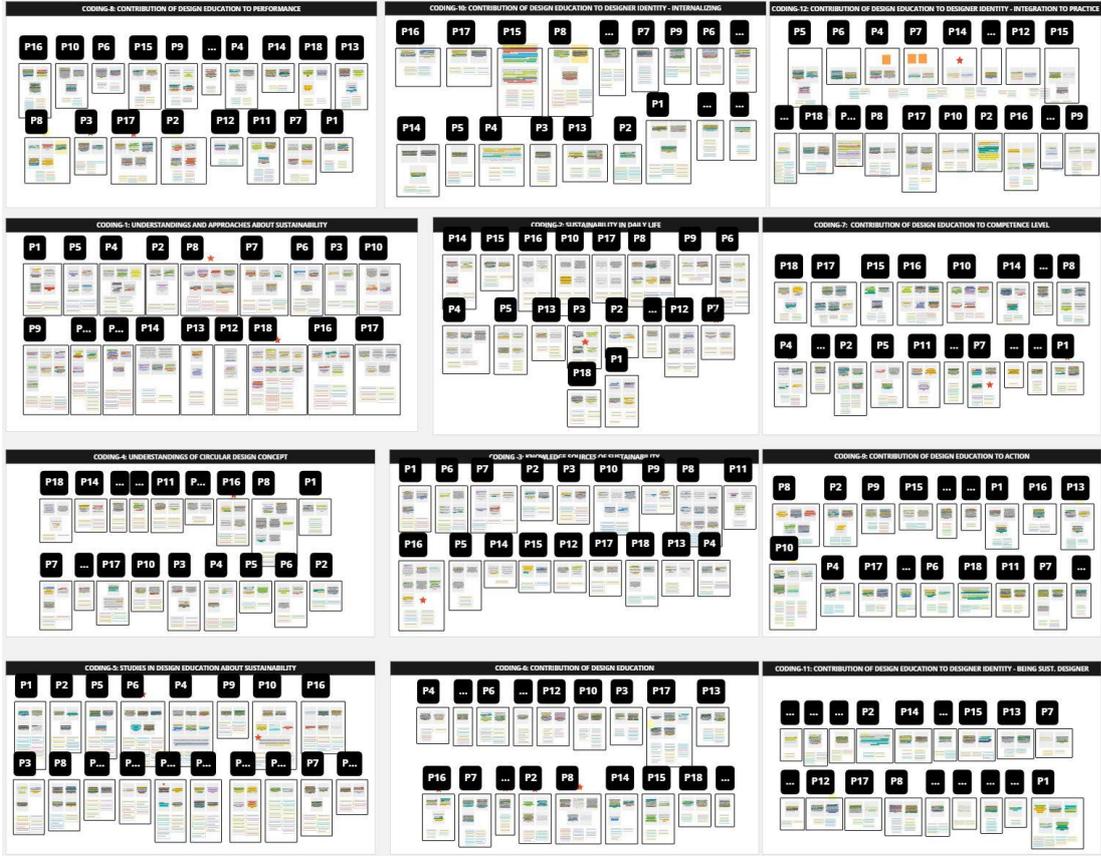


Figure H.1 : Clustering insights according to participants number tagged post-its through Miro AI.

APPENDIX I: Clustering of Codes



Figure I.1 : Clustering codes according to keywords through Miro AI.

APPENDIX J: Quotations from the Original Language (Turkish)

“Sürdürülebilirliğin benim için 2 farklı anlamı var. Birincisi yaptığım işin gerçekten bir şeyleri değiştirebilir uzun vadeli bir arkasında böyle bir amacın olması, ikincisi de tabii ki doğayla alakalı olan bakış açısı. İkisi de gerçekten günlük hayatımda yer alıyor veya seçtiğim işler de bunlarla alakalı hep.” (P15)[Q1]

“..hakikaten ama şey yani açıklaması ve uygulaması zor bir şey. Çok genel bir şey. Yani her şeyde sürdürülebilir olabiliyorsun. Bunu biraz daha detaylandırıp yaptığın işte uygulamak gerekiyor. O yüzden proje bazı düşündüğünde daha mantıklı oluyor. Hem açıklaması hem karşı tarafa anlatması çok zor bir iş.” (P16)[Q2]

“İnternet kapitalizmi gibi Hiper Objeler diye bir kavram var. Hani kendinden çok daha devasa kelimeler ancak biz insan olarak onlarla sadece etkileşebildiğimiz kısmını anlayabiliyoruz. İklim değişikliği ve bizim iklim anksiyetemizden kaynaklanan bu sürdürülebilirlik çabamız da bence bir sürü Hiper Objeler. Yani sürdürülebilirlik kavramı da bence bir Hiper Objeler olduğu için anlatması, konuşması, pratik olarak yapması çok zor.” (P8)[Q3]

“Sürdürülebilirlik kelimesi inanılmaz derecede hayatımızda. Son dönemde her yerde karşımıza çıkıyor.” (P13)[Q4]

“Sürdürülebilirlik ile ilgili benim öngörüm, şu an bütün dünyada gördüğüm şey herkes bu kelimeyi kullanıyor ama kimse tam olarak ne dediğini bilmiyor. Bence bu büyük bir problem.” (P16)[Q5]

“İlk aklıma gelen şu an elimizde olan kaynakları her şekilde bir sonraki nesillere aktarmak için bizim göstermemiz gereken çaba ve yapmamız gerekenler olduğunu düşünüyorum. Bu bağlamda hareket etmemiz gerektiğini düşünüyorum.” (P13)[Q6]

“Hâlâ çok gelişmesi gereken bir alan olarak görüyorum. Genelde sürdürülebilir ürünler daha fazla ücrete veya daha maliyetli olduğu için daha pahalıya satılıyor ve aldığı bu hizmetin normal ürüne kıyasladığında daha kalitesiz bir ürün almışım izlenimi oluyor.” (P9)[Q7]

“Fazla ürün almamaya çalışıyorum. Aslında bence en sürdürülebilir davranış bu. İhtiyacım yoksa gerek yoktur veya gerek olan bazı şeyler daha basit sistemlerle çözülebiliyorsa da gerek olmayabilir.” (P4)[Q8]

“Her kıyafet seçimimde böyle kullanım başına maliyet gibi bir kavramı dikkate almaya çalışıyorum. Çok fazla bir şey almamaya olan şeyleri olabildiğince kaliteli almaya ve uzun süre kullanmaya gayret ediyorum.” (P10)[Q9]

“Kıyafet çok almıyorum çünkü biliyorum ki çok emek gerektiriyor. Farklı kumaşlar, farklı yollarla temizleniyor ve bunların uygun olmayan işçiler tarafından yapıp benim ülkeme gelene kadar ne kadar yol aldığını biliyorum. Kimyasal atıklardan dönüştürülebilen enzimler olabiliyor. Bunların farkındayım.” (P4)[Q10]

“Mesela işte ben daha yurt dışında yaşadığım için, olabildiğince de az atık çıkaracak işte şeyler alıyorum. Mesela şişe şampuan almaktansa işte içine doldurmalı şampuanlar almak işte cam kavanozların içine koymak falan gibi. O tarz şeyleri önem veriyorum. Bu şekilde önemsiyorum, onun dışında bilmiyorum. Yani aslında bu konu gerçekten çok da düşünmemişim.” (P14)[Q11]

“İlk aklıma gelenleri söyleyeyim. Ben mesela bir şey alacağımda kıyafet olur, işte elektronik bir şey olur genelde hani pahalı olmasına rağmen daha sağlam, daha kaliteli ürünler almaya çalışıyorum ki uzun süre kullanabileyim. Sürekli bir şey almaktansa hem daha az zaman ayırmış oluyorum hem de uzun süre kullanabiliyorum. Yine sonunda sürdürülebilir oluyor.” (P16)[Q12]

“Çöpleri ayrıştırmaya falan çok dikkat etmiyorum. Mesela mutfakta bir şey ziyan olmasın diye donduruyorum. Daha hani mutfaktaki şeyleri sürdürülebilir kılmak için çünkü hızlı bozuluyor.” (P1)[Q13]

“İngiltere’de yaşadığım için bu bir zorunluluk. Türkiye’de bildiğimiz sürdürülebilirlik benim için sokak hayvanlarına artık yemekleri vermekle kısıtlı bir şeydi. Şu an yaşadığımız yerde her şey daha planlı. Yemek atığı, karton, plastik, cam vs hepsinin ayrı bir poşeti var. Belli sayıda ve belli ücretler ödeyerek alabiliyorum bu özel poşetleri. O yüzden inanılmaz zorlamayla olan bir şey. Hatta belli gün ve belli saati var. O yüzden buradaki sürdürülebilirlik anlayışı benim için bambaşka bir yere geldi.” (P17)[Q14]

“Çöpümü ayırtırmak konusunda mesela çok bir şey yapmıyorum sadece dışarıdaysam çöpümü ayırttırıyorum.” (P7)[Q15]

“Cam firmasında çalışmama rağmen çok fazla eğer yakınımda bir cam dönüşüm noktası yoksa cam ayırttırmaya bile gitmiyorum. Sadece geri dönüşüm anlamında değerlendirdiğimiz şeyler oluyor. Bunu alsam şu işe de yarar deyip saklayacağım şeyler olabiliyor.” (P9)[Q16]

“Her şey sürdürülebilir. Bir kıyafetin de sürdürülebilirliği var. Yani bir kıyafeti gereğinden fazla sıcaklık da yıkamadığın zaman ya da işte kot pantolonların içinde de duruyor. İçine de çevirip yıkadığı zaman onun sürdürülebilir hale getirmiş oluyorsun ya aslında yaşam ömrünü uzatıyorsun. Bu tarz önlemler almaya çalışıyorum.” (P7)[Q17]

“Ne kadar sürdürülebilir olunur onu bilmiyorum ama tabii ki yani özel hayatımda dikkat etmeye çalıştığım şeyler var.” (P6)[Q18]

“Tam sürdürülebilir bir şey hani nasıl bir ortamda oluyor? Mesela neyi sürdürebildik diyoruz. Hani bunlar çok net olmadığı için şey gibi biraz hani yetkinim ama böyle bir meslek unvanı henüz var mı ondan emin değilim o yüzden.” (P18)[Q19]

“Sürdürülebilir olduğunu sandığımız gördüğümüz şeylerin aslında çok da öyle olmadığını düşünüyorum, ne yazık ki, kapitalist düzende. Açıkçası biraz şirketlerin bu yaptığı çalışmalar - hani çok detaylı tabii ki bilmemekle birlikte - bana biraz yani promosyon gibi böyle şov gibi geliyor açıkçası.” (P11)[Q20]

“Ürün sürdürülebilirliği için, çünkü şu an çalıştığım yerde bu önemli bir konu fakat gel gör ki ben kullandığım ürünlerin ne kadar sürdürülebilir, ne kadar karbon ayak izine sahip olduğunu bilmiyorum. Bazen insan bilmek de istemiyor.” (P4)[Q21]

“Günlük hani ev atıkları mavi poşet içesine konuyor ama onlar da nereye gidiyor? Hiçbir bilgim yok.” (P17)[Q22]

“Doğayı korumak anlamındaki sürdürülebilirlik üzerine düşündüğüm zaman kendimi bilgi sahibi diye adlandırabilirim. Ama öbür tarafta tasarıma ne kadar adapte edebiliyorsun konusu, soru işareti bırakır ben de.” (P7)[Q23]

“Benim yaptığım işte böyle bir şey yok. Çünkü ben çok dijital ve çok hızlı akan bir şeyde çalışıyorum ve hani böyle bir yaklaşım olduğunu düşünmüyorum.” (P14)[Q24]

“Mesleki anlamda bir yer tuttuğunu düşünmüyorum. Özellikle dijital sektör geçtikten sonra iyice tutmamaya başladı. Yani o tarafta başka kritik konular vardı.” (P12)[Q25]

“Projelerim de şu an için fırsat olmadı. Hep böyle iş anlamında bu araştırmaları takip ediyoruz ama bulunduğum sektör gereği buna çok adapte olmadık.” (P9)[Q26]

“Daha büyük çapta şeyler yapabilmek böyle maddi koşullarımla paralel gidiyor gibi hissediyorum.” (P6)[Q27]

“Genel olarak açıkçası alamıyorum, almayı tercih etmiyorum. Çünkü sürdürülebilir ürünlerin fiyatı normallerinden bir tık pahalı oluyor. Ya bu yüzden tercih edemiyorum yani aslında.” (P3)[Q28]

“Birazcık daha ekonomim düzeldiği için son zamanlarda bir ürün aldığım zaman nereden geldiğine, kimin yaptığını, hangi malzemeden olduğuna, ne kadar su kullanılmış olabileceğine dikkat ediyorum.” (P4)[Q29]

“Hem belki yaşımanın ilerlemesiyle hem çalışma hayatına katılmakla işte global bir şirkette farklı bir bağlama oturduğu için sürdürülebilirlik kavramı benim için değişmeye başladı.” (P8)[Q30]

“Eskiden işte ay şu çantayı alayım, hangisi daha sürdürülebilir sorusunu gerçekten kendimi muhatap alabilirken ya da işte lokal gıdalarla beslenmeye dikkat etmeliyiz falan derken, iş hayatına girince hayatın gereksinimleri benim için bir hayatta kalma mücadelesine dönüştü.” (P8)[Q31]

“Çalıştığım yerde büyük bir gündem değil sürdürülebilirlik aksiyon planında. Daha çok sözel olarak adı geçiyor bu yüzden. Donanım olarak ortalamamın altındayım çünkü iş akışlarında çok fazla ve direkt olarak sürdürülebilirliği hedef almam beklenmiyor diyebilirim. Hani ürün öncelikle fonksiyonunu yerine getiriyor mu, yani işte en basit haliyle ürün ele alınarak ilerleniyor.” (P2)[Q32]

“Herkes kendi tarafından buna uygulamaya çalışıyor, anlatmaya çalışıyor ama tam olarak ne olduğunu gerçekten açıklayabilen, uygulayabilen çok az insan ve çok az iş görüyorum.” (P16)[Q33]

“Kendimi donanımlı hissetmiyorum. Şöyle ki, bununla karşılaşmadım. Yani tasarımcının aslında kendisini donanımlı hissetmesi biraz daha onu deneyimlemesiyle alakalı olduğunu düşünüyorum.” (P12)[Q34]

“Planları var kafamda ama eyleme geçmekte bazıları hani işte zaman yetmiyor. Hani çok şey düşünüyorum falan. Sıralama yapamıyorum.” (P5)[Q35]

“Profesyonel bağlamında tersten bakmak istiyorum bu konuya. Ben kendim bir tasarımcı olarak veya işte böyle bir düzen içerisinde üretim metodolojileri ile bağlı tüketim ürünleriyle bağlı bir alanda çalışan bir insan olarak kendi bilgimi ve inandığım şeyleri nasıl bir kaldıraç olarak kullanabilirim? Yani burada nasıl daha kendi yarattığının ettiğimin bir şey olmayacağı anlaşıldı ama bir organizasyon içerisinde belki bir kartopu gibi bitebilecek bir şeye dönüştürebilir isem ki bu da yine tek başıma yapabileceğim bir iş olmayacaktır.” (P8)[Q36]

“Gerçekten verdiği kararlarla çok büyük bir değişiklik yapabilecek mecralar bu kararları almıyorlar.” (P8)[Q37]

“Şu an yaşadığımız yerde işte her şey daha planlı. Yemek atığı, karton, plastik, cam gibi hepsinin ayrı bir poşeti var. Belli sayıda ve belli ücretler ödeyerek alabiliyorum bu özel poşetleri. O yüzden inanılmaz zorlamayla olan bir şey. Belli gün ve belli saati var. O yüzden buradaki sürdürülebilirlik anlayışı benim için bambaşka bir yere geldi.” (P17)[Q38]

“Ama bu benim kendi kendime yaptığım bir şey değil. Çünkü hani mesela atıyorum. Kahve satıcıları plastik pipet kaldırıp kağıt pipet koyduktan sonra azaldı. Ya da işte plastik poşete ücret geldi. Sonra da ben zaten hani sürdürülebilir olmak istiyordum, o da beni tetikledi” (P1)[Q39]

“Düşünüyorum ve Almanya'da olduğum için şanslıyım. Biraz seçici davranabiliyorum bazı konularda.” (P15)[Q40]

“İş yerimde mesela işte kağıt bardak falan kullanılmaması çok basit olarak hiçbir yerde kağıt bir ürün yok ve işte çöp kutusu yok. Herkesin masasının altında sadece ayrıştırma alanları var ve gidip hani ne bileyim işte bir içecek içtiğinde ay işte gidip hani paketle aldığında onu gidip içindeki buzları döküp ben zaten götürüp geri dönüşümü atardım ki şu an şirket bunu herkese bir tık hani zorluyor. Otomatikman yerleşmiş böyle yeşil uygulamalar var.” (P10)[Q41]

“O zaman da yani eski bir tarihte olsa da. Bu konu o zaman da çok önemliydi. Hani gelecekte tasarımcılar, endüstriyel tasarımcılardan sürdürülebilirlik ile alakası olan tasarımcılar daha çok piyasada var olacak diye konuşuluyordu. Yani bu da beni o zaman rekabet etmemde önemli bir unsur olacağını düşündürdüğü için hani sürdürülebilirlik konusu da benim önceliklerim arasında yer alıyordu. Yani bu konuda beni araştırmaya yönelmiş oldu bu durum.” (P2)[Q42]

“Kendimle ilgili kararlarımda kendi hayatımda yaptığım sürdürülebilirlikte ise o konuda çok sabit net yaptığım bir şey yok ama genel olarak hep böyle genel olarak bazı değerlerim var ve hep onlara uygun bir yaşam tarzı oluşturmaya çalışıyorum. Ona göre kararlarımı vermeye çalışıyorum.” (P15)[Q43]

“Sadece tüketici olarak sürdürülebilir davranış sergileyemiyorum. Onu kafama takmıyorum o kadar çok. Bir hayat tarzı olarak görmeye çalışıyorum.” (P18)[Q44]

“İhtiyacım olan bir şeyi hayatıma adapte etmek ve onu devam ettirmek gibi bir şey çağrıştırıyor. Hani ihtiyacım olduğu sürece bunu devam ettireceğim ve faydası olacak.” (P19)[Q45]

“Bence bunun gerçekten temelleri tasarım eğitimi esnasında atıldı. Farklı üniversitelerden gelen arkadaşlarımın bazılarının öyle kaygıları yokken İTÜ’de olan tüm dönem arkadaşlarımın böyle bir malzemeyi efektif kullanma, az atık çıkarma gibi kaygıları böyle o kadar kazanmış ki bizim tasarımlarımızı ve her türlü adım atışımızı etkiledi.” (P10)[Q46]

“Bir yandan da o işte sınıf içinde oluşan kolektif paylaşımlar da etkiliyor.” (P6)[Q47]

“Ben lisanstayken de sürdürülebilirlik ile ilgili detaylar eklenen projeler daha yüksek notlar alıyordu. Hani bu yönde araştırma yapmak akıllıca oluyordu o yüzden yani böyle genel bir edinim oldu.” (P2)[Q48]

“Tasarım eğitiminde hep sürdürülebilirlikten bahsediliyordu. Ama ben bunu genelde eleştiri olarak, yani mesela bir ürün tasarladığı zaman sürdürülebilir olmadığına dair bir eleştiri olarak ilk duymuştum. Genelde mesela hep kafamda tanımsızdı sürdürülebilirlik kavramı mezun olana kadar.” (P1)[Q49]

“Yine proje derslerimizde herhalde bir şekilde dirsek temasım oldu bu konularla bilmiyorum. Bütün proje hocalarım arada bir kendi bilgi dağarcıklarını bir şekilde bize böyle o polenlerle bir buluşturdular. Üniversitede Sürdürülebilir Tasarım diye ilk ders açıldığında açılır açılmaz ben bir şekilde o kontenjanı kapmıştım. Onun da etkisini hissediyorum.” (P8)[Q50]

“Okulda sürdürülebilirlik temel motivasyonumuz değildi ama yer yer sözü geçtiğinde ilgimi çekmişti. Meslek kuralları gibi bir liste vardı, 5-10 tane işte, tasarımcı etik davranmalı falan diye bir yerde sürdürülebilirlikle ilgili bir şey de geçiyordu. Orada mesela ilk karşıma çıkmıştı.” (P18)[Q51]

“Sosyal medyadan özellikle Instagram’da bu anlamda kaliteli içerik üreten işte içerik üreticilerini takip ediyorum ve onlar daha gündelik bazla da karşıma çıkabildiği için devam ediyor bu yani.” (P10)[Q52]

“Büyük teknoloji firmalarının bile artık sosyal medya sayfalarında ya da kendi web sitelerinde bununla alakalı paylaşımları sürekli oluyor. Genelde o tip yerlerden herhalde öğreniyorum.” (P3)[Q53]

“Benim konu ilgimi çekiyorsa ben genelde kendim araştırıp internette bilgi ediniyorum ya da yani bu son dönemde çok popüler olduğu için illa ki internette karşınıza ürünler ya da bir markete gittiğimizde büyük büyük yani yazıyorlar sürdürülebilir diye.” (P3)[Q54]

“Şirkette de açıkçası işte yeni müdürümüz bu konuyu biraz önemseydiği için, paylaştığı çeşitleri linkler vesairelerden haberimiz oluyor diyebilirim yeni gelişmelerden. Ama yani işte orada da açıkçası yine bana çok maalesef yapılanlar ya da gördüğümüz şeyler çok samimi gelmiyor.” (P11)[Q55]

“Bizim işyerinde sürdürülebilirlikle ilgilenen bir tane grup var. Yani insanlar gönüllü olarak işte biz ofisimizde sürdürülebilirliği nasıl daha çok ele alabiliriz diye bir araya geldiler. Bir sürü kararlar aldılar işte bütün elektronik cihazların kullanımı olsun ondan sonra insanların bir şeyleri alıp götürüp geri getirmemesiyle ilgili kararlar olsun.” (P15)[Q56]

“İş hayatında bu biraz daha işte detaylanmaya başladı. Çünkü mesela üretimle ilgili bir şey üretime yolluyorsun işte şu kadar maliyeti var. Maliyeti şu kadar düşürebiliriz, plastik kullanımı şu kadar düşüyor, şu kadar artıyor bu tarz terimler bilgileri öğrendiğin zaman aslında bir şeyi sürdürülebilir yapmak daha kafanda oturmaya başlıyor.” (P16)[Q57]

“Bir noktada ailemden bir şekilde beslendim gibi düşünüyorum. Anneanneler ve iki kuşak üstü tarımcılık ile uğraşıyor hala ve o yüzden ben de çocukluğumdan beri çok içli dışlıydım bu konuyla. Hep böyle kendine yetecek kadar olmayı ve tüketime dikkat etmeyi onlardan gördüm.” (P6)[Q58]

“Benim daha liseden babamın işi sebebiyle sürdürülebilirlik hakkında bir bilgim vardı, kimyasal atık lojistiği ile ilgileniyordu. Ama bunun ne kadar zararlı olduğuyla ilgili bilgiyi biyomateryal dersinde, lisansta gördüm.” (P4)[Q59]

“Kişiyile birebir tartıştıgımda mesela onu unutmuyorum. Öğrendiğim şeylerin hepsi muhtemelen böyle birebir kişisel veya işte etkileşim. Bunun için de yani etrafındaki insanların kaliteli olması lazım. Onların ne kadar işte bu bilgilye oldukça daha çok öğreniyorum.” (P16)[Q60]

“Aslında bir şeyin ömrü bittiğinde yeniden bir şey olması gerekiyormuş gibi bir kavram gibi geliyor bana.” (P2)[Q61]

“Tasarım yapmaktan itibaren ürünün yok olup sonra o üretim olan yerde yeniden o ürünün aynı şekilde veya daha iyi şekilde üretimi olması.” (P16)[Q62]

“Tasarlanması kullanıcılar tarafından elde edilen çıktının tekrar ürünün yapılmasına bu ürün başka bir hâle gelse de tekrar ona bağlı kalmasını anımsatıyor. Evrimleşsin kültürle veya başka bir şeyle ama yine de o tasarım her neyse yine kullanıcıdan çıktı. Alıp kendisini oluşturursun.” (P4)[Q63]

“Her türden yaklaşım olmalı sadece tek bir çözüm yok yani bence hani döngüsel ekonomi döngüsel tasarımıda. Hani işe yarayabilecek bir yaklaşım bence. Tasarımcıların, şirketlere ya da işte işletmecilere tanıtmasıyla bir potansiyeli olabilecek bir yaklaşım bence.” (P18)[Q64]

“Ürünün kendisinden hep böyle bir geri ya da ileri dönüşüm sağlayabilmek ile çok yönlü fayda gibi geliyor yani hem de işte sürdürülebilir olması.” (P1)[Q65]

“İlk defa duydum. Şu an ilk aklıma geleni söyleyeyim. Bir şekilde kullandığımız ürünlerin ya da ambalajların geri dönüşüp başka bir formda bize gelmesi gibi algıladım. Bilmiyorum, doğru mu. Bir de bunu çağrıştırdı, bir şeyleri tekrar tekrar kullanabilmek.” (P13)[Q66]

“Mesela atıyorum bir kutu sonra bir kutunun boşaldıktan sonra ki kullanım amacı başka bir şey olabilir. O kutuyu boş kullandıktan sonra belli bir süre geçtikten sonra da başka bir şey olabilir. Kullanılabilir sanki öyle gibi bir şey aklıma geliyor, çağrıştııyor bende.” (P14)[Q67]

“Sonuçta bir noktada hani madde olduğu için artık ömrünü dolduruyordur ama böyle döngüsel tasarım o şeyin, hammaddenin ömrünü uzatmak belki de diyeyim.” (P10)[Q68]

Şu an bunun hakkında bir bilgim yok. Yani şöyle benim düşündüğüm ve biraz da hani eğitimimden kaynaklı olan fikrim şu, tasarım süreci asla bitmeyecek ve bu tasarım süreci asla bitmemesine rağmen ki bu hem fiziksel hem de dijitalde devam ediyor ki özellikle dijitalde çok daha böyle sirkülasyonu olan bir süreç. Bu süreçte aslında döngüsel tasarım kavramının bana ifade ettiği şey şu, bu süreci de kapsayıcı olarak tasarlanması yani biraz daha geleceği de içinde barındıran parçaların olmasını bekleyebilirim diye düşünüyorum. Çok sallamış olabilirim şu anda.” (P12)[Q69]

“Ürünün yaşam ömrü. Üretimden, kullanıldıktan sonra da ileri dönüşüm sağlanabilmesi, tekrar başka bir amaçla kullanılabilmesi belki ya da geri dönüşüm sağlanabilmesi, ürünün piyasaya çıktıktan sonra bir tasarımın komple devam etmesi gibi işte ambalajından, etikete.” (P1)[Q70]

“Döngüsel tasarım daha komple bir tasarım anlayışını ifade ediyor. Modelden ürünleri üretirmeye kadar oradaki tüketici davranışını da yönlendirme, paydaşları bütünüyle bir döngüye katıp herkesin faydalı bir şekilde o sistem içerisinde verimli olması anlamında bir ürün döngüsü olarak kafamda bir çağrışım yapıyor.” (P9)[Q71]

“Ya bir şey tasarlarırken bu tasarımın ömrünü düşünmek gerekiyor işte ürettiğim, kullanıcı kullanımı ve sonrasında nasıl geri dönüştürülecek, nasıl tekrar bunu döngüye sokabiliriz? en başta düşünmek gerekiyor.” (P9)[Q72]

“Kullanım ömrü dolduğunda geri dönüştürmesi veya hani başka bir şeye dönüştürmesi anlamına geliyor bence hani onun bir döngüsü yani.” (P2)[Q73]

“Ürünün ya da işte neyse o şeyin bir şekilde bir döngü içerisinde hani kullanım ömrünü tamamladıktan sonra başka bir şekilde ekstra bir enerji işte karbon ayak izi yaratılmadan sanki tekrar bir hayat kazandırılması gibi bir şey olduğunu düşünüyorum.” (P11)[Q74]

“Döngüsel tasarım yaşam ömrünü tamamlamadıktan sonra çöpe dönüşmeme halini çağırıyor aslında. Yani tamamen bir atığa dönüşmeyen ya mesela bir pili kullanıyorsun ve sonrasında doğaya çok zararlı bir şey ortaya çıkarmış oluyorsun ya döngüsel olmayan bir tasarımı çağırıyor o bana.” (P7)[Q75]

“Döngüsel deyince sürekli aynı şeyi tekrarlanması gibi bir şey mi bilmiyorum” (P3)[Q76]

“Hani öyle görselleştirmeler de olur ya yani bir şeyin yok olmadığı bir dünya, bir iç tema gibi geliyor”. (P10)[Q77]

“Sistematik olarak belli bir girdinin belli bir çıktıya dönüştürülmesi o çıktının da belli başka bir yerde girdiye dönüştürülmesi” (P17)[Q78]

“Sürdürülebilirlikle karşılaştırsak bunun biraz daha iyi olduğunu düşünüyorum. İyi temellere dayanan bir konu. Çünkü daha odaklı.” (P16) [Q79]

“Tam içime sinmemişti kavram. Plastik o kadar geri dönüşemiyor zaten. Hani ya da tam olarak döngüsel olamıyor. Hiçbir şey işte şey hani biraz zaten var olan geri dönüşümün daha iyi pazarlanması gibi gelmişti.” (P18)[Q80]

“Birinci sınıfta bir projemiz vardı. Temel tasarımda sadece kot kumaşı yani eski kot kumaşlarını kullanarak çocuklar için o zaman aslında bir oyuncak tasarlamamız istenmişti. Sadece onu hatırlıyorum. Şimdi sorulunca fark ettim.” (P13)[Q81]

“Benim hatırladığım sadece projeleri sonradan düşündüğümde işte “çöpten bize bir şeyler yaptırıyorlar” vardı. Özellikle tasarımın temelleri dersinde sürdürülebilirlik üzerine bir şeyler yapıyorduk. Hep artıktan ondan bundan bir şeyler istiyorlardı. Ama bunun böyle detaylı bir açıklamasını hiçbir zaman almadık. Hani yaptık ve geçtik genelde. Buna kaykay projesi ya da oturak projesini örnek verebilirim. Karton kullanmıştım ama atık değildi, atıktan yapılması isteniyordu oysaki.” (P1)[Q82]

“Dördüncü sınıfta Biyomalzeme dersinde sesi absorbe eden bir malzeme olan Miselyumu kullanarak buna tam anlamına karşıt olsun diye hoparlör yapmak istemişim. Aslında küf oluşturdum, ama küfü talaş talaş kullandım. Çünkü en basit ve ulaşabileceğim malzeme oydu. Şekerli suyla karıştırdım. Ve miselyum küfünü içine koydum. O küp yavaşça büyüyor ve kabın şeklini alıyor. Daha sonra sen onu kırıyorsun ve yaşamını sonlandırıyor ve bu benim için harika bir şeydi. Çünkü hiçbir ek güç gerekmeden fabrika gerekmeden küfün kendi kendine büyüyor ve ürünün oluşuyor.” (P4)[Q83]

“3. Sınıfta bir firmayla cam bal kavanozunun ikincil kullanımı gibi bir şeyi düşünmemiz istenmişti. Çok zor kısıtları vardı. Genel olarak ilginç bir şey bulamadık ama en azından üzerine düşünmüş olduk.” (P18)[Q84]

“Sürdürülebilirlik bilgisi daha çok bana eğitim sırasında geldi ancak daha çok bu bilgi kitaplardan falan geldi. Projeler daha çok bana iç görü kattı. Mesela konular ne kadar kompleks, insanların davranışlarını değiştirmek ne kadar zor hani bu tip şeyler. Bu karmaşıklığı anlıyorsun biraz.” (P18)[Q85]

“Bitirmeden önceki projemdi galiba. İşte davranış değişikliğini ürün üzerinden nasıl sağlayabiliriz işte ne kadar sürdürülebilir olmalı, karşıdaki kişiyi nasıl tanımlarız, nasıl bir davranış sergiliyor ki biz onu nasıl değiştireceğiz falan gibi bir süreçti. Bir de küresel ısınma teması altındaydı. Ama o süreçte, ekosistemin ve hayat döngüsünün bizi nasıl etkilediğini ya da bizim o döngüyü nasıl etkilediğimize dair şeyler okuyup işte çizmişim. Su kirliliğini önlemek için bir proje yapmışım.” (P6)[Q86]

“Üçüncü sınıftayken adı zaten sıfır atık olan bir workshop’a katılmıştık. Tamamen hani istediğimiz şeyleri çalışabiliyorduk ama yani hiç atık çıkarmadan tasarım yapma gibi bir mottosu vardı. Çok da keyifliydi gerçekten. Çünkü kafa yaktırmıştı ve bir şey bulduğundaki o keyif apayrı oluyor.” (P10)[Q87]

“Circle ekonomisi diye bir workshop’a katılmışım. Seramik atölyesi nasıl döngüsel olabilir gibi bir proje yapmışım. Satılan ürünler eğer kırılırsa işte kırık parçalar geri gönderiliyor müşteriler tarafından.

Seramik de geri dönüşemeyen bir malzeme aslında. Mesela kırık parçaları ezip yeniden çamurla birleştirip çamurun içine atıyorsun seramik parçaları o çamurun içinde doku oluşturuyor. O bakımdan bir ileri dönüşümü gibi bir şey oldu yani obje dokuya dönüşüyor. Önemli şeyler kattı çünkü o workshoptan önce belki o kadar bir fikrim yoktu. Ama bu benim için bir aşama olmuş olabilir. Eğitimimde ilk defa orada öğrendim büyük ihtimalle.” (P5)[Q88]

“Bence sürdürülebilirliğe yönelik anlayışı tasarım eğitimi başlattı zaten. Düşünme gibi dönüştürücü bir etkisi olmuş olabilir belki. Tasarım eğitimindeki bu bire bir kullanımla ilgili şeyleri öğrenmek ve bunun işte trendleri nelerdir hani nasıl yapılırlar falan onları öğrenmek gerçekten başka birine dönüştürüyor insanı bence, yani hayat tarzını ve bakış açısını değiştiriyor gerçekten.” (P6)[Q89]

“Sadece sürdürülebilirlik değil, tasarım eğitimi bence hayatımın her yerinde o bakış açımı değiştirdiği için çok olumlu katkısı olmuştur. Tasarım eğitimi sayesinde her şeyden azar azar bilip ama her şeyin farkında olma yönü sayesinde her şeyi tam bilmezseniz ama her şeyin bir şekilde içindedir. Ondan dolayı sanırım çok araştırıyoruz. Sonrasında da yani o merak duygusunu galiba tetikliyor. Bilmiyorum. Galiba budur tasarım eğitiminin kattığı şey.” (P13)[Q90]

“Katkıda bulunmadı da bulundu işte. Temel bilgileri vermiş oluyor yani sürdürülebilirliği kullanmaya yönlendiriyor özellikle bu yani malzeme, materyalde olsun. Tamamen yani bunları kullanmaya itiyor.” (P3)[Q91]

“Kaynak bazında hani tekilli şeyler bazında fikir verdi ve ben de ilgimi olduğu için bir tık o ipin ucunu çektim, yani devam ettim.” (P10)[Q92]

“Hocaların aradaki demeçlerinden bir şeyler öğrenmiş olabilirim. Hani haksızlık da etmek istemem hocalarıma.” (P12)[Q93]

“Benim o okulda bulunduğum süre zarfı içerisinde bu çok daha bebek, tohum bir fikirdi ve hocalarımız da bunun aslında ne kadar kompleks bir kavram olduğunun farkındaydı. Hani belirli sosyal eşitsizlik konularının sürdürülebilirlik ile olan ilişkilerinden de böyle bahsettiğimizi hatırlıyorum. Yani çok göz ardı edebileceğim bir şey değil açıkçası. Çünkü dediğim gibi bence bu eğitimi almış olmasaydım asla herhangi bir şekilde profesyonel olarak ilgimi çekeceğini düşünmüyordum. Bana bir ipin ucunu yani vermiş oldu.” (P8)[Q94]

“Üretim süreçlerinde ki o karmaşıklık malzemelerin nereden geldiği falan bir işletmeci o kadar kolay hayal edemiyor ama biz mesela fabrikalara giderdik. Yaptığımız projelerde her zaman bir üretim süreçlerini düşündük. Onları düşününce insan daha bağdaştırabiliyor. Tasarımcı olarak daha büyük resmi görebiliyorsun bence.” (P18)[Q95]

“Sürdürülebilirliğin farkında olmama çok olumlu katkısı olmuştur. Bu yani sadece aldığımız eğitim değil, o yani karşılaştığımız insanların da bize etkileri sonuçta orada oluşturduğum çevre de buna etkili olmuştur. Bence iyi ki tasarım okumuş dediğim şeylerden biri sadece sürdürülebilirlik konusu hakkında farkında olmak.” (P13)[Q96]

“Döngüsel tasarım, döngüsel ekonominin ve sürdürülebilirliğin az çok neyi ifade ettiğini anlamış oldum ya da işte ileri dönüşüm kavramını ileri dönüşümün geri dönüşümden nasıl ayrıştığını idrak etme şansım oldu.” (P11)[Q97]

“Ama bu konu kesinlikle yani çok zaten çok hassas olmamız gereken bir konu. Yani biz olmayacağız da kim olacak? Bence ki tasarımcılar yani aslında bizim gibi insanlar Türkiye'deki diğer insanlara da bir şeyleri göstermemiz gerekiyor, anlatmamız gerekiyor. Ve o opsiyonu sunmamız gerekiyor.” (P15)[Q98]

“Tasarım eğitiminin işte şey kısmı ilginç. Üretim süreçleri konusunda baya bir eğitim almıştık. Oradan hiç sürdürülebilirliği ele almadık ama sonra sürdürülebilirlik konusunda kendim adım atınca insan o konuları hatırlıyor.” (P18)[Q99]

“Bir ürün tasarlıyoruz ya, onun tasarlanmadan önce onun üretim süreci vesaire böyle derinlemesine bir araştırmaya giriyorsun aslında böyle eğitimim bittiğinde birçok ürünün nasıl, ne aşamalardan geçtiğini böyle hayal ediyor oluyorsun bir aşamada. O da böyle farklı bir bakış açısı getiriyor olabilir diye

düşünüyorum. Ama bu bence farkında da olmadığımız bir yönümüz hani aslında ürünün bütün hayatını düşünmen gerekiyor ya, yani şey sadece bir kullanım amacı. Hani beş yıl sonra çöp olmayacak o ürünü bulmaya çalışıyoruz. Ama bu hani bakın bu falan filan diye anlatılmıyor da hani eğitimin içinde yedirilmiş oluyor.” (P7)[Q100]

“Direkt bir projeyi sürdürülebilir veya döngüsel olsun diye yapmadım. Hani projenin temel amacı olmadı öyle. Projem olmadı ama projenin içinde o kısmı dikkate aldım. Brite yoktu bu mesela.” (P16)[Q101]

“Bir atıktan ne yapabilirim diye çok strese girmişimdir. Neyden yapabilirim, nasıl yapabilirim zihnimi zorlamıştım. Bu biraz benim de öğrenci kafasında olmamdan alakalı. Hani o yaşta böyle bir şeye dikkat etmiyordum. En basit haliyle çok böyle bir algım yoktu. Biraz daha büyüdükçe böyle bir algım oluşmaya başladı.” (P1)[Q102]

“Her şey çok bulanık ama şeyi söyleyebilirim. Yani o zaman dediğim gibi daha farkında bile değildim sürdürülebilirliğin. Projelerdeki hatırladığım bir sorun çözmeye çalışıyorduk, bunun için de bir sorun bulmak lazım. Daha onu bile bilmiyorduk.” (P16)[Q103]

“Üzerine çok düştüğümüz bir şey değil. Çünkü çok geniş kapsamlı bir perspektiften bir ürün tasarımı gerçekleştiriyoruz. İlk başta araştırmasından son çıktıya kadar olan ki süreç oldukça yoğun. O yüzden hani buna böyle bir vaktimiz kalmıyordu. Sürdürülebilirliği proje derslerinde biraz es geçtiğimizi söyleyebilirim o yüzden.” (P12)[Q104]

“Öncelik olmadığı için ben o dönemde herhangi bir bilgi almadım. Bu nasıl olursa sürdürülebilir olur veya sürdürülebilir olması için senin hangi aksiyonları alman lazım veya ne yapman lazım veya tam olarak nedir, hangi parçaları etkiler gibi bir şeyi olması lazım. Yani birilerinin seni yönlendirmesi ve göstermesi ve bunu gerçek dünyayla bağlaması gerekiyor ki. O dönemde bunu anlayabil.” (P17)[Q105]

“Tasarladığım da bir ürünün bana kibarca sürdürülebilirliği nasıl olacak gibi veya bunun için neler yaparsın diye minik bir paragraf da olsa yazmamı zorunlu kılsalar iyi olurdu. Ben babamdan öğrenmeseydim veya ekstra araştırmasaydım, bilmeyecektim.” (P4)[Q106]

“Bazı faktörlerin arkada kalmasına göz yumabiliyorsun. Sürdürülebilirlik mi? Tamam ama zaten bakmıyorlar, ona göre puan vermiyorlar oluyor.” (P4)[Q107]

“Çok oturmuş bir alan da değil sürdürülebilir tasarım. Bir şeyleri yapman gerekiyor. Dayanabileceğin bir şey yok. Birikmiş bir bilgi, birikimi yok. Hani kendi kendine yol bulmaya çalışıyorsun.” (P18)[Q108]

“Bence bir tık daha o eğitimde yani daha büyük resmi de gösterebilirler. Yani daha dünyanın sorunları ve işte ilerleyen dönemlerde hakikaten bir tasarımcının çözümler geliştirebileceği alanlar diye iklim krizini biz ele alabilirdik işte mülteci sorununu ele alabilirdik. Ya toplumun çok haşır neşir olduğu, insanın odağında olduğu böyle şeyleri es geçtik ya bunlar için ürün de tasarlanabilir zaten.” (P10)[Q109]

“Sürdürebilirlik sorunlarını tasarımcı olarak daha belirgin görüyorsun bence. Çünkü işi yapan da biraz sensin.” (P18)[Q110]

“Tasarımcı olmasaydım, bireysel anlamda belki bir etkim olsun en azından gibi düşünebilirdim ama tasarımcı olduğum için. Şeyi biliyorum. Biz bir şey yapıyorsak ben bunun büyük ölçekte yapılmış ve uygulanmış olması gerekiyor ki bir işe yarasın.” (P17)[Q111]

“Tasarım vizyonu almak gerekiyor belki de farklı düşünmek için. Evet yani günlük yaşamımı çok etkileyen bir şey bence tasarım eğitimi. Yani çünkü hep bir şeylerin içindeyiz. Etrafımız bir şeylerle sarılı. Malzemelerle. Hani bunları da birileri yapıyor. Kendiliğinden olmuyor.” (P5)[Q112]

“Başka bir şey okusaydım, böyle bir kavramın varlığından bile daha geç haberim olacaktı. Daha az sorgular bir insan olacaktım belki.” (P1)[Q113]

“Girip bir mağazada veya dışarıda bir sokak satıcısından bir tasarımı gördüğüm zaman bunu kafamda aslında parçalara ayırıp bu tasarım ne kadar sürdürülebilir gözüküyor? İşte çevreye etkisi ne olur? Bunu hep düşünür oldum. Tabii ki bunun çok fazla komponenti var işte onu yapan işçi nasıl çalışıyor veya hangi şartlarda nasıl yapılıyor falan ama. Yani genel olarak tasarım eğitimi bence çok insanı sorgulamaya yönlendiren bir eğitim.” (P2)[Q114]

“Arkasında herhangi bir fikir olduğunu düşündüğünüz ürün karşınıza çıktığında düşünmeye başlıyorsunuz durdurulamaz bir şekilde. Bunun potansiyel etkileri ne olacak, bunu yapan kişi bunu yaparken ne düşündü, şu anda karşında bu kararı veren kişi ne düşünüyor” (P8)[Q115]

“Yaptığım bir davranış da olabilir hani. Bir alışkanlığın da olabilir. Hani neye doğru dönüşür nasıl devam eder? Gibi çünkü şey hani ya onu sağlıyor bence. Muhakeme sağlıyor. Hani herkes edinse çok iyi olur bence. Herkese tasarım okutalım. Bir şeyleri daha etraflıca düşünmemi sağlıyor olabilir.” (P5)[Q116]

“Malzeme kararını her zaman vermiyorsun belki, ama en azından şeyi biliyorsun, yani o malzeme bir yerlerden geliyor ve yeni bir ürün yaratıyorsun.” (P18)[Q117]

“Malzeme dersleri falan görüyorduk işte mesela petrol türevi plastik malzemelerin nasıl geri dönüşeceği, hangilerinin geri dönüşmeyeceğini işte termoset plastikler vesaire bunlar mesela hani bir bilinç oluşturdu. Tasarımda konsept olarak malzeme seçimimde sürdürülebilir olan ürünleri görmemi sağladı.” (P2)[Q118]

“Çok ürün edinmenin hiçbir faydası yok insana. İşe yarar ürün edinmenin faydası var ve bir ürüne baktığım zaman nasılımı düşünüyorsun. Bu artık otomatik bir refleks oluyor. Nasıl yapıldı acaba proje aşaması nasıldı? Ki bununla beraber tasarım çevresinde dura dura insanların kullandığı birtakım ürünleri de görüyorsun.” (P4)[Q119]

“Tabii ki sağlamıştır. Bir şekilde bende davranış değişikliğine sebep olmuş oldu. Çok minör de olabilir. Yani bir dediğim gibi daha sürdürülebilir ürünler tercih etmeye çalışmam galiba en etkili olan odur diye düşünüyorum kendim için.” (P6)[Q120]

“Benim davranışlarımı değiştirmede, böyle bir şey varmış falan olduğum bir şey çok fazla olmadı ama şöyle bir şeye neden oldu. Her türlü tasarım kararında ya da herhangi bir iş kararında sürekli böyle beynimde basılı bir düğme gibi kararlarımı tasarım ışığında almayı biraz daha böyle refleks edindim. Yani davranışlarım böyle dolaylı bir şekilde değiştirdi ama kişisel olarak zaten farkındaydım.” (P10)[Q121]

“Bir şeyin yaşam ömrünü uzatmaya çalışma kısmı falan bence onlar biraz daha tasarım eğitiminin bana kattığı şeyler. Plastik az kullanayım., daha az paket alayım ya da işte çözünen çöp poşeti kullanayım. Ancak bunların tasarım eğitimiyle bir ilişkisi var mı? Ondan emin değilim. Günlük hayatımdaki davranışları bilmiyorum. Belki de sağladı da hani ben bunu hani idrak edemiyor da olabilirim. Çok fazla bunu normalleştirmiş de olabilirim.” (P14)[Q122]

“Daha böyle aile ortamını falan düşününce orada inanılmaz bir etkileme dürtüsü hissediyorum. Yani onların dikkat ettiği şeylerle benim dikkat ettiğim şeyler inanılmaz farklı oluyor.” (P6)[Q123]

“Bir şeylerin arka planını anlatmaya başlıyorum ve insanlar buna yükseliyorlar. İster istemez reklamını yapıyorum aslında sürdürülebilirliğin. Çünkü hani arkasındaki süreci biliyorum ya da malzemeyi. Çevremdeki insanlara bahsettiğimde onlar da heyecanlanıyor. Çünkü onlar nereden bilsin, onlar yeni ürün veya malzeme takip etmiyorlar tasarımcılar kadar.” (P1)[Q124]

“İnsanları çok yönlendirmeyi sevmediğim için hani bir şeyleri teşvik etsem de bilgi anlamında paylaşıyorum. Yapmayan yine yapmıyor gibi ısrarcı olmuyorum.” (P9)[Q125]

“Yeri gelince böyle güzel örnekler tasarımına bağlaştırmayı seviyorum. Eğlenceli hale getirmeye çalışıyorum yani özetle bunu böyle hadi bilinçli olalım. He sen ne yaptın senin yüzünden böyle falan değil de yani.” (P16)[Q126]

“Bir faydam olabileceğine inanıyor muyuz? Evet lafta çok güzel, başka insanlarda bir davranış değişikliğine yol açmak isterim ancak ben kimim ki? Benim tasarımı eğitimim veya yaşadığım çevrem bana böyle bir özgüveni veya bununla savaşılabilecek cesareti ve araçları verdi mi?” (P8)[Q127]

“Biyomalzemeleri falan öğrendik ama belki de ikna eğitimi falan verilmesi gerekiyordu. A durumundan B durumuna nasıl bir değişim yaratırız, bu o kadar zor bir şey ki.” (P8)[Q128]

“Genel olarak benim düşüncem kolay kolay insanları bak şöyle yap, böyle yap işte bu zararlı bu yararlı diye anlatırsan bu davranışlarını pek değiştirmeyecek. Senin verdiğin tasarımla da aynı şey olacak. Ha tamam doğru, güzelmiş falan deyip bir gün iki gün yaptıktan sonra öbür gün yine yapmayacak. Çünkü bu uzun vadeli bir şey. Kültür, sen ve etrafındakilerle değiştirmeyi başarabilirsin insanları. O yüzden böyle bir çabam olmuyor.” (P16)[Q129]

“Böyle şeylerde çalışmış insanların bence yönlendirmesi evet gerek yani sonuçta bu toplumsal bir dönüşümse bu tabii ki bunları bilen insanlarla başlayacak.” (P14)[Q130]

“Bunu birilerine anlatmak veya birilerinden talep etmek bana haksızlık gibi geliyor. Bu bir lüks şu anda. Daha öncelikli şeyler var şu an. Dünya 60-70 sene sonra belki yok olacak ama zaten insanlar şu an daha yarımını göremiyor. Yani o yüzden hani bak bu senin yaptığının etkisi şu olacak demek bana haksızlık gibi geliyor.” (P17)[Q131]

“Yani bu kadar büyük üretimler, şirketler vesaire bunların yanında tabii ki sonuçta birey olarak ne yapabiliyorsan kar ama yani bunların yanında yarattığımız şey devde kulak falan. Bireysel olarak alacağım bir aksiyon yeterince etkisi olmayacağımda da etkisi var yani hani tek başıma dünyayı ben mi kurtaracağım mantalitesi de var.” (P11) [Q132]

“Bir tık daha sanırım aksiyon almaktansa böyle gözlemleyen taraftayım. Çok böyle sürdürülebilirlik konusunda aktif bir şey gelmedi aklıma yani bilmiyorum belki imkan olmadı. Belki bunlara önem veren ya da bunlara aralık yani yaratan yerlerde bulunmadım.” (P10) [Q133]

“Bir topluluğa katılmak gibi sürdürülebilirlikle ilgili bir şey yapmadım. Herhalde daha çok kendi bireysel olarak yapabildiğim şeyleri yapıyorum. Aktivist bir harekete ya da işte bununla ilgili yürüyüşlere katılmadım. Kendi işimle de zaten tam olarak örtüşüremiyorum. Proje bazlı örtüşebilir ama o da hiç olmadı.” (P14)[Q134]

“Aksiyon almadım. Öyle ki yani gerçekten evet, kötü bir tasarımcıyım galiba ama, şöyle uzmanlaştığım tasarımda hiç böyle bir problemle karşılaşmadığımdan dolayı aslında buna çözüm de bulma gereksinimi taşıyorum sanırım.” (P12)[Q135]

“Kurumsal firmalarda özellikle yüksek yönetsel seviyelerden ancak fikir olarak çıktığında uygulanabilir olduğunu düşünüyorum. Daha yüksek etkisi olan yaklaşımların. Bunun dışında hani fikir geldiği zaman aklıma malzemenin az kullanılmasıyla ilgili ya da işte kolay sökülür takılır olması. Böylece hani ayrışmasının kolay olması bir yerde geri dönüşümde bunun ayrıştırılmasında rahat olması gibi mikro ölçekte öneriler paylaştığım oluyor.” (P2)[Q136]

“Üretim verimini arttırmak için mesela bir şeyler yapabiliyoruz. Hani buradaki ama şey gene kaygı aslında biraz da maddi yani. Önerilerimin şirket çıkarlarıyla tabii ki örtüşmesi lazım. Yoksa aslında şirket bu tarz işte inovatif fikirlere, düşüncelere önem veriyor. Ancak sürdürülebilir bir fikrin hayata geçmesi pek mümkün değil bence. Çünkü sürdürülebilir ki maliyet ile ilgili bir şirkette yani.” (P8)[Q137]

“Vicdan azabı duyuyorum artık. Tasarımda eğer uygulayabilirsem onu uygulamam lazım. Çünkü rahatsız ediyor beni. Şirket projelerine de bağlı ama en azından masaya getirmem lazım. Belirtmem lazım. Herkesin farkındalığına arttırmam lazım. Enerjimi oraya biraz harcamam lazım. Çünkü bir şeyi biliyorken yapmamak hakikaten genel olarak kötü bir şey. Hani doğru olanı bilerek susamam veya onu hani geçiştiremem.” (P16)[Q138]

“Duygusal yaklaşıyorum. Çok da sorumluluk sahibi hissediyorum. Yani optimal doğruları bilmeme rağmen yapamamak vicdanen beni rahat bırakmıyor. Bu yönde bir yetkim yok ancak paylaşımım da önemsiz. İş yerinde dikkate alınmıyor çünkü.” (P2)[Q139]

“Kurumsal bir şirkette çalışınca çok böyle bir özel özgün bir tasarımcı kimliği kalıp kalmadığından emin değilim. Yani ne talep gelirse biraz talebe yönelik çalıştığımız için bu konuda yönsüzüm. Şartlar neyi gerektirirse.” (P11)[Q140]

“Şu an çok sürdürülebilirliği içselleştirmiş olarak kendimi tanımlamam herhâlde zaten çalıştığım alanda sürdürülebilirliği tam ters bir şey yapıyorum ben. Tamamen lüks üzerine çalışıyorum.” (P17)[Q141]

“İnsan zihni dirençli gördüğü patikayı takip etmek istemiyor. Dirençleri aşmak için ekstra motivasyona ihtiyaç duyuyoruz. Ama çevrendeki insanlar motivasyon kırıcı olunca, iş yerinde bu konuda da sen de gün sonund istersen günde 9 tane pet şişeyi dönüştüreyim sizin bu fabrikada gün içindeki verdiğiniz zararı kurtaramayacağım. Senin dünyadaki üretim pratiğinle değiştirmedeğin kararlar ilgili en ufak bir değişim olmayacak. Hiçbir kararı ben verebilecek gibi hissetmediğim için, ben işyerine gittiğimde kendim bile değilim. Bilmem şu konuda uzmanlığı olan bir insanım. Kendi benliğim kalmayınca bende utanç bile kalmamış.” (P8)[Q142]

“Havamdan geçilmezdi herhalde. Zor bir şeyi başarmışım diye düşünürdüm.” (P8)[Q143]

“Vicdanen rahat ya da işte topluma karşı sorumluluklarını yerine getirmiş diyebilirim.” (P14)[Q144]

“Dünyanın merkezine ya böyle içinde bulunduğum ortamla bütünleşmiş ve hani onunla nefes alıyor, onunla ilerliyor, onunla düşünüyor gibi hissettirirdi. Yani gerçekten işte ben bir yere bir şey tasarlıyorum ve o şey benden çok uzakta ve kopuk devam ediyor gibi değil. O kararlarımda benimle başladığı andan itibaren yani büyümeye yaşamaya devam ederdi. Öyle düşünürdüm, hissederdim.” (P10)[Q145]

“Daha çok ben aktif bir şekilde entegre edebilmek için yani kendim üretim sürecinde özellikle edindiğim bilgilerle kendim bir üretim icra edersem o zaman entegre edebilirim. Yani gidip hani üretim süreçlerinde de yer alacağım, ürünleri kendim takip ederek yaparsam.” (P2)[Q146]

“İnsanları rahatsız etmeden doğayı koruyacaksa bunu kimsenin bizden nefret etmesine neden olmadan yapmalıyız. Çünkü o zaman tepki verirler. Tek amacım izlendiğini bilmesini sağlamak, böylece bunu kimseden korkmadan yapabilir. Davranışlarla örnek olmak gerektiğini düşünüyorum.” (P7) [Q147]

“Mesela bir fikrimi geliştirirken bir şeyleri bu kapsamda linklerim yöneticime. Yani şöyle bir trend ile de kullanıcıyı kazanmış olacağız ve bu da bizim işimize şöyle katkı sağlayacak gibi. Ben bunu daha farklı satmalıyım ki bunu satın almalılar gibi. Etki etmek istiyorsam o terazideki işte dengeleri artık herkesin nabzına göre ayarlamak gerekiyor.” (P10) [Q148]

“Bence birlikte çalışma ve şartları yaratma tasarımcının en büyük görevi ve bunun alt yapısını oluşturma. Hani direkt ben tasarımcı olarak bir şeyi sürdürülebilir yapacağım değil ama bir tasarımcı olarak ben bu ürünün sürdürülebilir olması için diğer insanları nasıl buna yönlendirebilirimi bulmak. Daha aslında soft sikiller gerekiyor, iyi tasarım yapmak değil de insan ilişkilerini iyi bir şekilde yönetebilmek gibi bir şey geliyor. (P18)[Q149]

“Çok bir etkim olamayabilir çünkü hani belli bir sektöre girip çalışıyoruz ya ondan dolayı da hani onun zaten kabullenmiş oluyorsun. Bir değişiklik yapma şansınız olmazmış gibi geliyor.” (P5)[Q150]

“Dijital üründe fiziksel üründen çok daha hızlı değişkenler var ve aslında bu değişkenlikler biraz sürdürülebilir olmanın önüne taş koyabiliyor. Biraz daha bunların belirli olduğu bir dünyada çalışmak biraz daha rahatlatırdı. İlk başta bunları belirlemeye çalışırdım diye tahmin ediyorum.” (P12)[Q151]

“Şu anki bu şirkette entegre etmem çok zaman alır. Tasarladığım ürünlerin kaygıları bana ait değil. Kullanıcı yönündeki beklentiler, ürün yönetiminin talepleri, satılabilirlik ve pazarlanabilirlik, rakipler arasından ayrılabilirlik. Kalite algısının yüksek olması, fiyat kalite dengesi, kullanım gibi parametreler gözetilerek özellikle bu ürünler tasarlanıyor diyebilirim.” (P2)[Q152]

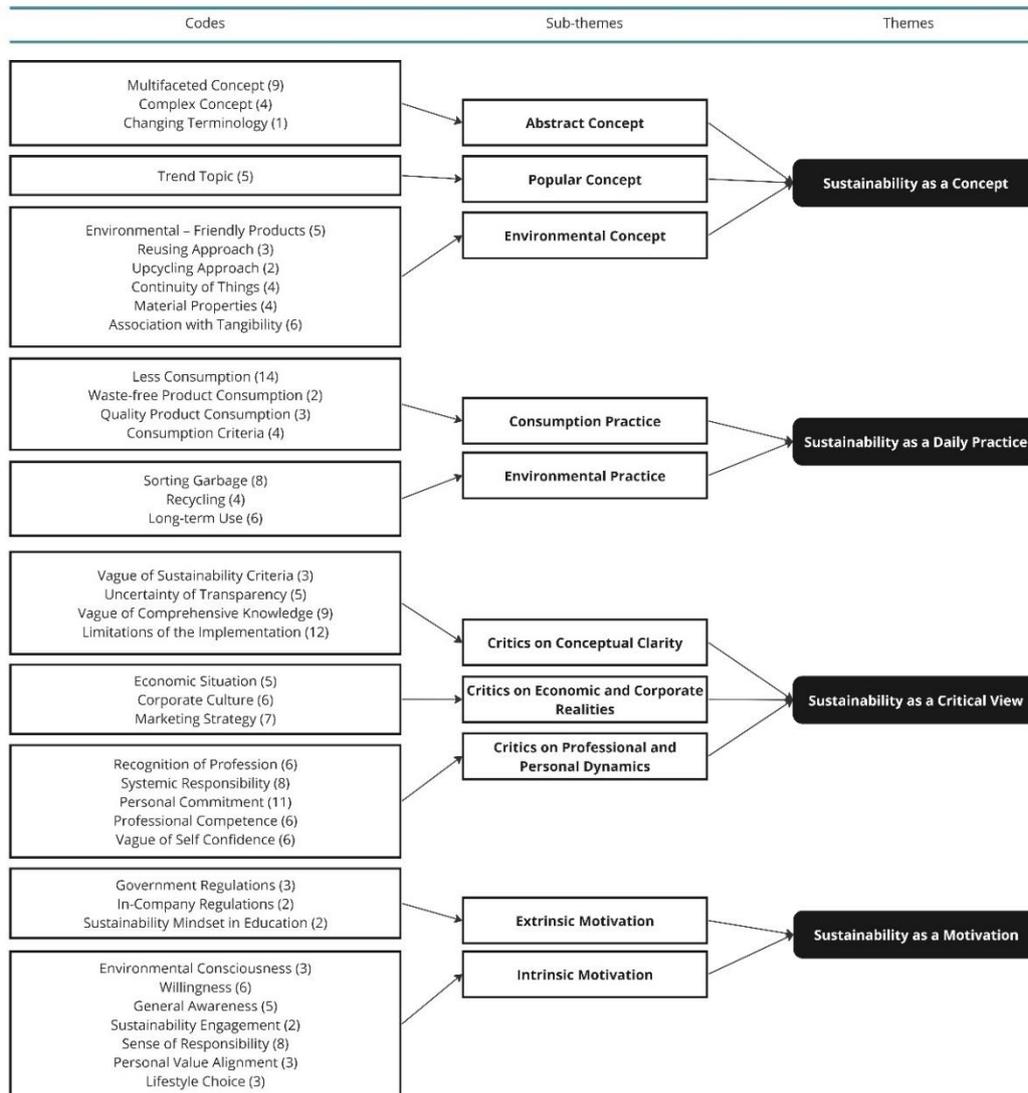
APPENDIX K: Tabulating Survey Findings

The screenshot displays a Google Sheets spreadsheet with a large table of survey findings. The table is organized into columns for various categories and is color-coded by section. The categories listed in the bottom right corner include: All from Responses, Completion Centre, Self-Assessment of Designers, 3 Word List, Knowledge sources, Degree Universities, Graduation Year, Working Sector, Working Industry, Experience Year, Lab Year 2, Sust. Course, Sust. Project, and Sustainability of Material. The spreadsheet interface shows the standard Google Sheets menu (File, Home, Insert, Tools, Layout, Formulae, Data, Review, View, Help) and a toolbar with various editing and formatting options. The data is presented in a grid format with multiple rows and columns, each cell containing text-based survey responses.

Figure K.1 : Tabulating survey findings through Google Sheets.

APPENDIX L: Structure of Findings

Category 4.1: Sustainability Approaches of Designers



Category 4.2 : Designer's Knowledge Sources about Sustainability

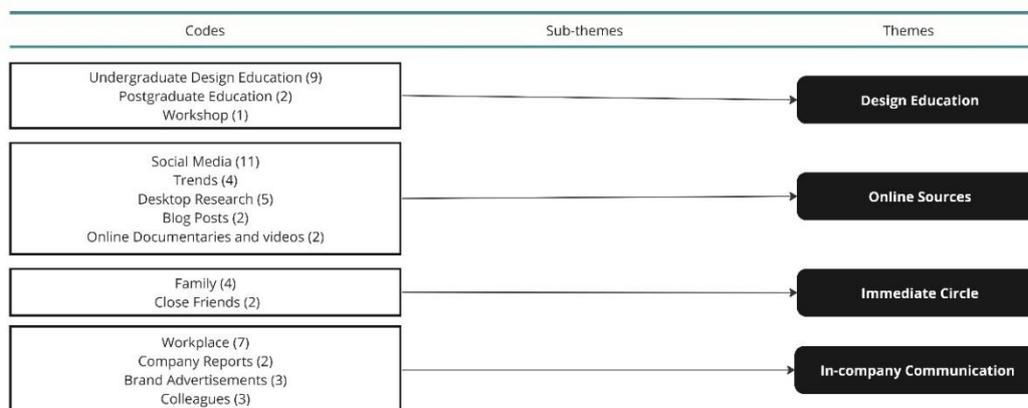
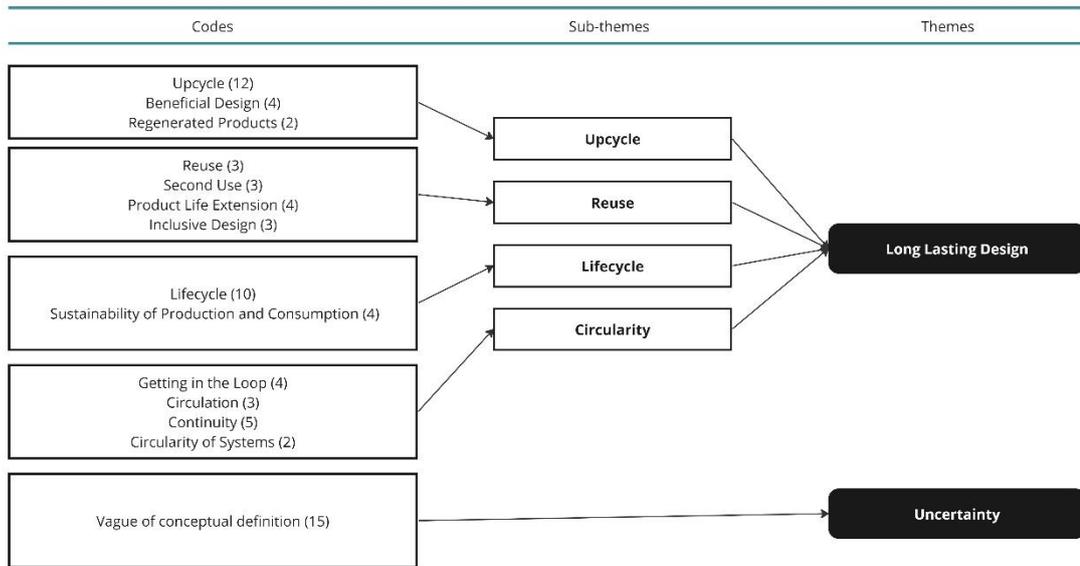


Figure L.1 : Entire structure of findings with emerging codes.

Category 4.3 : Circular Design Approaches of Designers



Category 4.4 : Contribution of the Design Education

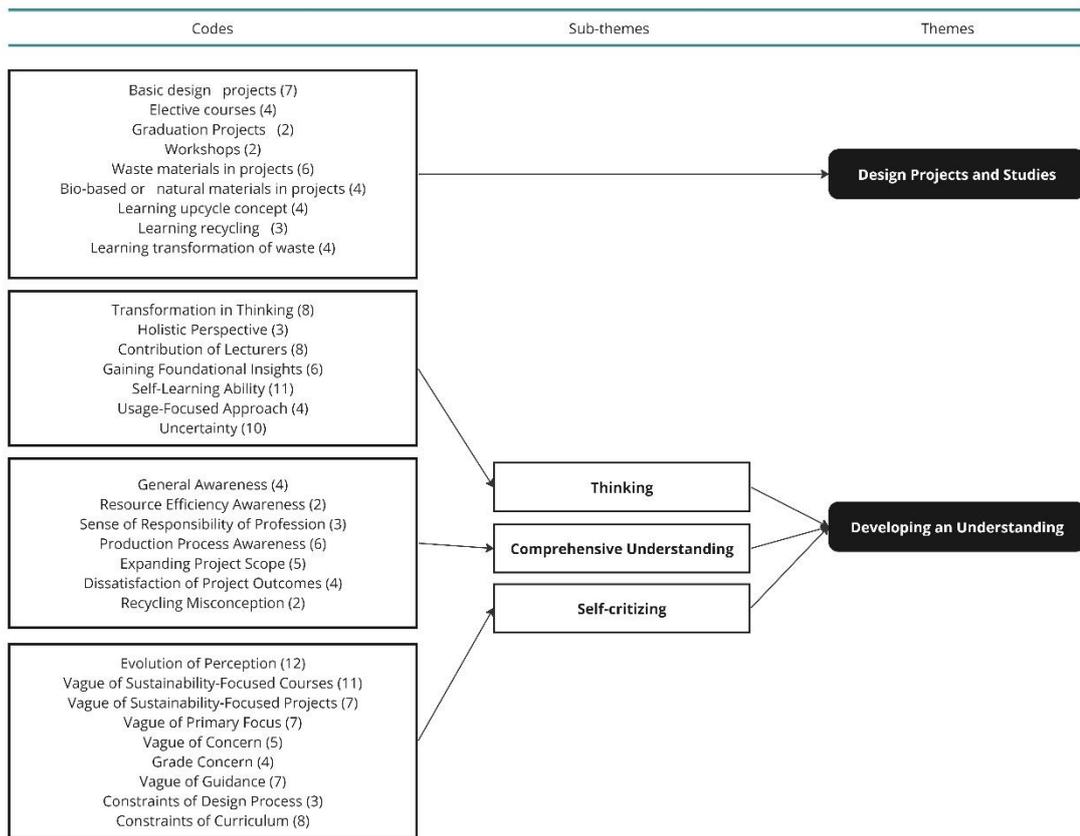


Figure L.1(continued): Entire structure of findings with emerging codes.

Category 4.5: Designers' Competency, Behavior, and Professional Identity

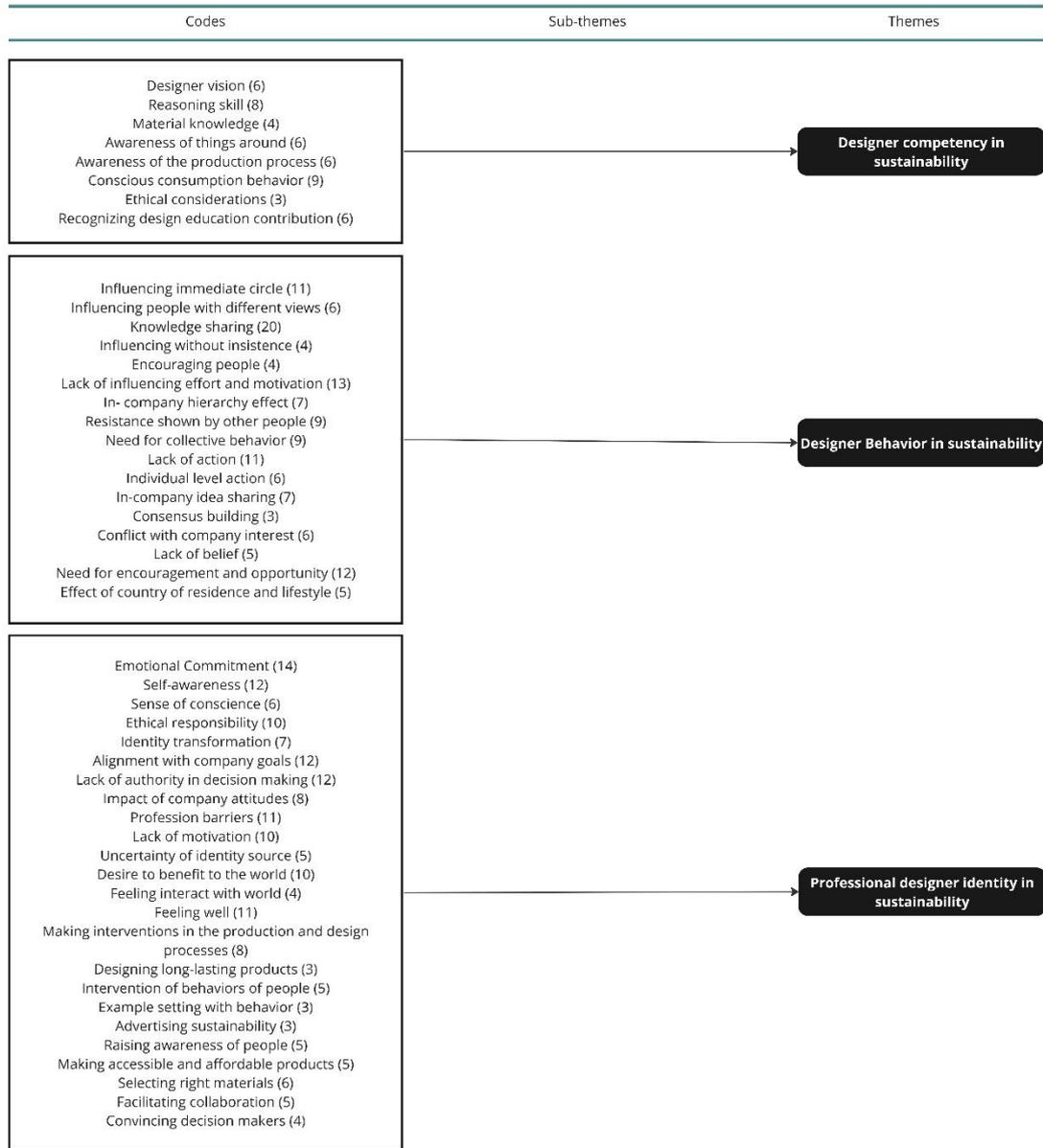


Figure L.1(continued): Entire structure of findings with emerging codes.

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PUBLICATIONS, PRESENTATIONS AND PATENTS ON THE THESIS:

- **Ayhan, S. N., & Gelmez, K.** (2022). Döngüsel Davranış Bağlamında Tasarımcı Kimliği: Tasarım Eğitimi Açısından Genel Bir Bakış. *UTAK 2022 Tasarım ve Çoğulculuk, (14-16 Eylül 2022)*.