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REFLECTIONS OF VIRTUAL REALITY IN THE FIELD OF ARCHITECTURE: A CONTENT ANALYSIS OF MASTER'S AND DOCTORAL THESES IN TURKEY

Minel KURTULUŞ[1,a,*]

[1]Istanbul Gelisim University, Faculty Of Fine Arts, Interior Architecture, Istanbul, Türkiye

[a]minelkurtulus@gmail.com, ORCID: 0000-0003-4623-0613

ABSTRACT

The transformative impact of digital technologies on the discipline of architecture is becoming increasingly evident. In this context, virtual reality (VR) technology contributes significantly to processes of interaction, representation, and presentation by offering a three-dimensional digital spatial experience. This study examines how VR technology has been addressed in the field of architecture in Turkey by analyzing a total of 36 master's and doctoral theses published between 1999 and 2024 in the Council of Higher Education (YÖK) National Thesis Center database (considering variables such as distribution by year, keywords, methodology, type of thesis, advisor title distribution, and university). The database search was conducted on June 2, 2025. The analyses reveal that the majority of the theses are practice-oriented master's research, whereas doctoral-level studies predominantly focus on theoretical frameworks and model development. Thematically, the theses concentrate on areas such as architectural education, spatial perception, visualization, urban design, cultural heritage, and construction safety. The most frequently employed approach is the mixed-methods design (qualitative + quantitative), highlighting the necessity of supporting the interactive nature of VR with multidimensional data. The study demonstrates that VR technology has the potential to enhance participatory design, creativity, and spatial awareness in both architectural education and practice.

Keywords: Virtual Reality, graduate theses, metaverse, digital technologies, architecture, virtual Reality

***Sorumlu Yazar (Corresponding Author)**

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SANAL GERÇEKLİĞİN MİMARLIK DİSİPLİNİNDEKİ YANSIMALARI: TÜRKİYE'DEKİ YÜKSEK LİSANS VE DOKTORA TEZLERİNİN İÇERİK ANALİZİ

ÖZET

Dijital teknolojilerin mimarlık disiplini üzerindeki dönüştürücü etkisi giderek belirginleşmektedir. Bu bağlamda, sanal gerçeklik (VR) teknolojisi, üç boyutlu dijital mekân deneyimi sunarak etkileşim, temsil ve sunum süreçlerine önemli katkılar sağlamaktadır. Bu çalışma, Türkiye'de mimarlık alanında VR teknolojisinin nasıl ele alındığını belirlemek amacıyla, YÖK Ulusal Tez Merkezi veri tabanında 1999–2024 yılları arasında yayımlanmış toplam 36 yüksek lisans ve doktora tezini (yıllara göre dağılım, anahtar kelimeleri, yöntemi, tez türü, danışman unvan dağılımı, üniversite vb.) incelemektedir. Tarama 02.06.2025 tarihinde yapılmıştır. Analizler sonucunda, tezlerin büyük çoğunluğunun uygulamaya yönelik yüksek lisans araştırmaları olduğu, doktora düzeyindeki çalışmaların ise kuramsal çerçeve ve model geliştirmeye odaklandığı görülmüştür. Tematik olarak tezler; mimarlık eğitimi, mekânsal algı, görselleştirme, kentsel tasarım, kültürel miras ve inşaat güvenliği başlıklarında yoğunlaşmaktadır. En sık tercih edilen yöntem karma yöntem (nitel + nicel) olup, bu durum VR'ın etkileşimsel doğasının çok boyutlu veriyle desteklenmesi gerekliliğini ortaya koymaktadır. Çalışma, VR teknolojisinin mimarlık eğitiminde ve pratiğinde katılımcı tasarımı, yaratıcılığı ve mekânsal farkındalığı artırma potansiyeline sahip olduğunu göstermektedir.

Anahtar kelimeler: Sanal gerçeklik, lisansüstü tezler, metaverse, dijital teknolojiler, mimarlık ve sanal gerçeklik

1. INTRODUCTION (GİRİŞ)

In recent years, the rapid advancement of digital technologies has brought about a profound transformation within the discipline of architecture, affecting a wide range of areas from design processes to presentation techniques, educational models, and user experience. At the core of this transformation lie virtual reality (VR) technologies, which, with their interactive and multisensory nature, enable users to have immersive experiences in three-dimensional digital environments that closely approximate reality, thereby demonstrating significant potential, particularly in design-oriented disciplines. Thanks to virtual environments that are constructed to resemble real spaces, the experience, testing, and presentation of architectural spaces have acquired a new dimension, positioning VR as a strategic tool for both pedagogical and professional applications.

Architectural education inherently encompasses skills such as materializing abstract concepts, experiencing spatial relationships, and critically evaluating design. Therefore, the opportunities

provided by virtual reality technologies have given rise to an important research domain in this field. Indeed, in Turkey, there has been a notable increase in academic interest in VR in recent years; it has been observed that, especially in the post-pandemic period, the acceleration of digitalization processes has led to a growing prevalence of these technologies in postgraduate theses.

In this context, identifying the reflections of VR technologies within the discipline of architecture, and evaluating in which thematic contexts, through which methodological approaches, and by whom these technologies have been studied, has become an important research need. To date, however, no comprehensive analysis has been conducted on postgraduate theses produced with the keyword "virtual reality" in Turkey, nor have the developmental trends in this area been systematically documented. This study aims to address this gap by examining a total of 36 master's and doctoral theses in the field of architecture, which are publicly accessible through the National Thesis Center of the Council of Higher Education (YÖK Thesis Center).

This analysis seeks to reveal the research themes, methodological tendencies, and institutional and academic advisor profiles associated with virtual reality within the discipline of architecture, while also providing a methodological and thematic framework for future research. In doing so, the study aims to contribute to a deeper understanding of how VR technologies are being integrated into architectural research and practice in Turkey.

2. LITERATURE REVIEW (LİTERATÜR TARAMASI)

Virtual reality (VR) technology has demonstrated remarkable development in recent years, particularly in the fields of architecture, education, and design. This technology is utilized across a wide range of application areas due to its significant effects on spatial perception, user experience, and the design process [1,2]. The use of VR in architectural education enhances students' spatial skills, increases their creative engagement, and facilitates the concretization of abstract concepts [3,4]. While virtual environments provide more interactive and immersive experiences compared to physical spaces, traditional environments stand out for their permanence and tangibility [5]. The integration of these two settings paves the way for holistic approaches in exhibition and cultural design. The presentation of historical buildings through VR not only raises awareness of heritage conservation but also improves the accessibility of cultural assets [6,7].

Wayfinding behaviors are another significant area influenced by VR technology. In complex facilities such as hospitals, the layout of floor plans directly affects users' wayfinding performance, while in virtual environments these behaviors can be analyzed more objectively

[8]. Additionally, transparent walls and distinct architectural elements play a crucial role in orientation and emergency scenarios [9]. In the context of urban design, VR encourages user participation in the design process, fostering more democratic and interactive practices [10,11]. However, technical challenges, hardware costs, and user habits remain significant barriers to the widespread adoption of this technology. Some studies emphasize that in order for VR to become an integral part of architectural practice, fundamental issues such as lack of knowledge must be addressed [12].

VR also plays an influential role in the construction sector and industrial transformation. Transformations in post-industrial areas based on principles of sustainability can be planned through VR scenarios to improve the quality of social life [13] Innovative training applications developed with mobile VR and eye-tracking technologies further enhance occupational safety and user awareness [14]. Nevertheless, some researchers argue that VR can never fully replace real spaces and always remains a form of imitation [15]. However, many studies reveal that VR is a powerful tool that enhances user engagement and learning efficiency in both educational and professional contexts [16,17].

Overall, virtual reality technology, with its interactive, participatory, and creative experiences in diverse contexts, has become a key component of the digital transformation in architecture, education, and cultural domains. Although certain limitations persist, the literature indicates that VR is assuming an increasingly significant role in design and learning processes**.**

3. METHOD (YÖNTEM)

The primary aim of this study is to examine master's and doctoral theses focusing on virtual reality (VR) within the field of architecture in Turkey, from both thematic and methodological perspectives, in order to reveal the trends, diversity, and developmental dynamics of academic production in this area. In this regard, the study provides a multidimensional analysis of how VR technologies are addressed within the discipline of architecture, which topics are emphasized, which research methods are preferred, and within which institutional structures these studies are produced.

The scope of the study comprises a total of 36 postgraduate theses identified through a systematic search of the National Thesis Center database of the Council of Higher Education (YÖK Thesis Center) in Turkey. The search was conducted on June 2, 2025, using the keywords "sanal gerçeklik" (virtual reality) and "VR," and was filtered to the *title field* and limited to the field of architecture. The theses included in the analysis were systematically classified according to variables such as thesis year, thesis type (master's/doctoral), university, academic title of the advisor, research method used (qualitative, quantitative, mixed-method), keywords,

thematic focus, and main findings.Both descriptive statistical methods and content analysis were employed in the data analysis process. Quantitative findings include measurable data such as the distribution of theses by year, institutional concentration, advisor profiles, and methodological preferences. The qualitative analysis evaluates the thematic contexts in which VR is addressed in the theses, the approaches used, and the common themes identified in the results.

This methodological approach provides a comprehensive overview of the academic reflections of VR technologies within the discipline of architecture, making it possible to identify research trends, gaps, and future directions. Moreover, by offering a guiding framework for future postgraduate research, the study aims to serve as a reference for researchers in terms of both content and methodology.

4. ANALYSIS AND FINDINGS (ANALİZ VE BULGULAR)

Table 1. Thematic and Methodological Distribution of Postgraduate Theses on Virtual Reality in Architecture

Author/Year/Thesis Type	University/Title	Keywords	Method/Theme	Finding
Okuyucu, E./2024/MS.c	ITU/Assoc. Prof. Dr.	x	Mixed/Quantitative-Qualitative – Healthcare Facilities and Virtual Reality	VR-based floor plan layouts provide objective insights into wayfinding behavior and spatial orientation in healthcare buildings.
Mercan, I/2024/MS.c	ITU/Assoc. Prof. Dr.	x	Mixed/Quantitative-Qualitative – Urban Design and Virtual Reality	Virtual reality in urban design increases public participation and design awareness, but technical and cost constraints limit widespread adoption
Kılıç, Ş./2024/MS.c	Maltepe Uni./Asst. Prof.	Spatial perception, virtual reality experience, exhibition spaces, memory, perception	Mixed/Quantitative-Qualitative – Exhibition Spaces and Architecture	VR enhances spatial perception with immersive experiences, while physical spaces provide tangible and memorable encounters, highlighting the potential for integrated exhibition design.
Öztürk, S./2024/MS.c	IStanbul Aydın Uni./Asst. Prof. Dr.	Interior Architecture, Virtual Reality, VR, Design Studio, Interior Architecture Education	Quantitative – Interior Architecture and Virtual Reality	VR applications foster student engagement and creativity in interior architecture by supporting spatial awareness and conceptual clarity

Author/Year/Thesis Type	**University/Title**	**Keywords**	**Method/Theme**	**Finding**
Bektaş, O./2024/MS.c	Bursa Uludağ Uni./Prof.Dr.	Augmented Reality, Virtual Reality, Cultural Heritage	Quantitative – Cultural Heritage and Virtual Reality	Digital presentation of historical buildings via VR, multilingual support, and AI personalization increases cultural education and digital tourism potential.
Kurtuluş, M./2024/PhD	MSGSU/Prof. Dr.	Physical Environment Components, Virtual Learning Environment, Virtual Learning Space, VR Platform, Metaverse	Mixed/Quantitative-Qualitative – Virtual Learning Environment and Virtual Reality	VR-based educational environments demonstrate that physical environmental factors affect user experience, informing the design of virtual learning spaces.
Yasak, U./2024/MS.c	Yıldız Teknik Uni./Assoc. Prof. Dr.	Wayfinding, emergency evacuation, visibility, virtual reality, architectural design	Mixed/Quantitative-Qualitative – Emergency Scenarios and Virtual Reality	Transparent walls and architectural elements in VR settings improve wayfinding performance and evacuation behavior.
Kömürcü, T./2024/MS.c	Dumlupınar Uni/Prof. Dr.	Interior Architecture Education, Material, Space Design, Spatial Perception, Virtual Reality	Mixed/Quantitative-Qualitative – Interior Architecture and Virtual Reality	VR in interior architecture education strengthens spatial perception, offering a more effective and practical learning process than conventional methods.
Atahan, D./2024/MS.c	Balıkesir Uni./Assoc. Prof. Dr.	Virtual Reality (VR), Augmented Reality (AR), construction sector, technological innovations, digital transformation, data analysis, smart construction, technological integration	Qualitative – Construction Sector and Virtual Reality	VR, AR, and MR technologies enhance project management, visualization, and sustainability in construction, contributing to digital transformation
Coşer, H./2024/MS.c	ITU/Prof. Dr.	Virtual Reality in Urban Design, Urban Space Simulation, User Experience in Virtual Space, Neuro-Architecture	Mixed/Quantitative-Qualitative – Urban Space and Virtual Reality	VR supports safer and more participatory urban space design by improving user perception and interaction.
Taştan, H./2023/PhD	Yıldız Teknik Uni./Assoc. Prof. Dr.	Immersive Virtual Reality, architectural education, spatial skills, building components, cognitive load,	Mixed/Quantitative-Qualitative – Architectural Education and Virtual Reality	VR-based teaching models enhance spatial skills, cognitive load management, and learning performance in architecture education.
Usta, B./2023/MS.c	Yıldız Teknik Uni./As	Virtual reality, architectural representation, design	Qualitative – Architectural	High sense of presence in VR strengthens information transfer and user collaboration in the architectural design process.

Author/Year/Thesis Type	University/Title	Keywords	Method/Theme	Finding
	soc. Prof. Dr.	process, presence, performativity	Design and Virtual Reality	
Doma, O./2023/PHD	ITU/Prof. Dr.	x	Mixed/Quantitative-Qualitative – Virtual Education and Virtual Reality	VR supports creative design exploration during conceptual stages, becoming an effective design tool for practice and education.
Taşdelen, M./2023/MS.c	ITU/Assoc. Prof. Dr.	x	Mixed/Quantitative-Qualitative – Game-Space and Virtual Reality	Individuals with design education exhibit higher spatial performance in VR environments, validating its role in architectural training.
Kabır, M./2023/MS.c	ITU/Ast. Prof.	x	Mixed/Quantitative-Qualitative – Biophilia and Virtual Reality	VR-assisted design scenarios for post-industrial sites support sustainable and biophilic transformations, improving local quality of life.
Karadallı, Ş./2022/MS.c	DEU/Prof. Dr.	Conservation of Historical Environment, Virtual Reality, Presentation, İzmir Kemeraltı Bazaar and Inns Region	Mixed/Quantitative-Qualitative – Historical Environment Conservation and Virtual Reality	VR enhances accessibility and awareness in historical heritage conservation by digitally presenting historical sites.
Şarkışla, M./2022/MS.c	Erciyes Uni./Ast. Prof.Dr.	Architectural Representation, Representation Techniques, Spatial Perception, Raumplan, Free Plan, Müller House, Farnsworth House	Mixed/Quantitative-Qualitative – Spatial Perception and Virtual Reality	VR outperforms 2D techniques in complex architectural spaces by improving spatial perception in multisensory contexts.
Kılıç, E./2021/MS.c	ITU/Prof. Dr.	x	Mixed/Quantitative-Qualitative – E-Commerce and Virtual Reality	VR-based e-commerce applications strengthen user experience and loyalty by enhancing product perception.
Şahin, A./2021/PhD	Karatay Uni./Ast. Prof.Dr.	Basic design, design education, perception, spatial perception, virtual reality, learning to learn, guided exploration, learning styles	Mixed/Quantitative-Qualitative – Virtual Education and Virtual Reality	VR enriches basic design education by boosting spatial awareness, creativity, and learner engagement.

Author/Year/Thesis Type	**University/Title**	**Keywords**	**Method/Theme**	**Finding**
Özdoğan, M./2021/MSc	Konya Teknik Uni./Prof. Dr.	Architectural Education, Virtual Reality, Virtual Environment, Building Knowledge, Generation Z	Mixed/Quantitative-Qualitative – Virtual Education and Virtual Reality	VR systems improve Generation Z students' understanding of structural courses by strengthening spatial cognition.
Özgün, S./2021/MS.c	Gazi Uni./Assoc. Prof. Dr.	Space Production, Cyber Space, Visual Culture, Spatial Interface, Virtual Reality	Quantitative – Space and Virtual Reality	Cyber-space formed by architecture, art, and technology merges physical and virtual realms into multilayered and dynamic spatial experiences.
Turhan, Ü./2020/MSc	ITU/Assoc. Prof. Dr.	x	Mixed/Quantitative-Qualitative – Games and Virtual Reality	VR technologies foster realistic spatial perception, memory retention, and design skills in children's play and learning processes.
Sevim, H./2019/PhD	Konya Teknik Uni./Prof. Dr.	Perception, Communication, Architectural Design Process, Client, Virtual Reality	Mixed/Quantitative-Qualitative – Client Relationship and Virtual Reality	VR strengthens architect-client communication during design presentations, enabling better pre-construction evaluation and satisfaction.
Özel, B./2019/MSc	ODTU/Asst. Prof.Dr.	Risk Recognition, Virtual Reality, Eye Tracking, Construction Site Safety	Mixed/Quantitative-Qualitative – Construction Site and Virtual Reality	Mobile VR, eye-tracking, and gamification improve construction workers' hazard recognition and safety awareness.
Dumlu, B./2018/MSc	ITU/Assoc. Prof. Dr.	x	Mixed/Quantitative-Qualitative – User Experience and Virtual Reality	VR storytelling changes users' spatial perception and memory recall through audiovisual stimuli and virtual exploration.
Yıldan, İ./2018/MS.c	ITU/Prof. Dr.	x	Mixed/Quantitative-Qualitative – Virtual Education and Virtual Reality	VR environments foster creativity and flexible thinking in design studios, enhancing spatial perception compared to traditional 3D modeling.
Karışma, A./2017/MSc	Gazi Uni./Assoc. Prof. Dr.	Architectural Design, Computer-Aided Design, Virtual Reality, Internet	Qualitative – Design and Virtual Reality	VR and IT applications increase efficiency in architecture and construction, yet knowledge gaps hinder fully interactive VR usage.

Author/Year/Thesis Type	**University/Title**	**Keywords**	**Method/Theme**	**Finding**
Aydın, E./2012/ PhD	YTU/Asst. Prof.Dr.	Virtual Reality, Three-Dimensional Virtual Reality, Representation, Architectural Representation, Semiotics, Dynamic Lighting	Mixed/Quantitative-Qualitative – Space and Virtual Reality	Dynamic lighting in 3D VR environments enhances spatial representation, but requires advanced interactive tools for full potential.
Kayapa, N./2011/PhD	YTU/Asst. Prof.Dr.	Virtual Reality Environment, Perceptual Differences Between Real and Virtual Reality Environments, Depth Perception, Visual Field, Visualization,	Mixed/Quantitative-Qualitative – Representation and Virtual Reality	VR expands spatial communication and design expression, with interactive visualization tools improving outcomes.
Töre, T/2010/MS.c	MSGSU/Prof. Dr.	x	Qualitative	VR is an effective tool for presenting and preserving cultural assets, supporting sustainability in conservation processes.
Ayoğlu, H./2005/MS.c	ODTU/ Asst. Prof.Dr.	Digital Architecture, Extension of Reality, Virtual Reality Environment, Information Space	Qualitative	x
Zafer, D./2007/ MS.c	Anadolu Uni./Assoc. Prof. Dr.	Architectural Design Process, Computer-Aided Design, Virtual Reality, Information Technologies, Virtual Reality Applications in Architectural Design	Qualitative	Integrating VR into architectural design strengthens communication and supports creative, collaborative solutions.
Kınayoğlu, G./2002/MS.c	ODTU/ Assoc. Prof. Dr.	Depth, Virtual Reality Modeling Language (VRML), Computer-Based Architectural Representation	Qualitative	X
Ünur, K.2001/MS.c	YTU/Assoc. Prof. Dr.	Computer-Aided Design, Architectural Design, Virtual Reality, Virtual Reality-Aided Design, Technology	Qualitative	x
Karadayı, A./2000/PhD	KTU/Prof. Dr.	Architecture, Virtual Reality, Internet, Computer-Aided Design, CAD, Archive, Visual	Mixed/Quantitative-Qualitative	VR remains a virtual medium and can never fully replace the experience of real physical space.

Author/Year/Thesis Type	University/Title	Keywords	Method/Theme	Finding
		Model, Simulation, Multimedia		
Ünaldı, C./1999/MS.c	ITU/Prof. Dr.	X	Qualitative	x

Evaluation of the Trends of Postgraduate Theses by Year

The chronological distribution of postgraduate theses on virtual reality (VR) in the field of architecture reflects the gradual yet notable integration of this technology into academic discourse in Turkey. Based on data obtained from the National Thesis Center (YÖK), the first master's thesis on VR was completed in 1999. Between 1999 and 2016, academic interest remained limited, with only one thesis produced in most years, and the research largely emerging from individual initiatives. The first doctoral dissertation was published in 2012, marking the initial shift from applied studies toward theoretical engagement with the topic.

A visible increase in interest has been observed since 2017. Although the number of theses remained modest at first, a steady upward trend became apparent after 2018. Notably, 2019 was the first year in which both a master's thesis and a doctoral dissertation were produced concurrently. Following a brief stagnation in 2020, a significant rise occurred in 2021 and 2022, with growing diversity in research themes and methodologies.

The most substantial increase took place in 2023 and peaked in 2024, with five and eleven theses completed respectively. While the majority of these studies were at the master's level, the presence of doctoral research has also become more consistent, reflecting a deepening academic engagement. These findings suggest that VR has evolved from a niche interest to a recognized and expanding research area in architectural scholarship.

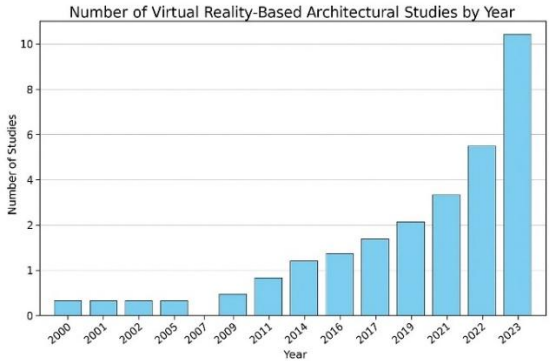

Figure 1. Architecture Theses on Virtual Reality by Year

Statistical Analysis of Postgraduate Theses by Academic Level

Within the scope of the 36 theses examined, the theme of virtual reality (VR) has been addressed specifically within the field of architecture. The vast majority of these theses are at the master's level; in total, 29 master's theses were identified, corresponding to 80.5% of the total sample. Doctoral dissertations, on the other hand, account for seven theses, representing 19.5% of the total. This distribution indicates that the topic of virtual reality in the discipline of architecture has primarily been explored at the master's level in the context of academic research.

The significant proportion of master's theses suggests that research in this area is still in its developmental and application-oriented phases, with a strong emphasis on examining the practical and implementation aspects of new technologies. The fact that studies on the use of virtual reality technologies in architectural education, design processes, and spatial perception are predominantly conducted at the master's level demonstrates that the experimental and applied dimensions of the field remain at the forefront.

On the other hand, although the proportion of doctoral dissertations is relatively low, these studies generally aim to make deeper theoretical and methodological contributions. Doctoral-level research investigates the conceptual dimensions of virtual reality technology within architecture—such as design paradigms, user experience, physical environment components, and educational models—in a more detailed and systematic manner, thereby contributing to the advancement of the discipline.

This distribution demonstrates that academic production on virtual reality in architecture is still on an upward trajectory; however, it also highlights the need for more advanced research and the development of theoretical frameworks at the doctoral level. Furthermore, the fact that both

master's and doctoral theses often employ mixed-method approaches—incorporating both qualitative and quantitative analyses—emphasizes the importance of interdisciplinary and multi-dimensional research perspectives in this field (Figure 1)

In conclusion, it can be observed that academic studies on virtual reality within the discipline of architecture are predominantly concentrated at the master's level; however, significant research is also being conducted at the doctoral level to deepen the field and strengthen its theoretical foundations. This situation indicates that, in parallel with technological developments, virtual reality applications in architecture will increasingly be addressed in a broader and more systematic manner.

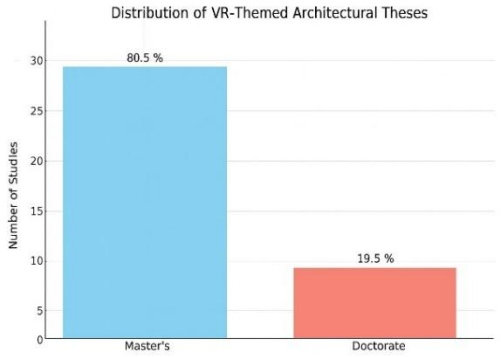

Figure 2. Distribution of Virtual Reality-Themed Theses in Architecture by Type

Analysis of Postgraduate Theses by Universities

The institutional distribution of VR-themed theses in architecture in Turkey reveals a strong concentration in technical universities located in metropolitan areas, particularly Istanbul. Istanbul Technical University (ITU) leads with nine theses, accounting for 25% of the total, reflecting its advanced research infrastructure and emphasis on technological innovation. Yıldız Technical University (YTU) and Middle East Technical University (METU) follow with three theses each (8.3%), underscoring their continued academic engagement in interdisciplinary research. Other Istanbul-based universities collectively contributed six theses (16.7%), highlighting the city's dynamic research environment.

In addition to metropolitan institutions, several regional universities such as Bursa Uludağ, Dumlupınar, Maltepe, Karatay, Balıkesir, Dokuz Eylül, Anadolu, Istanbul Aydın, Karadeniz Technical, and Kütahya Dumlupınar each produced one thesis (2.8%), indicating a nationwide

distribution. Konya Technical University and Gazi University, with two theses each (5.6%), also demonstrate notable regional contributions.

Overall, while VR research in architecture remains primarily centered in large technical universities, the participation of regional institutions suggests a growing national research landscape. This expanding academic interest indicates that future studies will likely become more diversified and widespread, supporting both innovation and international visibility in architectural education and technology.

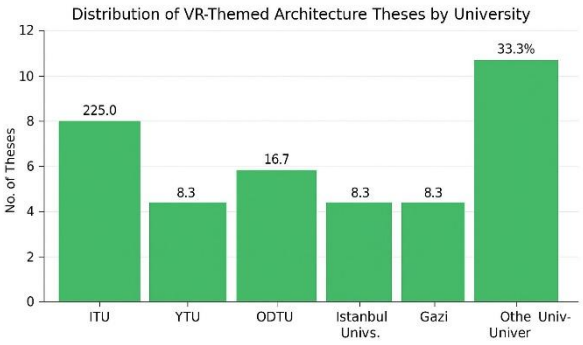

Figure 3. Distribution of Virtual Reality-Themed Architecture Theses by University

Analysis by Academic Title of Thesis Advisors

An evaluation of the academic titles of the advisors for the 36 theses examined provides significant insights into the level of academic supervision and the nature of the research produced. According to the data, the advisors' titles include Associate Professor (Assoc. Prof.), Assistant Professor (Asst. Prof.), Professor (Prof.), and, in some cases, supervisors whose titles are unspecified. This distribution offers valuable information regarding the academic experience levels of the advisors and the nature of the theses.

It is observed that for master's theses, advisors holding the titles of Associate Professor and Assistant Professor are more commonly involved. This suggests that master's students benefit from the guidance of experienced yet early- to mid-career academics during their research process. Advisors at the associate professor level or in the early stages of their academic careers after earning their PhD often play an active role in supervising research involving contemporary methodologies and technological innovations.

On the other hand, it is noteworthy that doctoral dissertations are more frequently supervised by academics holding the title of Professor. This can be attributed to the fact that doctoral studies require a higher level of expertise and guidance. The professor title reflects the academic's extensive experience and scholarly productivity, making it expected for doctoral students to work under the mentorship of senior scholars at this level.

Additionally, the fact that some theses do not specify the advisor's title, or that this information is unclear, indicates certain gaps in data records, which slightly limits the precision of the analysis.

Overall, when viewed in terms of advisor titles, it can be said that virtual reality-themed theses in architecture—at both the master's and doctoral levels—are supervised by experienced academics. This plays an important role in ensuring the scientific rigor and quality of the research produced.

In conclusion, the distribution of academic advisor titles demonstrates that academic production in the field of architecture and virtual reality in Turkey is supported by scholars at various stages of their academic careers, and that interdisciplinary knowledge is being transferred to emerging researchers. This diversity enables research in the field to advance on a foundation that is both innovative and robust (Figure 4).

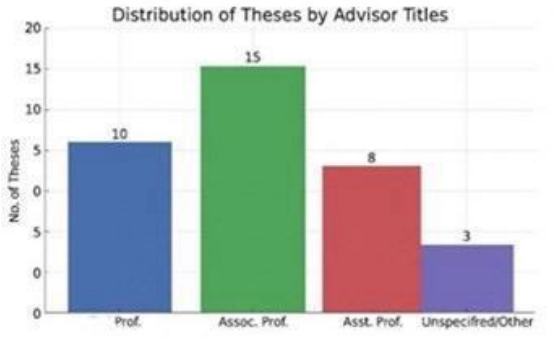

Figure 4. Visualization of the Relationship Between Advisors' Academic Titles and the Number of Postgraduate Theses

Analysis of Keywords

The table of 36 postgraduate theses includes a variety of keywords associated with virtual reality (VR) and architecture. These keywords reflect the thematic focuses, methodologies, and application areas of the theses, providing an important framework for understanding how VR is utilized within the discipline of architecture. Below, the frequency of keywords, their thematic groupings, and their relationships with the theses are analyzed.

Frequency Analysis of Keywords

An examination of the keywords shows that certain terms are frequently repeated, highlighting specific thematic focuses. The most commonly used keywords and their frequencies are listed below (note that some theses do not specify any keywords):

Virtual Reality (VR): Appears as a common keyword in all 36 theses, serving as the central focus for all studies.

Spatial Perception: Directly indicated in five theses [5,19,24,16,1] and addressed indirectly in others.

Architectural Education: Specified as a keyword in five theses [3,19,4,21,16].

- Urban Design: Clearly mentioned in two theses [10,11]
- Cultural Heritage: Highlighted in two theses [7,6]
- Wayfinding: Used as a keyword in two theses [8,9]
- Interior Architecture: Specified in two theses [3,19]
- Design Process: Found in three theses [21,2,36]
- Other Notable Keywords: Terms such as Augmented Reality (AR), Construction Site Safety, Biophilic Design, Neuro-Architecture, E-commerce, Gaming, and Spatial Representation each appear once and reflect more specific themes.

Figure 5. Word Cloud Analysis of Keywords in Postgraduate Theses

Analysis of Research Methods Used

The total of 36 theses examined were classified into three main categories based on their methodological approach: qualitative, quantitative, and mixed-method (qualitative + quantitative).

• Theses Using a Qualitative Method:

A total of nine theses (25%) relied solely on qualitative research methods. These studies predominantly employed techniques such as observation, content analysis, thematic analysis, and experiential reflection. Theses in this group often focus on topics such as architectural representation, user experience, and the design process.

• Theses Using a Quantitative Method:

Four theses (11.1%) used only quantitative data, concentrating on tools such as surveys, statistical analyses, and numerical performance measurements. Although this group is more limited in number, it appears particularly in studies involving data-driven modeling and user testing.

• Theses Using a Mixed-Method Approach:

The majority of the theses—23 in total (63.9%)—were prepared using a mixed-method approach. In these studies, qualitative and quantitative techniques are integrated: user opinions related to VR experiences are supported by statistical analyses, while thematic content is enriched through observation and interpretation.

The data show that the most commonly used research method in VR-themed architecture theses is the mixed-method approach. This indicates the necessity of evaluating a multidimensional technology like VR in a way that considers both user experience and measurable outcomes. On the other hand, the fact that qualitative methods are preferred more frequently than purely quantitative ones aligns with the experiential, visual, and interpretive nature of the discipline (Figure 6)

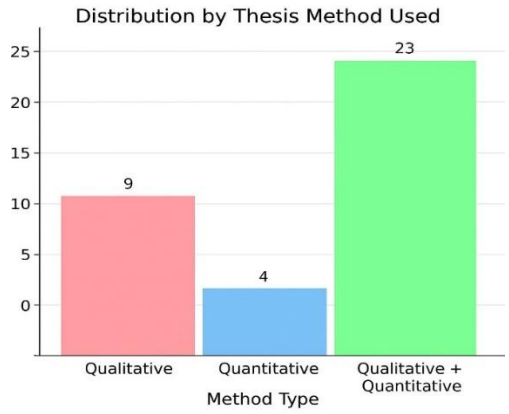

Figure 6. Distribution of Research Methods Used in Postgraduate Architecture Theses

Analysis of Thesis Findings

When the general findings of the theses are evaluated thematically, it becomes evident that virtual reality (VR) technology provides multifaceted contributions to the discipline of architecture. Many studies have demonstrated that VR technology enhances users' understanding, perception, and experience of space, proving especially effective in clarifying complex spatial organizations, abstract design ideas, and wayfinding processes. In education-focused theses, VR has been defined as a tool that increases students' creativity, spatial awareness, motivation, and engagement, and has been shown to deliver more effective learning outcomes compared to traditional methods in fundamental design, interior design studios, and construction knowledge courses.

In user experience and interaction-based studies, it is noted that the interactive environments provided by VR increase user satisfaction and strengthen the client-architect relationship during architectural presentations. Theses focusing on architectural design processes indicate that VR particularly expands diversity during the conceptual design stages, supports intuitive decision-making, and contributes to collaborative processes. In the context of urban design and cultural heritage, VR emerges as a tool that enhances public participation, enables the digital presentation of cultural heritage, and strengthens awareness of preservation.

Studies related to wayfinding behavior and emergency scenarios reveal that VR offers a robust simulation environment that allows for the objective analysis of user behaviors. Findings on sectoral applications indicate that VR accelerates work processes in fields such as construction, shopping, and construction site safety, increases risk awareness, and improves the consumer

experience. In this respect, VR technology can be considered a transformative tool in the field of architecture at both pedagogical and practical levels.

Evaluation of Findings in Terms of Research Depth and Conceptual Framework

Doctoral dissertations are generally built upon a more comprehensive theoretical background and aim to provide advanced contributions, such as developing design criteria, proposing models, or suggesting pedagogical frameworks.

- For example, [18] proposed a design guide for virtual learning environments.
- Doctoral theses such as [4] and [16] developed teaching models, pedagogical strategies, or assessment tools.

Master's theses, on the other hand, have mostly focused on identifying the current situation, conducting situational analyses, investigating user perception, exploring technological integration, or implementing small-scale experimental applications.

- For instance, [19] examined the impact of VR on color and material selection,
- While [10] analyzed potential future trends but did not produce a model.

Depth of Findings in Relation to Research Methods

• All doctoral dissertations (100%) employed a mixed-method (qualitative + quantitative) approach. This method combines user experiences with statistical analyses, resulting in multidimensional findings.

• In master's theses, the distribution was approximately: mixed-method (62%), qualitative only (21%), and quantitative only (17%). This indicates that while doctoral theses tend to achieve greater research depth, master's theses generally work with more limited data sets.

Thematic Analysis of Postgraduate Theses

Based on the data presented in the table, the thematic analysis shows that the concept of virtual reality (VR) has been addressed from various perspectives, particularly in the fields of architecture, interior architecture, urban design, education, the construction industry, and cultural heritage. Among the theses examined, the most frequently recurring themes include VR-supported educational environments, the design process, spatial perception, representation and visualization, urban design, cultural heritage, and safety. Notably, the greatest concentration is observed in VR-based educational applications. The studies emphasize the potential of VR technology to enhance student engagement, strengthen spatial perception, foster creative thinking, and contribute innovatively to core design pedagogy within interior architecture and architectural education. In this regard, VR applications are highlighted as

effective tools for increasing learning motivation and interaction among Generation Z students and for concretizing abstract concepts.

Similarly, in relation to the design process and spatial perception, the use of VR has been discussed in terms of enriching user experience, improving the comprehensibility of complex spaces, and offering new possibilities for representation through the transfer of physical environmental components into virtual settings. In the themes of representation and visualization, it is emphasized that elements such as photorealistic or non-photorealistic visualization techniques, dynamic lighting, and perceptual depth enhance architectural communication and that interactive presentation techniques contribute to the evaluation of design decisions.

In the context of urban design, VR technologies support user participation and community engagement, thereby contributing to making urban spaces more comprehensible and accessible. Topics such as urban space simulations, neuro-architectural approaches, and user experience illustrate the concentration of research in this area. Additionally, in the domains of cultural heritage and historical environment conservation, innovative approaches such as the digital presentation of historic structures, VR integration, multilingual support, and AI-assisted personalization have demonstrated the potential for strengthening public awareness of historic environments and increasing conservation consciousness.

On the other hand, in the construction industry and construction site safety themes, aspects such as risk recognition, eye tracking, and smart construction have been discussed in relation to the applicability of VR in occupational safety training. Furthermore, in more specific areas such as wayfinding behavior in healthcare facilities, emergency evacuation scenarios, and the relationship between gaming and space, VR applications have been shown to enable detailed and objective analysis of user behaviors.

Overall, these themes indicate that VR technologies are strongly integrated with concepts such as spatial perception, user experience, participation, representation, design processes, safety, and conservation within architecture and related fields, with a particular focus on educational processes. Accordingly, the contributions of VR applications—such as enhancing interaction, concretizing design decisions, and fostering user-centered design approaches—are prominent; however, it is also understood that limiting factors such as technical challenges, costs, and user habits must be taken into account(Figure 7)

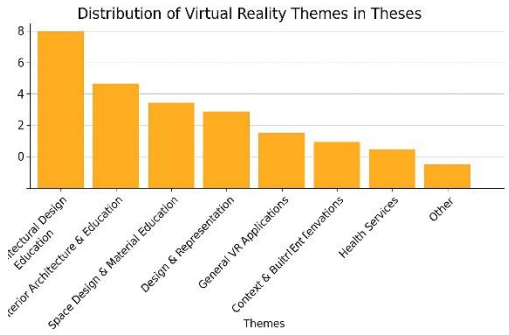

Figure 7. Thematic Concentrations of Virtual Reality in Theses

Findings

Findings on Trends of Postgraduate Theses by Year

The distribution of theses by year shows a significant increase in virtual reality (VR)-themed research, particularly in the last five years. This growth is thought to be related to the spatial constraints experienced during the pandemic and the increased need for remote education models. In addition, improved accessibility to hardware and software has likely contributed to this rising interest. The limited number of theses produced in the early years (1999–2016) can be explained by the fact that VR technologies were not yet widespread and technical infrastructure was limited at that time. The peak in the number of theses in 2024 suggests that the practical value of VR within the discipline of architecture has become more widely recognized.

These findings indicate that VR technology is becoming increasingly institutionalized in academia and holds development potential both in practical and theoretical dimensions.

Findings on the Academic Levels of Postgraduate Theses

The fact that the majority of theses have been produced at the master's level suggests that the topic of VR in architecture is still largely in an exploratory and application-oriented phase. This is thought to be due to the practical nature of VR technologies, which are well-suited for producing outputs based on real-world applications, thus driving research to be predominantly experimental and project-based. The relatively small number of doctoral dissertations implies that the theoretical foundations of the subject are not yet fully mature, although they are beginning to deepen. This difference can be attributed to the fact that master's theses tend to test the applicability of new technologies, while doctoral research aims to develop conceptual models and establish methodological frameworks that make more advanced contributions.

Overall, these findings suggest that VR-focused research in architecture is primarily embraced as an applied field but is also beginning to strengthen its potential for theoretical development.

Findings on Universities Producing Postgraduate Theses

In the distribution of theses by university, Istanbul Technical University (ITU) clearly leads, which is thought to be due to the institution's strong infrastructure in architecture and digital technologies and the high level of academic interest in the topic. Similarly, Yıldız Technical University (YTU) and Middle East Technical University (METU) are also seen to support innovative themes like VR through their well-established engineering and architecture faculties. The notable contributions from other Istanbul-based universities are linked to the city's expansive academic network and technological ecosystem. This concentration is believed to result from the robust research infrastructure, laboratory facilities, and interdisciplinary collaborations available in major cities.
Meanwhile, the representation of universities across Anatolia—even at lower percentages—indicates that the subject is not limited to metropolitan institutions and that awareness is increasing nationwide. The contributions of mid-sized technical universities (e.g., Gazi University, Konya Technical University) are seen as signs of growing local academic interest in VR.
In conclusion, these findings suggest that the concentration of VR-focused architecture theses at large urban universities with strong infrastructures is expected, yet regional diversity is also expanding.

Findings on Advisors' Academic Titles

An examination of advisor title distribution shows that associate professors and assistant professors are more commonly involved in supervising master's theses, whereas professors tend to supervise doctoral dissertations. This is thought to reflect the need for more hands-on supervision by younger, dynamic academics for current, technology-focused and practice-based master's research. Conversely, the advanced theoretical frameworks and methodological rigor required at the doctoral level necessitate the guidance of more senior academics. These findings suggest that in a new research area like VR, knowledge transfer is balanced between younger and more experienced academics.
Instances where advisor titles are missing or unclear likely stem from inconsistencies in record-keeping, which can limit the reliability of the data to some extent. Overall, this pattern indicates that the diversity of academic supervision plays an important role in supporting interdisciplinary knowledge sharing within VR-themed architecture research.

Findings on Keywords

The keyword analysis shows that spatial perception, architectural education, and urban design/cultural heritage are the dominant themes in VR-focused architecture theses. This is thought to be related to VR's potential to enhance spatial experience, increase interaction in education, and support participatory design processes.
The fact that master's theses include more practice-oriented, specific themes (e.g., wayfinding, construction site safety) is likely due to students' need to test VR in tangible contexts. Conversely, the more abstract, conceptual, and innovative keywords found in doctoral theses align with the need to strengthen the field's theoretical framework.
The absence or vagueness of keywords in some theses is thought to result from a lack of attention during data recording and classification, partially limiting the depth of the analysis. Overall, the diversity and thematic clustering of keywords demonstrate that VR is embraced as an interdisciplinary exploration field within architecture.

5. DISCUSSION AND RESULT (TARTIŞMA VE SONUÇ)

The findings of this study indicate that the application of virtual reality (VR) technology within the field of architecture is primarily concentrated in domains such as educational processes, spatial perception, representation, and urban design. This trend appears to arise from the necessity of concretizing conceptual abstractions inherent in design-based disciplines, as well as from the interaction expectations characteristic of Generation Z students. However, the data also reveal that VR has been comparatively underexplored in more practical areas, including the construction sector, construction site safety, and wayfinding behaviors. This suggests that the practical dimensions of the technology remain somewhat limited and warrant further investigation.

Another significant point emerging from the study pertains to the insufficient attention given in the theses to limiting factors such as cost, inadequate technical infrastructure, and user habits. This observation underscores the need for a more thorough theoretical examination of the fundamental barriers impeding the broader adoption of VR applications. While the widespread use of mixed-method approaches in the reviewed theses reflects a commendable methodological richness in capturing the multifaceted effects of VR, it is anticipated that this approach could be further strengthened through the inclusion of detailed, in-depth case studies.

In the analyzed theses, the contributions of VR technology to architectural practice are generally presented within a positive framework, positioning the technology as a tool that enriches spatial experience and facilitates the design process. Nevertheless, this perspective often overlooks

critical arguments suggesting that VR may offer a superficial mode of representation, weaken connections with physical space, and overshadow the intuitive dimensions of design. Contrasting viewpoints in the literature contend that VR has the potential to reduce architectural thinking to a predominantly digital paradigm. Consequently, there is a clear need for a heightened level of critical evaluation in the theses, allowing for a more comprehensive exploration of the technology's potential limitations and contentious aspects.

Although VR technology is often lauded in the literature for its capacity to support innovative design processes and enhance spatial experiences, opposing perspectives also exist. Certain scholars argue that VR reduces architectural thought to digital representation, undermining the sensory and intuitive connections with physical space. Furthermore, critiques suggest that the technology may instrumentalize the design process, potentially diminishing the creative role of the architect. In this context, the impact of VR on architectural practice should be assessed not only in terms of its potential benefits but also through a critical lens that acknowledges its possible drawbacks.

In conclusion, this study emphasizes the opportunities offered by VR technologies in architectural practice, education, and design processes, while simultaneously highlighting the need to strengthen interdisciplinary collaborations, broaden practice-oriented research themes, and maintain methodological diversity. Future research is expected to address both the theoretical and practical boundaries of VR in a more holistic manner, thereby uncovering the true potential of the technology within the field of architecture.

6. RESULTS (SONUÇLAR)

This study provides a comprehensive analysis of master's and doctoral theses focusing on virtual reality (VR) within the discipline of architecture in Turkey, revealing both methodological and thematic trends. The analysis demonstrates that VR is predominantly addressed in contexts such as education, spatial perception, representation and visualization, urban design, cultural heritage, and safety. This emphasis is likely rooted in VR's multifaceted contributions, including its capacity to enhance spatial understanding, concretize abstract concepts, increase student engagement, and support design processes. The findings further indicate that the vast majority of these theses are at the master's level, suggesting that VR research in Turkey remains largely practice-oriented, experimental, and user-centered, whereas more comprehensive theoretical frameworks are primarily developed at the doctoral level.

The prevalence of the mixed-method approach as the most frequently employed research strategy underscores the necessity of evaluating an interactive technology like VR through both qualitative and quantitative lenses. Additionally, the dominance of Istanbul-based technical universities in the institutional distribution points to the critical role of strong academic infrastructure and advanced technological resources in supporting research output in this field. While VR technology is gaining visibility in architectural research in Turkey, the study identifies several methodological and thematic gaps. In particular, technical barriers, costs, user habits, and sustainable integration are insufficiently addressed, which represents a significant limitation for the long-term adoption of VR applications in architectural practice.

Looking forward, it is recommended that VR-focused architectural research move beyond purely application-oriented studies and develop interdisciplinary approaches capable of deepening the theoretical framework. Comprehensive doctoral-level investigations, including modeling, the development of evaluation criteria, and pedagogical strategy proposals, would strengthen the knowledge base and provide a foundation for innovative applications. Moreover, expanding the use of VR in areas such as the construction sector, construction site safety, risk management, and smart building design could accelerate the integration of this technology into practical, real-world contexts.

In the context of Turkish master's and doctoral theses, VR integration in architecture is predominantly examined within educational and representational frameworks. While this approach exhibits certain parallels with international literature, it provides a comparatively limited discussion of epistemological and ethical dimensions. For instance, academic studies in North America and Western Europe more frequently explore VR's potential to transform authority relationships within the design process, the implications of user-centered design paradigms, and the ontological status of digital space. In Turkey, such theoretical expansions are still in a developmental phase. This observation is important for assessing the extent to which local academic production aligns with global trends and where it diverges.

VR's position within the discipline of architecture should be considered not merely as a technical tool but as a phenomenon that transforms knowledge production processes, professional ethical values, and institutional structures. Within this framework, it can be argued that VR generates an epistemological shift in architecture, redefining the experience of space along the axis of digitalization and altering the subject-object relationship in the design process. Foucault's theoretical framework on knowledge-power relations and the production of space offers a valuable reference point for understanding VR's effects on architectural representation. Additionally, the ethical dimensions of VR can be discussed in relation to the processing of user data, the privacy of digital space, and the democratization of design. At the institutional

level, VR is observed to redefine professional roles, transform collaborative models, and reshape professional standards in line with digitalization.

In conclusion, this study demonstrates that VR holds considerable potential within architecture, particularly in pedagogical, design, and representational contexts. To fully harness this potential, it is essential to strengthen interdisciplinary collaboration at the postgraduate level, maintain methodological diversity, and support practice-based projects in partnership with sector stakeholders. Such an approach would facilitate the integration of VR into architectural practice in a more qualified, sustainable, and enduring manner, enhancing spatial perception, user experience, and design processes.

DECLARATION OF CONFLICT OF INTEREST

The author declares that no potential conflict of interest or financial benefit has arisen in relation to this study

REFERENCES (KAYNAKLAR)

1. Ünaldı, C. (1999). *Virtual reality and its role in architectural design* (Master's thesis). Istanbul Technical University, Istanbul.
2. Karadayı, A. (2000). *A virtual reality model for the architectural archive of Eastern Black Sea* (Doctoral dissertation). Karadeniz Technical University, Trabzon.
3. Ünal, K. (2001). *Virtual reality-aided design* (Master's thesis). Yıldız Technical University, Istanbul.
4. Kınayoğlu, G. (2002). *Architectural representation and virtual reality* (Master's thesis). Middle East Technical University, Ankara.
5. Zafer, D. (2007). *The effect of virtual reality technologies on the architectural design process* (Master's thesis). Anadolu University, Eskişehir.
6. Töre, T. (2010). *Virtual reality and architectural conservation: An evaluation in the context of presentation and narrative* (Master's thesis). Mimar Sinan Fine Arts University, Istanbul.
7. Kayapa, N. (2011). *An investigation of visualization features in perceptual differences between real and virtual reality environments* (Doctoral dissertation). Yıldız Technical University, Istanbul.

8. Aydın, E. (2012). *Improving architectural space representation in three-dimensional virtual reality: Creating primary and secondary meaning* (Doctoral dissertation). Yıldız Technical University, Istanbul.
9. Karışma, A. (2017). *Examples of virtual reality use on the Internet* (Master's thesis). Gazi University, Ankara.
10. Yıldan, İ. (2018). *The effect of immersive virtual reality environments on spatial perception in architectural design education* (Master's thesis). Istanbul Technical University, Istanbul.
11. Dumlu, B. (2018). *Analysis of user experience with visual and auditory stimuli in virtual reality storytelling* (Master's thesis). Istanbul Technical University, Istanbul.
12. Sevim, H. (2019). *A method proposal for experiencing virtual reality in architect-client relations* (Doctoral dissertation). Konya Technical University, Konya.
13. Özel, B. (2019). *Measuring hazard recognition ability on construction sites with eye tracking and virtual reality technologies* (Master's thesis). Middle East Technical University, Ankara.
14. Turhan, Ü. (2020). *The effects of virtual reality environments on children's play and learning experiences* (Master's thesis). Istanbul Technical University, Istanbul.
15. Kılıç, E. (2021). *Designing and testing an e-shopping application in a virtual reality environment* (Master's thesis). Istanbul Technical University, Istanbul.
16. Özdoğan, M. (2021). *Integration of building knowledge education in architecture schools with virtual reality systems* (Master's thesis). Konya Technical University, Konya.
17. Özgün, S. (2021). *Reinterpreting space production with virtual reality tools* (Master's thesis). Gazi University, Ankara.
18. Şahin, A. (2021). *Examining the effects of using virtual reality systems in basic design courses on students' learning processes* (Doctoral dissertation). Karatay University, Konya.
19. Kılıç, Ş. (2024). *The effect of virtual reality experience on spatial perception: An examination through exhibition spaces* (Master's thesis). Maltepe University, Istanbul.
20. Karadallı, Ş. (2022). *The use of virtual reality in the field of historic environment conservation* (Master's thesis). Dokuz Eylül University, Izmir.
21. Şarkışla, M. (2022). *Comparing virtual reality technology with traditional representation techniques in terms of spatial perception in architecture* (Master's thesis). Erciyes University, Kayseri.
22. Taştan, H. (2023). *Examining an immersive virtual reality system for teaching building products in architectural education: An instructional model approach* (Doctoral dissertation). Yıldız Technical University, Istanbul.
23. Usta, B. (2023). *The use of virtual reality in the architectural design process in the context of presence and agency* (Master's thesis). Yıldız Technical University, Istanbul.

24. Doma, O. (2023). *Dreamscape: The use of virtual reality in architectural design and education* (Doctoral dissertation). Istanbul Technical University, Istanbul.
25. Taşdelen, M. (2023). *Improving spatial presence and spatial performance of puzzle-solving games in virtual reality environments* (Master's thesis). Istanbul Technical University, Istanbul.
26. Bektaş, O. (2024). *Augmented and virtual reality technologies in the presentation of architectural heritage: Example and development process of the "Discovery Bursa" mobile application* (Master's thesis). Bursa Uludağ University, Bursa.
27. Öztürk, S. (2024). *A study on the use of virtual reality applications in interior architectural design studios* (Master's thesis). Istanbul Aydın University, Istanbul.
28. Mercan, I. (2024). *Virtual reality applications in urban design: Determining potentials and future trends* (Master's thesis). Istanbul Technical University, Istanbul.
29. Yasak, U. (2024). *Evaluating the effect of visual access on emergency wayfinding behavior in architecture through virtual reality* (Master's thesis). Yıldız Technical University, Istanbul.
30. Kabır, M. (2023). *Adaptive-sustainable reuse of a post-industrial area with a biophilic approach: The "Green Museum" evaluated with virtual reality technology* (Master's thesis). Istanbul Technical University, Istanbul.
31. Kömürcü, T. (2024). *The effect of virtual reality perception on color and material selection in interior architecture education* (Master's thesis). Dumlupınar University, Kütahya.
32. Atahan, D. (2024). *The use of virtual reality applications in the construction sector* (Master's thesis). Balıkesir University, Balıkesir.
33. Coşer, H. (2024). *An evaluation of the use of virtual reality and neuroscience approaches in the urban space design process* (Master's thesis). Istanbul Technical University, Istanbul.
34. Okuyucu, E. (2024). *A methodology for evaluating spatial performance in hospital buildings through inclusive virtual reality and behavioral sequence analysis* (Master's thesis). Istanbul Technical University, Istanbul.
35. Kurtuluş, M. (2024). *Examining virtual learning spaces on online VR platforms in terms of physical environment components and proposing design criteria for virtual learning spaces* (Doctoral dissertation). Mimar Sinan Fine Arts University, Istanbul.
36. Aksüt, T. (2022). Architects must quickly adapt to future changes with the Metaverse. Türkiye İMSAD, (49), 34–38.
37. Elmas, Z. A. (2022). *Holding real estate fairs and opening sales offices in the Metaverse will not be surprising*. Türkiye İMSAD, (49), 38.
38. Kurtuluş, M., & Tekin, Ç. (2023). *Metaverse chronology and the Metaverse in the national architectural environment.* ART/ICLE: Art and Design Journal, 3(2), 110–134. https://doi.org/10.56590/stdarticle.1332515