



# On the Interaction Between Shared Design Studios and Interior Architecture Students: A New Spatial Experience with Extended Reality for Supporting Place Attachment

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**Abstract:** Place attachment is one of the basic psychological needs in the human-space relationship. It is known that the characteristics of the shared design studios have a direct effect on the space adaptation of the user. Place attachment occurs simultaneously with the space adaptation process of the students, therefore these two concepts have a direct relationship with each other. Open and flexible activities in shared design studios reduces the adaptation and working efficiency of the students. It can be said that this situation will cause problems in the sense of belonging to that kind of learning environments. It is known that the user of the shared workspace tends to personalize the studios as a result of the need for belonging in the place adaptation status. The process of the study is trifold; first the concept of shared design studios was examined and researches on the concepts of personalization and belonging were conveyed through literature reviews in order to reveal the interior design students and shared design studio relationship. Then using literature data, a spatial belonging scale was presented to interior design students to determine their place attachment status and augmented reality was used to test the tendency to customize shared studio spaces accordingly. Lastly their affiliation in the hybrid environment and their tendency to personalize the space were analyzed.

**Keywords:** Shared design studios, Place attachment, Extended reality, Personalization, Interior architecture education

## Introduction

Shared design studios emerge when students from different disciplines share the same space at different times, which is especially common in design education. It is well known that these studios foster students' creativity by encouraging collaborative work, and that the multidisciplinary interaction environment they foster is extremely beneficial to students'

multiple thinking and problem-solving skills (Lueth, 2008; Aydınli, 2014; Samson, 2015).

However, few studies have been conducted on the sub-psychological effects of multiple use in these locations and the resulting lack of personalization on students. Even if students demonstrate spatial motivation in places where personal interventions are not possible, they will not be able to fully develop their spatial belonging, which will negatively affect their

interaction with the space in the long run, resulting in negative orientations on the work done and the user's mood (Demirbaş, et al. , 2000 & Scupelli, 2016).

A new spatial experience is sought to solve the spatial belonging problem by enabling the virtual personalization of the user on the space through hybrid spatial interventions supplemented with virtual layers, which can be built using new generation augmented reality technologies. The main purpose of this research is to create a hybrid space for students, which we consider as a solution to this place attachment and lack of personalization shortcomings, consisting of a combination of virtual and real and provide a new interactive spatial experience between shared design studio and interior architecture students.

The concepts directly related to the subject are examined in connection with each other; place attachment, design studios and augmented reality technologies will be mentioned with literature reviews. The relationship between interior architecture students and studio spaces has been analyzed and examined in the context of the sense of belonging that occurs in the process of human-space interaction. Consequently, different situations that may arise on the user and in design studios are emphasized and considered as problems to solve. Then, new generation technologies are discussed, including their usage patterns, differences, and usage areas. This explanation provides a clear definition of extended reality as a solution tool and evaluates its positive potential for solving the problems described in the previous sections. Do interior architecture students show a place attachment in shared studios? Will virtual changes have an impact on the interaction between shared design studios and interior architecture students? In order to seek answers to the research questions, first of all, a sense of belonging scale was applied to the students, after which a pilot study on digital personalization with 10 determined students and then semi- structured interviews were carried out to measure the effect of students on this experience and place attachment.

### **Place Attachment**

The place attachment is one of the basic psychological needs in the human-space relationship (Baumeister & Leary, 1995). It is known that the characteristics of the work spaces have a direct effect on the space adaptation of the user (Wells, 2000). During this interaction, the person attributes a number of meanings to the place where he spends time. Perceived space is formed in the mind of the individual. The place attachment occurs simultaneously in this process of perceiving space. Therefore these two concepts have a direct relationship with each other. It is known that the open and flexible working function in public or semi-public spaces reduces the adaptation and working efficiency of the user (Lepley, 2000). It can be said that this situation will cause problems in the sense of belonging to that place. It is known that the user of the shared design studios tends to personalize the space as a result of the need for belonging in the adaptation process with the space.

The concept of belonging is crucial in human-space interaction and the spatial adaption process. As a result, identifying the problem of attachment that occurs in interior architecture students and presenting a new spatial experience proposal to this problem through the changing of the space via extended reality (XR) technologies will serve as a source for future research in the field of due diligence and original solution proposal covered by the study. When spatial experiences are improved, especially in shared design studios in design education, these working spaces will become more accepted by students. With this solution, it is possible for students to spend more and more productive time in these areas.

Modern education includes design studios, which are widely utilized by students in interior architecture school. It is a significant phenomenon. The most fundamental aspect of design studios is not the finished product, but the design process itself. These shared studios stand out as collaborative settings in which an interdisciplinary 'thinking and behavior style' is imposed on the student. The design studio was established in architectural education in 1819 at

the Ecole des Beaux-Arts in Paris (Figure 1). Formal architecture education began in Europe and eventually moved to North America created the system's framework (Ashraf, 1995).



**Figure 1:** Ecoles des Beaux-Arts, design studio. URL-1

In 1919, Bauhaus School in Germany introduced a new approach to design education by presenting an alternative collective education. Bauhaus education model is intended to place architectural originality at the forefront, trying to free students from all forms of technical training and promoting creativity and individual expression style. The educational method is collaborative and hands-on, taking place in students' actual workplaces (Figure 2).



**Figure 2:** Bauhaus School, foundation course with Tomás Maldonado at HfG Ulm, 1955. URL-2

Current design education is conducted in the context of these two historical ecole. The shared design studios (Figure 3) still exist as interdisciplinary teaching environments that play an important role especially in design education process. Shared design studios cannot be customized. Therefore, it creates some negative situations for the students.



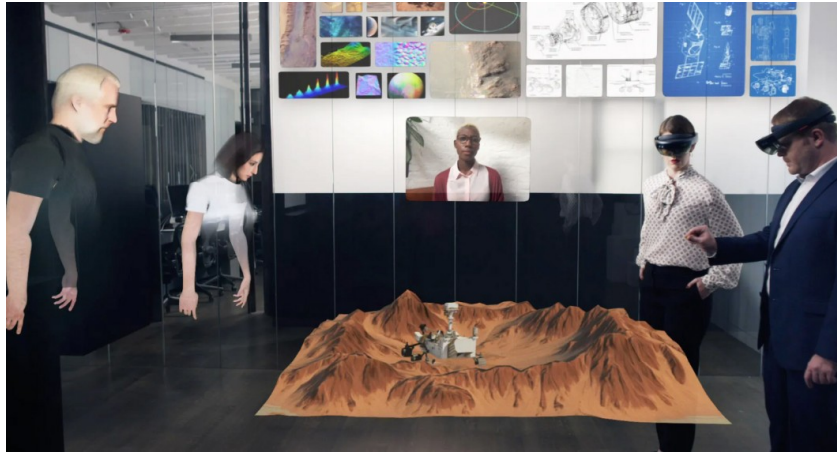
**Figure 3:** Middle East Technical University, Faculty of Architecture, design studio Photo: Nicolai Steino. URL-3

Design studios, which are multipurpose and actively used by design students from several disciplines and an anonymous character is presented which cannot be personalized for a group or an individual. According to studies (Demirbas & Demirkan, 2000, Busato, et al., 2000) design students create orientations based on their privacy demands when using these places. Students' attitude to these studios includes the inclination to create an individual place to work alone or alone and the tendency to utilize or increase the divider to ensure privacy between the desks (Scupelli, 2016). As a result of these two behaviors, design reveals that students need to increase their privacy levels by making individual involvement in these shared working areas.

Among design students and educators share same idea that the physical components of the shared working environments play a supportive role in learning. Subjective evaluations of geniality and preferable classroom spaces, physical variables of learning environments lighting level, seating comfort, degree of interior complexity, the size of the space, the absence of a view of the outside, seating arrangement and cascading more convenient

were found to be associated (Douglas, et al., 2001). These studies demonstrate that feasible individual involvement and adjustments in the interaction between design students and design studios are very essential and effective in the learning process.

With changing lifestyles, technology has a significant impact on the differentiation of individual demands. Many tasks that have lately undergone conceptual transformation have become more communication and interaction oriented. However, beyond physical demands, user needs that have been reshaped in a



*Figure 5: An example of the usage of extended reality (XR). URL-5*

### **Extended Reality Tools and Their Spatial usage**

Technology is both a producer and a product of social change; the evolution of communication technologies has brought new technological tools and boosted the convenience of living conditions. While previous products in this field were made up of interfaces and interactive tools that were completely independent of physical spaces, today's products include the human body and the physical environment in the interaction, can be articulated to existing physical conditions, and allow the virtual and real environments to exist in an integrated structure, increasing the interaction between the individual and the environment (Figure 4).



*Figure 4: An Example of extended reality (XR). URL-4*

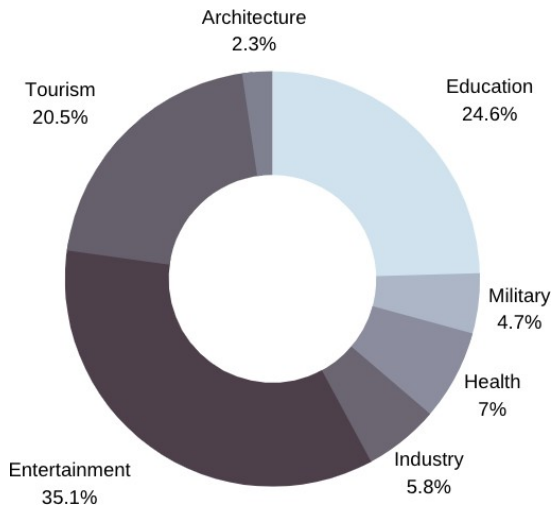
dimension independent of time and physical space have begun to develop through technology-oriented experiences (Figure 5).

Simultaneously, technology-based solutions were assessed in order to satisfy rapidly changing user needs, making it easier for the user to create a relationship with the space and becoming a key aspect in establishing the user-space relationship. Because of these effects, technologically enhanced apps were developed with the goal of creating new spatial experiences and began to be widely used by acting as a tool in the distinction of the perceptual dimension of space. An XR experience makes it possible to achieve this integrated state of perception. XR is the simultaneous use of 3 different virtual reality technologies. These Technologies are; VR: Computer simulation creates 360-degree perceptible virtual environment experiences. AR: The incorporation of virtual objects into physical space - the start of the user's true spatial experience. MR: Real-time interaction between the physical and virtual worlds.

With the widespread use of extended reality technology in education, new generation, experience-based learning processes have



emerged. It has been determined that knowledge gained through this XR technology is more long-lasting in design education (Freitas & Campos, 2008). Furthermore, it has been observed that students in courses supported by XR technologies pay more attention to the courses (Shelton & Hedley, 2002) (Figure 6).

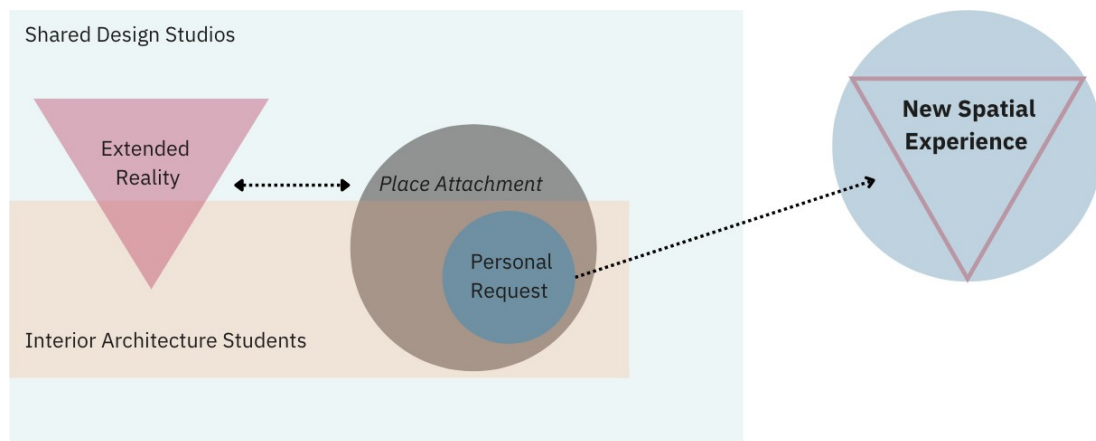


**Figure 6:** URL-6 Forecast distribution of the augmented and mixed reality market worldwide in 2022. (2016). Statista:  
<https://www.statista.com/statistics/610066/worldwide-forecast-augmented-and-mixed-reality-software-assumptions/>

With the incorporation of this intensive use of extended reality technologies in the field of education, as well as its potentially promising side in the field of architecture, it will have served as a new tool to support education in interior architecture education.

According to studies, XR technologies are on the rise, particularly in the post-2020 period, thanks to the effect of Covid 19, and this output will rise by 18% between 2021 and 2028. These expected outcomes reinforce the notion that XR technologies should be developed and varied to meet new demands outside of their usual applications. According to the literature and resource reviews, there is no academic study on customizing the learning environments of interior architecture students with XR. This technological potential was realized, particularly for the studio spaces shared in design and architecture education and for future architects and the research foundation was formed accordingly.

In the interaction diagram of the research (Figure 7); by developing a hybrid individual space with virtual additions in the physical space, we can create an efficient place experience in interior architecture education by emphasizing the concept.



**Figure 7:** The interaction diagram of the research.

	1ST STAGE			2ND STAGE		
<b>WORKING GROUP</b>	17 FEMALE 2nd Grade Interior Architecture Students	13 MALE 2nd Grade Interior Architecture Students		4 FEMALE 2nd Grade Interior Architecture Students	6 MALE 2nd Grade Interior Architecture Students	
<b>CONTEXT</b>	SPECIFIED SHARED DESIGN STUDIO			SPECIFIED SHARED DESIGN STUDIO		
<b>QUESTIONNAIRE</b>	5 1st PART Demographic	11 2nd PART Place Attachment	4 3rd PART Place Personalisation	PILOTING		Semi Structured Questionnaire

*Figure 8: The method diagram.*

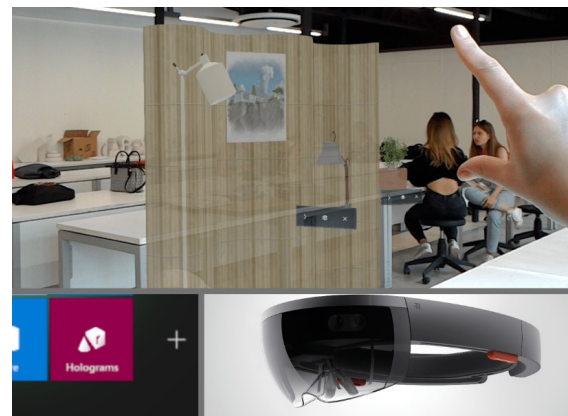
### Methodology

Methodology of the study consists of two stages (Figure 8). In the first stage we tried to understand the existing place intentions of the students to the shared design studios. In the first, a questionnaire and a pilot study were conducted and semi-structured interviews were conducted with the students over this study. The first stage of study was conducted using a questionnaire consisting of three different parts. The first part of the questionnaire consisted of multiple choice questions in which just one answer could be given for a single question. Initially, some demographic information was collected. Using Williams & Roggenbuck's (2021) place attachment scale, 11 questions were created for students to answer. With the following 4 questions, it was determined if the participants needed personalization elements in the space. Additionally, it was determined how they perceived the behavioural elements in the space. There were 30 participants, of whom 17 (56%) were female and 13 (44%) were male. All participants are students who took the same design studio course in the 2nd grade of interior architecture education. For this reason, all students regularly use the same design studio 2-3 times a week at the same or different times.

The second stage of the study involved conducting a pilot study and then semi-structured interviews with 10 students chosen based on their responses to the 1st questionnaire. In the semi structured interviews, 4 open-ended questions were asked, followed

by 10-minute interviews with each of them. All interviews were recorded to ensure the validity of the evaluation.

The pilot study investigated whether interior design students demonstrated change behavior during the co-design studio and how these changes affected them. During the pilot study, Microsoft HoloLens was used for creating the hybrid place. With the holograms application in HoloLens, students' existing design studios can be changed in size, location, existing; separator, plant, table lamp, floor lamp and art object were placed. Students were expected to make personal changes from this standard objects (Figure 9).



*Figure 9: The image of the mixed reality tool, application and the virtual objects which has been given during case study to interiors design students from the researcher.*

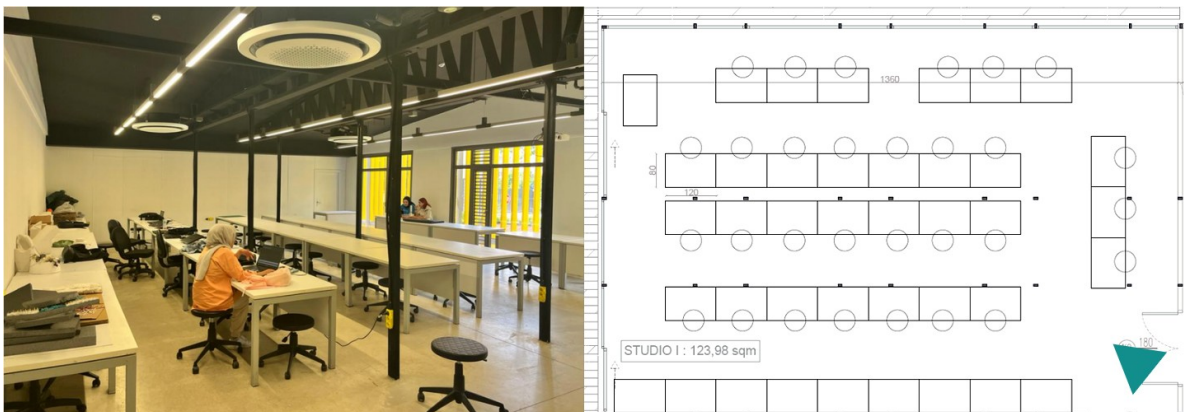
Based on the standard deviation values in the survey responses in the 1st stage, we selected the specifically 10 students for pilot study (Figure 10). The study was taken during a studio course in the existing studio, where interior architecture students take weekly design courses (Figure 11).

### Results

The results of the study consist of answers given by the students to the 1st questionnaire and semi structured interviews after the pilot study. In the first part of the study, it was aimed to determine the place attachment status of the students and their personal demands and place attachment attitude on the existing place. The students' place attachment attitude was positive in the majority, contrary to our expectation. In terms



*Figure 10: The images of the students and the place where the case study was conducted during the research.*



*Figure 11: The photograph & layout plan of the specified shared design studios where the case study was conducted during the research. The layout plan is not to scale.*

of the reliability of the research, the Cronbach alpha value was measured as 0,816. According to the data obtained from 4 following questions about the personalization of the space, 47% of the students stated that they want to see objects belonging to them in the space, 42% of them stated that they want to determine the equipment and colors in the studio as per preferences. Additionally, 31-36% of respondents agreed with the statement that their computers and desks were to be separated so that other users cannot see it (Table 1).

The answers were analyzed with the Likert scale as follows;

- 1: I Strongly Disagree
- 2: I Disagree
- 3: No Idea
- 4: I Agree
- 5: I Strongly Agree

The answers given to the questionnaire about personalization in the first part were discussed together with the answers obtained from the semi-structured interviews. According to the answers given to the first statement "I would

*Table 1; Descriptive statistics of the 1st stage (Attachment Scale) of the study.*

Question		Mean	Std. Deviation	Variance
1	Do you use this design studio regularly?	1,1333	0,34575	0,120
2	How often do you use this design studio?	1,9667	0,18257	0,033
3	This place is a part of me.	3,9000	0,84486	0,714
4	This is a very special workplace for me.	3,8333	1,08543	1,178
5	I can identify myself with this workplace.	3,5000	1,07479	1,155
6	I am very attached to this place.	3,3333	1,06134	1,126
7	This workplace means a lot to me.	3,6333	1,06620	1,137
8	This is the best place to work.	3,7333	1,20153	1,444
9	No other field of study can compare with this one.	2,8667	1,38298	1,913
10	This workplace makes me happy.	3,9000	0,84486	0,714
11	Working here is more important to me than working elsewhere.	3,2333	1,00630	1,013
12	I wouldn't prefer any other workplace instead of this one.	2,7000	1,02217	1,045
13	I enjoy working here more than anywhere else.	3,4667	1,07425	1,154
14	I would like my desk and computer to be separated so that other users cannot see it.	3,3333	1,26854	1,609
15	I would like to be able to change the color of the desk I work on according to my own preferences.	3,5333	1,16658	1,361
16	I would like to see my individual objects that I brought from my own working environment on the desk where I work.	3,8000	0,92476	0,855
17	The level of privacy here makes me feel good.	3,0000	1,25945	1,586



**Table 2:** Findings of question, I would like my computer and desk to be separated so that other people cannot see it.

		I would like my desk and computer to be separated so that other users cannot see it.					Total
		I Strongly Disagree	I Disagree	No Idea	I Agree	I Strongly Agree	
What is your gender?	Female	1	5	4	5	2	17
	Male	1	2	3	2	5	13
Total		2	7	7	7	7	30

like my computer and desk to be separated so that other people cannot see it." (q.14) no distinct orientation was noted. On the other hand, during the semi-structured interviews, they stated that they were positively impacted by the level of privacy and digital separation in the hybrid environment (Table 2). The responses to the second statement "I would like the ability to change the color of the desk on which I work " (q. 15) was "I agree". In semi-structured interviews conducted after a hybrid setting, participants indicated that they could have a positive impact by changing the colors of some spatial elements (Table 3). The majority of respondents agreed that they would prefer to have their own objects on the desk where they study. The students expressed that

they wanted to be able to carry their own personal belongings, including their personal goods. There was also a desire for more virtual objects with better visual perception level (Table 4). To the contrary of our expectations, the majority of responses to "The level of privacy here makes me feel good" (q.17) were "I agree". However, in the semi-structured interviews, they reported that the virtual separators in the hybrid environment positively affect their sense of personal space and privacy (Table 5).

I would like to be able to change the color of the desk I work on according to my own preferences.

**Table 3:** Findings of question, I would like the ability to change the color of the desk on which I work.

		I would like to be able to change the color of the desk I work on according to my own preferences.					Total
		I Strongly Disagree	I Disagree	No Idea	I Agree	I Strongly Agree	
What is your gender?	Female	1	4	2	8	2	17
	Male	1	1	1	7	3	13
Total		2	5	3	15	5	30

**Table 4:** Findings of question, I would like to see my individual objects that I brought from my own working environment on the desk where I work.

		I would like to see my individual objects that I brought from my own working environment on the desk where I work.					Total
		I Strongly Disagree	I Disagree	No Idea	I Agree	I Strongly Agree	
What is your gender?	Female	1	2	0	9	5	17
	Male	3	1	4	4	1	13
Total		4	3	4	13	6	30

**Table 5:** Findings of question, I like the level of privacy here.

		The level of privacy here makes me feel good.					Total
		I Strongly Disagree	I Disagree	No Idea	I Agree	I Strongly Agree	
What is your gender?	Female	4	2	3	8	0	17
	Male	1	4	2	4	2	13
Total		5	6	5	12	2	30

### Discussion and conclusion

This study focused on identifying personalization and belonging problems in the interaction between students' existing shared design studio and providing a digital solution for this problem. This study revealed that the students felt a sense of belonging to the existing design studios. According to the secondary study and semi-structured interviews conducted on these questions, different interior architecture students have different spatial expectations in design studios, as well as a place attachment. According to semi structured interviews, students had needs and feedback they weren't able to articulate clearly in the first stage, as evidenced by repeated questions after the hybrid space study. In this context, personalization of the space is an important requirement, which supports the study's solution proposal. Study enrichment was

enhanced by the unexpected contradiction of the results.

It has been observed that the users have developed a place attachment in general. Furthermore, they stated that they wanted to make personal changes to the existing objects in the shared design studios based on their privacy and personal space levels, and to adjust them based on their preferences. According to the interior architecture students, the customized hybrid space would boost their motivation and positively affect their reasons and frequency for choosing the place. However, the students reported difficulties with the technological equipment and application as well. The study demonstrates that students can spend more time being motivated if the problems associated with hybrid spaces are resolved. In this regard, the use of extended reality tools in shared design

studios may have positive effects on the education of interior architecture students.

Further research should consider other technical factors, such as the use of acoustics and lighting, which can increase satisfaction through personalization, in addition to behavioral factors. The study was limited to personalize shared design studios in line with technological and technical possibilities with a general virtual tool without interfering with physical data. In the future, it should be re-evaluated and eliminate the problems with existing technical infrastructure applications in order to obtain more positive results.

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