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# STUDENT EXPERIENCES OF BLENDED LEARNING IN INTERIOR ARCHITECTURE

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## ABSTRACT

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| Aim/Purpose | This study investigates, through structural equation modeling, the direct and indirect effects of blended learning on overall course satisfaction and student performance in interior architecture. |
| Background | For critical education contexts, it is important to analyze student satisfaction with blended learning as well as its effects on student performance. In the context of teaching design, there is a need for in-depth research to understand what factors determine satisfaction with blended learning and how these factors affect performance in design courses both directly and indirectly. |
| Methodology | To explore the student experiences of blended learning and its effects on the relationship between overall course satisfaction and student performance, data was collected through a survey instrument from a randomly selected 306 undergraduate students, 220 female and 86 male, each enrolled in four daytime blended learning sections of a design course. |
| Contribution | Different than other studies, this study contributes to the literature by investigating the direct and indirect effects of a blended learning environment on the relationship between overall course satisfaction and student performance in the interior architecture context, rather than solely focusing on satisfaction or performance. |
| Findings | The findings show that satisfaction with blended learning has a significant and direct influence on performance. Different than the studies in blended learning satisfaction literature, the study found blended interpretation and experience as significant contributors to impact blended learning satisfaction in design courses. |
| Recommendations for Practitioners | The findings in the study are intended to assist design instructors in improving student satisfaction of a blended design course in order to enjoy the possibilities of new information and communication technologies (ICTs) as well as to serve |

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| | as a basis for developing an effective course mechanism in a blended design curriculum. |
| Recommendations for Researchers | The study focused on the mediating effect of only one variable, which was performance, but researchers could investigate more variables, such as experience, learning strategies, and retention as having mediating effects on student satisfaction in different blended learning models in design courses. |
| Impact on Society | This study emphasizes that students' satisfaction with blended learning in challenging learning environments like interior architecture provides learners with choices to develop more student-centered instruction and increased performance and engagement. |
| Future Research | It is advisable to (i) explore the blended learning behavior of international design students compared with national students and (ii) investigate potential implications of computer-mediated feedbacks on student creativity. |
| Keywords | blended learning, design teaching, student performance, course satisfaction, personalized learning |

## INTRODUCTION

There is currently a growing trend among higher-education institutions towards blended learning. Research has revealed many advantages of blended learning, including pedagogic richness, flexibility, and cost-effectiveness (Graham, 2006). Ensuring that students are satisfied with blended learning is an important goal across the globe (Boelens, De Wever, & Voet, 2017; Garrison & Kanuka, 2004; Graham & Robinson, 2007; Lai, Lam, & Lim; 2016). Students are more engaged with a university when they can successfully move through the process of blended learning. Student learning has become more dynamic, interactive, and motivated worldwide as higher-education institutions create more effectively blended educational experiences. However, in the context of design education, students still have difficulty with motivation and self-direction in blended learning courses, and they are not satisfied with the process. The level of design students' acceptance toward blended learning courses is low, and integrating multiple online instructional modalities has a positive influence on student design learning (Y. Wu, Wen, & Sun, 2017). To promote higher quality learning outcomes, experiences, and achievements of goals, researchers in design curricula suggest that student satisfaction with blended learning should be considered when teaching diverse design disciplines, such as industrial design, interior design, architecture, or planning. Teaching design is based on the core process of *learning by doing* (Schon, 1985) and embraces numerous forms of representations (visual, verbal, tactile, and written), assessment types (design reviews, juries, and studio work), and teaching methods (desk/individual critiques, group tutorials, and lectures).

Different from other disciplines, design education is rich in teaching, learning, and communication potential, and thus using blended learning resources may produce changes in learning patterns and practices (Lopez-Porez, Porez-Lopez, & Rodroguez-Ariza, 2011). Although online learning methods are starting to be integrated into design education, a very little empirical research has focused exclusively on the relationship between the various aspects of blended learning satisfaction and student performance in the design disciplines. Hence, student satisfaction with blended learning and its effects on student performance should be analyzed in the contexts of critical education environments. More research is needed in order to understand what factors determine satisfaction with blended learning experiences in design teaching environments and how these factors affect student performance in design courses both directly and indirectly.

This study is important in terms of being first and foremost to explore if the use of digital environments along with face-to-face learning in interior architecture has a significant influence on studio

performance, and if the student acceptance toward blended studio courses has direct or indirect effects on overall course satisfaction. Different from other studies, this study contributes to the literature by investigating the direct and indirect effects of a blended learning environment on the relationship between overall course satisfaction and student performance in the interior architecture context, rather than solely focusing on satisfaction or performance. The findings in the study are intended to assist design instructors in improving student satisfaction of a blended design course in order to enjoy the possibilities of new information and communication technologies (ICTs) as well as to serve as a basis for developing an effective course mechanism in a blended design curriculum. The present study is the first that adopts a structural correlation analysis to develop design specific blended learning factors and analyzes direct and indirect effects of those factors on blended learning experiences of interior architecture students.

## LITERATURE REVIEW

### *BLENDED LEARNING*

Blended learning has many definitions, including *hybrid course* (Graham & Kaleta, 2002; Hensley & Tallichet 2005; Reasons, Valadares, & Slavkin, 2005), *mixed mode learning* (Bates & Poole, 2003; Harasim, 2000), and *distributed learning* (Dabbagh, 2004; Dempsey & Van Eck, 2007; Saltzberg & Polyson, 1995). The various definitions cover diverse topics. The most commonly accepted definition is that blended learning shifts away from traditional, face-to-face classroom courses towards a more student-centered learning model. This is achieved by using various active and interactive online applications such as readings, discussions, and uploads (Cicco, 2015). With the help of this combined learning process, students are part of the learning process, and their satisfaction is therefore a higher priority. To benefit from both teaching methods, a blended learning experience should maximize student learning, accommodate the needs and expectations of both students and instructors, and reflect students' satisfaction with the blend (Jones & Lau, 2010; Pituch & Lee, 2006). According to the National Research Council (NRC) (2012), an effective blended-instructional strategy should consist of four components: knowledge-centered, which puts the emphasis on understanding rather than remembering; learner-centered, in which individual learners' personal and cultural backgrounds and learning styles are valued; community-centered, which has collaborative learning activities and fosters a community of practice and inquiry involving legitimate peripheral participation; and assessment-centered, during which formative assessment is used to make student thinking transparent and evaluations performance-oriented.

According to Graham, Woodfield & Harrison (2013), blended learning has been used to make the learning more accessible to students. Blended learning offers opportunities to cater to individual needs of students and provide more personalized learning (Wanner & Palmer, 2015). Boelens, De Wever, and Voet (2017) have reviewed the four key challenges to the design of blended learning; incorporating flexibility, stimulating interaction, facilitating learning process and fostering an affective learning. All of these features of blended learning focus on the needs of learners and promote a more effective teaching pedagogy and enhanced satisfaction. Since instructors could not notice the encountered problems of students when transactional distance is high, the key challenge in blended learning is not to lose social interaction (Boelens et al., 2017). The other frequently cited challenges of blended learning include the difficulties of lack of skills of organizing differentiated instruction in large and personalized classrooms, which is time consuming and needs more manageable online activities (De Neve, Devos, & Tuytens, 2015). The recent study of Boelens et al., (2018) found professional support of instructors' belief about blended learning design as a crucial importance to address student diversity for positive blended learning experiences. Thus, it is significant that instructors should become more aware of blended learning and diverse experiences of students to reflect on their own practice (Nicolae, 2014).

The pedagogical approaches used to harness the above-explained features of blended learning vary from low level of projects, such as smoothening existing learning activities, to high-level of projects, such as meeting student learning needs (Kim, Kim, Lee, Spector, & DeMeester, 2013; Klug, Krause, Schober, Finsterwald, & Spiel, 2014). The common points of those projects are their focus on content delivery and organizing online learning activities for practical needs (Bliuc, Casey, Bachfischer, Goodyear, & Ellis, 2012). However, the outcomes of most of the blended learning deliveries still lack what kind of strategies should be put forward for differentiating between students, and how use of blended learning pedagogy should be varies regarding the differences of student experiences in various learning environments (Boelens et al., 2018), such as interior design education environments.

## *Student Satisfaction in Blended Learning Environments*

There are various definitions of student satisfaction that can be classified under two main categories: (1) the perception of the student's enjoyment and the pleasure taken by the student in the learning experience (Sweeney & Ingram, 2001) and, (2) the total of student feelings and behaviors as a result of the learning process and learning environment (Naaj, Nachouki, & Ankit, 2012; Thurmond, Wambach, Connors, & Frey, 2002; J-H. Wu, Tennyson, & Hsia, 2010). According to these two common definitions, student satisfaction is not directly linked to academic performance and course grades. Although there is an argument among educators that student satisfaction does not necessarily imply higher academic performance, there are also studies that advocate that course satisfaction is a direct measure of the quality of education (Brew, 2008). Elevated student satisfaction can lead to lower dropout rates, higher persistence, and a greater commitment to the program (Afzaal & Ahmad, 2011; DeBourgh, 2003; Koseke & Koseke, 1991; Reinhart & Schneider, 2001). According to Pike (1991), satisfaction then influences grades, which have an intermediary role on motivation (Howard & Maxwell, 1980). Student satisfaction of blended learning courses is likely to be based on multiple aspects of their learning process simultaneously, including instruction, instructor, and materials. Thus, it is accurate to relate student satisfaction to quality of education, student experience, and motivation (Naaj et al., 2012). A positive student experience implies that the student is happy with the overall education at an institute and, therefore, acts as a public relations asset for the university (Naaj et al., 2012). According to Booker and Rebman (2005), a student's level of satisfaction is positively related to the likelihood that the student will take one or more similar additional courses.

A review of the theoretical background shows that most studies on blended learning focus on student satisfaction, student performance, and/or students' information retention (Howard & Maxwell, 1980). Richardson and Swan (2003) examined social presence in online courses in relation to student perception of learning and student satisfaction. There are also studies, which compare student satisfaction of online learning with traditional learning (Maki, Maki, Patterson, & Whittaker, 2000; Melton, Graf, & Chopak-Foss, 2009; Pear & Novak 1996). J-H Wu et al. (2010) examined the determinants of student learning satisfaction in blended learning based on the social cognitive theory and found that the learning climate and performance expectations significantly affect a student's satisfaction with the learning process. According to Al-Qahtani and Higgins (2013), there is a statistically significant difference among traditional, blended, and e-learning formats in terms of student performance that favor the blended learning method. A recent study by Asarta and Schmidt (2013) explored student performance differences between traditional and blended formats in the following groups; (1) studies which found blended learning to be superior; (2) studies which found no significant difference and (3) studies which found the traditional format to be superior. However, none of these studies focus on course subjects in the design context. The course subjects commonly analyzed in these studies are in the fields of management, computing, chemistry, accounting, health, statistics, and biology. There is only one study discussing the causal interrelationships between student satisfaction and performance in five aspects of blended learning (Sockalingam, 2013), but it is in the context of business courses, such as accounting, finance, management, and statistics. According to Sockalingam (2013), while satisfaction with assessment has direct effects on performance, satisfaction with course content, course design, and online discussion has indirect effects.

Several studies examined also the relationship between perceived ease of use and student satisfaction in blended learning (Rahman, Hussein, & Aluwi, 2015; J. Wu & Liu, 2013). Rienties and Toetenel (2016) indicated the importance of learning design in predicting and understanding student satisfaction, retention and performance in blended and online environments. Learning design, which means making more informed decisions about designing learning activities and being pedagogically informed about the effective use of technologies (Conole, 2012), strongly influences student satisfaction in blended learning, whereas the primary predictor of student retention is the communication activities of blended learning. Although student satisfaction plays key role in happiness of blended learning (Arbaugh, 2014; Zerihun, Beishuizen, & Os, 2012), Toetenel and Rienties (2016) found that satisfaction and retention were not even mildly related to each other. Alshehri (2017) investigated student satisfaction and commitment toward a blended learning finance course and found a significant negative correlation between the level of satisfaction and GPA score, but a significant positive correlation between student commitment and GPA score. This study goes beyond the other satisfaction, retention, and performance studies by examining these causal relationships in interior architecture for the first time. Moreover, this study is unique in that it redefines aspects of the blended learning experience based on the educational context. The research problem and its importance are explained in the following section.

## RESEARCH QUESTIONS AND HYPOTHESES

As explained in the literature review, blended learning is an effective instructional method. To improve its impact on student performance, many researches have been continuing to work on its effectiveness. One of the most important key aspects of blended learning is student satisfaction. Hence, this study was undertaken to investigate three related questions in interior architecture context:

- What factors determine blended learning satisfaction in design teaching environments?
- How do these factors affect student performance in design courses directly and indirectly?
- Does students' satisfaction with blended learning have an indirect effect on overall course satisfaction as mediated by performance in interior design studio courses?

Based on the three research questions, a research model was hypothesized (Figure 1), and the following hypotheses were examined:

> Hypothesis 1 - There are different factors contributing to blended learning satisfaction in design courses compared to other subject areas.
>
> Hypothesis 2 - Blended learning satisfaction has an indirect, positive effect on overall course satisfaction as mediated by performance in design courses.

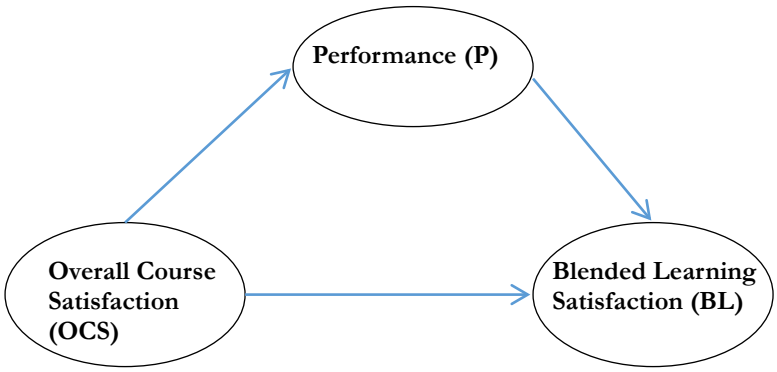


**Figure 1: The hypothesized model of the study**

## FACTORS AFFECTING STUDENT SATISFACTION WITH BLENDED LEARNING

Student's satisfaction with blended learning can be affected both directly and indirectly by factors such as interaction, instruction, and technology. According to Irons, Keel, and Bielema (2002), providing a choice of communication tools greatly increases learning satisfaction in the blended format. Having alternatives in learning styles not only influences whether and how to use technology (Bonk & Graham, 2012), but these new opportunities, not just the technology on its own, have significant effects on student performance (Olapiriyakul & Scher, 2006). Bollinger (2004) focused on instructor, technology, and interaction as the key factors affecting student satisfaction. J-H. Wu et al. (2010) illustrated the primary dimensions of blended learning satisfaction with three factors: a learner's cognitive beliefs (self-efficacy and performance expectations); technological environment (system functionality); and social environment (interaction). The results showed that interaction and performance expectations significantly affect a student's satisfaction with blended learning. Brew (2008) investigated the value of student feedback with blended learning satisfaction and gathered data on three critical aspects of blended learning: course design, development, and implementation. Naaj et al. (2012) analyzed this issue further by defining six main factors which can have both direct and indirect relationships with blended learning satisfaction: instructor, technology, class management, interaction, instruction, and learning management system. Recently, Kuo, Chen, and Hwang (2014) investigated the factors impacting student satisfaction by taking into account course differences. Kuo et al. (2014) identified four main factors: (1) interaction referring to learner, instructor, and content; (2) internet self-efficacy referring to individuals' beliefs, confidence, and expectations in their ability to accomplish a specific task; (3) self-regulated learning as the degree to which students are motivationally and behaviorally active participants in their own learning; and (4) course category (i.e., undergraduate vs. graduate) and program (i.e., areas of study). In this study, similar to the two previous (i.e., Naaj et al., 2012, and Kuo et al., 2014), four major factors affecting blended learning satisfaction are defined by taking into account the requirements of the design education context as explained in the next section. These four factors in this study also correspond to the four key challenges to the design of blended learning reviewed by Boelens et al. (2017). The four factors in the study are interaction, instruction, instructor, and technology. The below paragraph elaborates how these four factors are interpreted within the framework of this study.

This study is based on Moore's (1989) three types of interaction: *learner-learner*, *learner-instructor*, and *learner-content*. Recent studies expand on Moore's aspects by proposing other aspects of interaction including *learner-interface*, *learner-tool*, *learner-designer*, and *learner-task* (Gunawardena, Lowe, & Anderson, 1997; Hirumi, 2011). In this study, *learner-learner* interaction refers to many modes of communication which exist between learners, including guidance, feedback, critiques comments, and exchange of ideas and thoughts. *Learner-instructor* is similar to *learner-learner* interaction, where students and instructors come together through informal and formal meetings, critiques juries, and discussions throughout the semester to explore a given design problem. *Learner-content* interaction is an iterative one-way process, an internal conversation of the learner based on the conceptualization, articulation, implementation, and integration of design critiques and previous study. Regarding the instruction within the framework of this study, students are more satisfied with comprehensive instructions as they learn from them more easily. How well courses are planned and taught also affects student retention and future enrollment in successive blended courses, as students will be more likely to recommend the course to other students (DeBourgh, 2003). Instructor as the third factor is also significant in this study. In architectural design education, which consists of studio instruction and project design, students develop and gain knowledge of design thinking through conceptualization, articulation, implementation, and integration of design critiques that are assigned by the instructor (Fischer, Nakakoji, Ostwald, Stahl, & Sumner, 1998; Salama 1995; Schon, 1985). Positive interactions between students and instructors via critiques in design studios create the opportunity for learning the required information. Thus, the instructor has a key role in the context of design education in which

learning occurs through practice, observation, and experiences between students and instructors (Schunk, 1996). The success of blended learning, then, is not solely based on the simple integration of classroom teaching with technology. Since using technology in diverse blended learning resources may produce changes in learning patterns and practices (Lopez-Porez et al., 2011), this study also includes technology as one of the factors affecting blended learning satisfaction. As defined by Boelens et al. (2017), technology should be used to create an affective learning climate, which makes learner feel safe, accepted and valued.

## BLENDED LEARNING IN DESIGN EDUCATION

Combining online and face-to-face (f2f) instruction can be valuable in interior design education (Afacan, 2016; Gul, 2015). This platform is particularly important in design education contexts, where students are required to collaborate within a social community and weigh their knowledge, skills, and views against those of others. A responsive and social learning environment created with various degrees of instructional methods and mediated with diverse knowledge from different aspects can improve the quality of design teaching. *Knowledge* is defined as information combined with experience, context, interpretation, and reflection (Davenport, 1997). In the field of design, the aim of the education is not solely to acquire knowledge, but rather to gain knowledge through project-based projects that are conducted both in studio and non-studio courses. A studio environment is promoted as the ideal educational setting in many design disciplines, including industrial design, architecture, interior architecture, and urban design, as they are all based on group problem-solving, collaboration, and problem-based learning (Saghafi, Franz, & Crowther, 2014). In interior architectural design education, knowledge and information is shared in discussions while at the same time participants can develop alternative solutions to design problems. Allowing students the opportunity to create their own interaction will increase their study skills and promote higher-level thinking, reasoning, and social interaction skills. According to Afacan (2016), discussions in design studios are at the core of an architectural education since design is a matter of analyzing, synthesizing, evaluating, and presenting ideas for a creative solution. Design studio education is based on the core process of *learning by doing* (Schon, 1985). The design studio takes its form from the problem-solving learning approach and collaboration. It emphasizes teamwork and focuses on processes and interdisciplinary practices. A design studio provides an environment for discussion in which the students have the opportunity to receive feedback from the instructor (Gurel & Potthoff, 2006). This interaction between the learner and instructor enables the design studio education to be rich in teaching and learning with the potential for communication. Thus, the design studio has the potential to benefit from blended learning education since it allows both the instructors and the students to utilize the possibilities of new information and communication technologies (Afacan, 2016). The instruction in design studio could be supported by visual, verbal, tactile and written representations, design reviews, juries, and studio work assessments, and desk, individual critique, group tutorial and lecture instruction (Afacan, 2016).

As the daily trends have changed according to technological improvements, the new generation's habits have also changed (Pektas, 2012). According to Prensky (2003), there are two types of people in this digital world: a digital native, who was born into the digital world, and a digital immigrant, who learns to adapt to the digital environment. Since the population's characteristics have changed according to digital improvements and applications, traditional teaching methods are no longer sufficient for this design community (Pektas, 2012). Educational technology has started to change by being more flexible and adaptable. Online learning methods have started to integrate with design studios in architectural education since design studio based courses are considered an ideal educational setting for the project based disciplines of architecture, graphical design, and landscape design (Saghafi et al., 2014). Gul (2015) analyzed instructional methods used in computer-assisted courses in interior architecture and found that students, in computer-aided presentation and image-manipulation courses, preferred application-oriented instruction methods. According to Gul's study, the invention-based instructional method was chosen as the best method for problem solving and creative thinking skills. For learning design-thinking skills, the searches and analyses method was chosen as the most benefi-

cial instructional method. Finally, the collaborative-learning based instruction method proved to be the most beneficial for pre-design investigation skills. Regarding Boelens et al. (2017) study, instruction is closely related to instructional activities, such as organization, discipline, skill using technology, self-efficacy, to assist the students to regulate their learning.

# METHOD

## *SAMPLE GROUP AND THE SETTING*

Third and fourth year undergraduate students from an interior design course in the interior architecture department at a private university in Turkey were randomly selected as the sample group. Data was collected from 306 undergraduate students, 220 female and 86 male, each enrolled in four daytime blended learning sections of a design course. Bilkent University Ethics Committee provided ethical approval, and all research was performed in accordance with relevant guidelines/regulations and all participants provided informed consent.

Blended learning was incorporated into the course for four hours per week (two hours per class) over a period of 14 weeks. The same instructor taught all the sections in order to eliminate biases and influences. An introductory lecture about blended learning and course schedule were given to all participants at the beginning of the module, and their informed consent was obtained for the experimentation. Modular-Object-Oriented-Dynamic-Learning-Environment (MOODLE) is the online course management system at the chosen university that is used as a supporting online portal for blended learning courses. The blended course was composed of the following characteristics: 80-minute lectures given by the instructor during the weekly class meetings; student presentations, available online in the form of slides, videos, and animations; and an exam, which was given in the middle of the semester during a class meeting. There was not a final exam, but a final project was assigned for the last six weeks. Students conducted their projects with other students, guest tutors, and the instructor through online critiques, group discussions, and one video conference. Class critiques were held once a week, during which students received face-to-face feedback. The pedagogical strategies and instructional methods applied in this course were based on both dialogue-oriented and student-focused methods with e-learning modules, in which the instructor and the students could enjoy the possibilities of new Information and Communication Technologies (ICTs).

## *INSTRUMENT*

To observe the impact of blended learning satisfaction on student performance and overall course satisfaction (OCS), data was collected through a survey instrument at the end of the semester. The survey was conducted face to face with each student. The survey consisted of three parts (See Appendix). The first part collected participants' demographic data, such as age, gender, and Grade Point Average (GPA), as well as their previous blended learning experience(s), divided into four factors: the number of blended learning courses they took during their undergraduate education; the usage frequency of the supporting online course tool, MOODLE; their willingness to take other blended learning courses in the department curriculum; and their attitude towards the time-saving features of the MOODLE tool. The second part of the survey consisted of 25 questions in the 5-Point Likert-scale (from 5-'strongly agree' to 1-'strongly disagree'). In order to ensure that a comprehensive list of blended learning dimensions was included, survey questions were developed by reviewing the previous studies in the literature review section. Thus, each question of the survey was formed by considering student performance and overall course satisfaction, and the questions were listed randomly based on the four factors of blended learning satisfaction: interaction, instruction, instructor, and technology. These questions were adapted from the study of Naaj et al. (2012), and a pilot study was conducted to adapt Turkish culture to the scale. The final part included an open-ended question to obtain student thoughts, comments, and opinions about how to create a more efficient blended learning system for the future.

Content validity of the instrument was done with an expert panel including both instructors and students, who were selected based on the following four criteria: (1) knowledge and experience with the blended learning; (2) capacity and willingness; (3) sufficient time to participate; (4) effective communication skills (Adler & Ziglio, 1996). The alpha reliability coefficient of the pilot study was 0.922. To confirm the content validity, a pilot study of the survey was conducted with eight department instructors and 40 department students who previously had an experience with blended learning. To maintain the internal reliability of the questionnaire, after the completion of the data collection phase, a reliability analysis was conducted with the use of Cronbach's alpha. The alpha reliability coefficient is 0.841, indicating that the instrument was reliable.

## *Data Analysis*

The data analysis has three main phases:

Phase I - Factor Analysis - to test Hypothesis 1

Phase II - Structural Equation Modeling (SEM) - to test Hypothesis 2

Phase III - Structural Correlation Analysis - to test Hypothesis 2

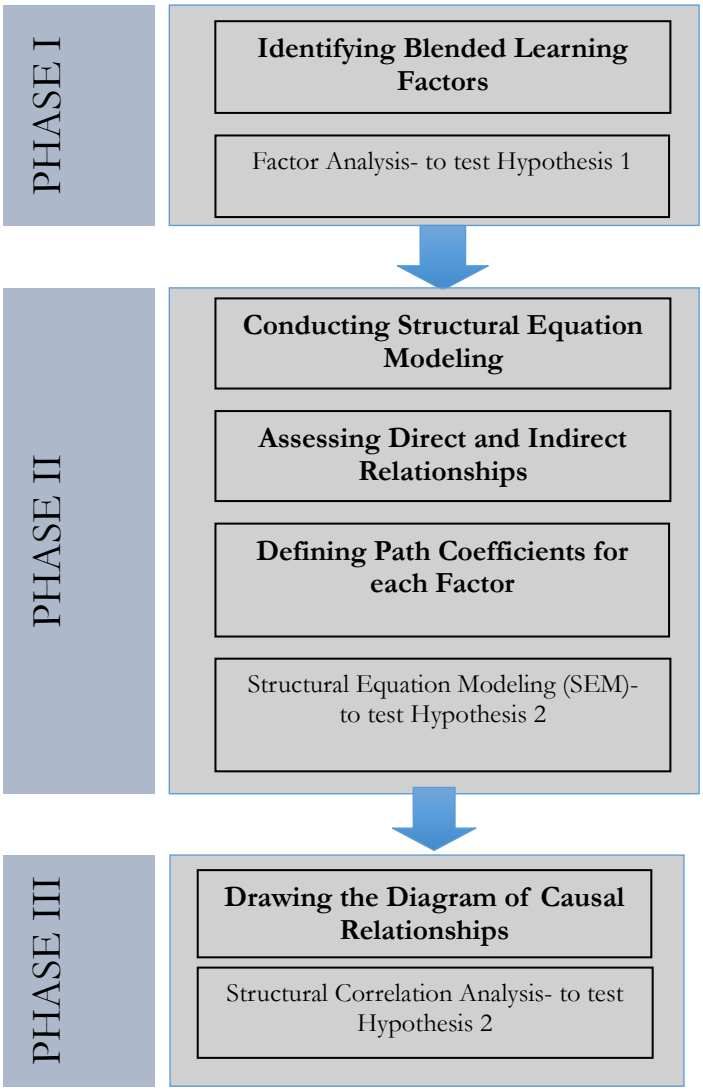


**Figure 2: The process model of the study including data analysis phases**

To find out the direct and indirect relations of the blended learning factors, correlation coefficients of the factors are calculated, and correlation analyses are made to construct an output diagram of causal relationship between these factors and performance (Figure 2). In Phase 1, the IBM SPSS Statistics 22.0 software package is used for the exploratory factor analysis. In Phase 2, the IBM AMOS 24.0 software package is used for SEM. SEM originates from the path analysis, which was invented by Sewall Wright in 1921. First, a path diagram is drawn to start a SEM analysis. According to Hox (1997), a path diagram is composed of boxes for observed or measured variables and circles for latent or unmeasured factors. Arrows explain the relationships between them. A single headed arrow, *a path*, is used to explain a causal relationship or a regression coefficient in the model. A double-headed arrow shows a covariance or correlation, without a causal interpretation (McArdle, 1996). Correlation analysis is a data analysis method developed by Jacob Cohen in 1968 (Henson, 1999). The analysis is based on the relationship between the multiple regression and correlation (MRS) and the analysis of variance (ANOVA). The purpose of using this method in this study is to measure the accuracy of the data results from the SEM (Hox, 1997). The reason that the study uses SEM and correlation analysis is due to the effectiveness of the approaches in confirming relationships and revealing their casual nature and strength.

## RESULTS

According to the descriptive analysis, while the majority of students (202) state that they are *very familiar* and 48 students define their experience as *familiar* with blended learning, the remaining define themselves as *somewhat familiar* (34) and *not familiar* (22) with the term. Among the students, 190 students have taken more than three blended learning courses during their undergraduate education. Sixty-seven students define their blended learning experience based on two courses, whereas 22 students have taken only one and the rest of the students had not taken any blended learning courses. Finally, although most of the students (281 out of 306 students) have used the MOODLE tool when it is required by the course, all the students are willing to take more blended learning courses in the design departments and have positive attitudes towards the blended format's time-saving features.

### *FACTORS CONTRIBUTING TO BLENDED LEARNING SATISFACTION IN DESIGN COURSES: HYPOTHESIS 1*

A confirmatory factor analysis was conducted to develop the correlation matrix and to decide on the strength of the correlations between the questions. First, the mean values of the questions were checked for a floor and/or ceiling effect to carry out an effective factor analysis. A floor and/or ceiling effect could occur in a Likert-Scale since the response means for each item could be lower and/or higher than they should be if students are just using the extreme ends of the scale. In this study, none of the questions scored with a mean lower than 1.50 or greater than 4.50. Later, the questions scoring lower than 0.30 were eliminated since 1.00 is the indicator of a perfect correlation, and the scores below 0.30 represent a weak association (Argyrous, 2005). All questions in the survey scored above 0.30, so all the questions remained in the survey. A rotated component matrix was then constructed to determine factors from the set of the correlations. This matrix offers factors with their loadings that are essential to identify which statement is correlated to a particular factor. At the end of the analysis of the rotated component matrix, the factors having three items and less were removed in order to ensure a reliable correlation system. Finally, four blended learning factors were identified with 52.19 % variances (Table 1). Table 2 lists all the items of the factors along with their loadings and reliability values (Cronbach's Alpha).

**Table 1: Summary of the rotated factors for blended learning satisfaction**

| FACTOR | SCALE | EIGENVALUE | VARIANCE (%) | CUMULATIVE (%) |
|---|---|---|---|---|
| 1 | Student Blended Learning Interpretation | 7.39 | 29.58 | 29.58 |
| 2 | Student Motivation | 2.32 | 9.30 | 38.88 |
| 3 | Technology Management | 1.89 | 7.57 | 46.45 |
| 4 | Student Course Experience | 1.43 | 5.56 | 52.19 |

**Table 2: The items of the factors along with their loadings and reliability values**

| FACTORS | QUESTION NO. | LOADING | QUESTION ITEM |
|---|---|---|---|
| **Factor 1:** Student Blended Learning Interpretation | Q25 | 0.742 | Overall, I am very satisfied with the course. |
| | Q6 | 0.722 | I am satisfied with my participation in the class. |
| | Q5 | 0.692 | I am satisfied with the way I interact with other students. |
| | Q16 | 0.669 | The instructor makes me feel that I am a true member of the class. |
| | Q19 | 0.636 | Feedbacks on assignments were given in a timely manner. |
| | Q12 | 0.583 | I am satisfied enough with this course to recommend it to others. |
| | Q11 | 0.555 | I am satisfied with how I am able to apply what I have learned in this course. |
| | Q13 | 0.531 | Compared to face-to-face format, I am less satisfied with the blended learning experience. |
| **Factor 2:** Student Motivation | Q7 | 0.720 | The use of blended technology in this course encourages me to learn independently. |
| | Q1 | 0.696 | A blended learning session keeps me always alert and focused. |
| | Q3 | 0.632 | I am satisfied with the quality of interaction between students and instructors. |
| | Q20 | 0.584 | Interaction is adequately maintained with the instructor when the instructor is on the other side of the blended learning classroom. |

| FACTORS | QUESTION NO. | LOADING | QUESTION ITEM |
|---|---|---|---|
| **Factor3:** Technology Management | Q24 | 0.837 | Technical problems are not frequent and they do not adversely affect my understanding of the course. |
| | Q23 | 0.620 | Course content shown or displayed on the smart board is clear. |
| | Q22 | 0.575 | The technology used for blended learning is reliable. |
| **Factor 4:** Student Course Experience | Q9 | 0.792 | I am dissatisfied with my performance in this course. |
| | Q4 | 0.693 | I am dissatisfied with the process of collaboration activities during the course. |
| | Q8 | 0.549 | I am satisfied with the level of effort required by this course. |

The rotated items of Factor 1 are named 'Student Blended Learning Interpretation'. The items in Factor 1 highlight the importance of student attitudes towards blended learning satisfaction in different sub-categories. The first item, 'Overall I am very satisfied with the course', is ranked as the first item of the Factor 1. The other seven items are related to student perception, confidence, and expectations in a blended learning course. These eight items are found to influence blended learning satisfaction in a design course. Since the learning process in a design course mainly involves exploration of the subjects through discussions, critiques, and feedbacks, the items 'the way the students interact with others', 'timely feedback', and 'class participation' become significant in blended learning satisfaction. This factor is closely related with learner control over decisions. Learners may have control in terms of speed and option to choose instructional activities. Factor 2, 'Student Motivation', is composed of four variable items. These items refer to how learner motivation and course engagement allow students to learn independently, to be focused on, and to interact with other course participants. According to Kuh and Hu (2001), class engagement and course motivation cover a sense of belonging and value for the education. There are various factors that increase student motivation, such as communication, student-instructor interaction, group work, interactive learning, and student interests. Thus, especially in design courses, a high level of interaction helps to increase positive attitudes towards learning, satisfaction with learning, and student engagement and motivation, resulting in higher student achievement overall. This factor is closely related with personalized learning, which means adaptation of content based on individual differences among learners. Difficulty level should match each student motivation level.

The rotated items of Factor 3, 'Technology Management', include the avoidance of technical problems, clearance of the course content displayed on smart boards, and the reliability of the technology used in the blended course. As discussed in previous studies, technology in design education should be regarded as a key concern. Taking the requirements of learning design in an interior architecture education into account, such as detailed level of idea generation, analogical reasoning, development of a set of 2-D or 3-D solution alternatives, furniture, and color and material selection, integration of technology with adequate visual and multimedia tools plays a critical role in the effective comprehension of learning outcomes. This factor is based on the idea of providing improved technology skills to stimulate promising interaction and familiarize the students with the technology and its tools. Factor 4, 'Student Course Experience', refers to the students' satisfaction with their own performance during the course, of their interaction in the process of collaborative activities, and with the

level of personal effort required by the course. Capturing student experiences and linking those experiences to educational activities is significant for the success of a blended learning course. More attention should be paid to account for emotional engagement of learners. This factor is essential for the blended learning satisfaction in design disciplines, where blended design classes make the experience more difficult because of the challenges of the online portion. Since during design process student progress is based on their reflective action and learning by doing activities (Schon, 1985), emotional support is required. Design students prefer face-to-face critiques, as the instructors can then observe the progress of a student in more detail and give better feedback. Thus, design disciplines should investigate how students navigate and experience a blended course between these two modalities. With reference to these four factors, the first hypothesis, 'there are different factors contributing to blended learning satisfaction in design courses compared to other subject areas', was supported.

## *Direct and Indirect Effects of Blended Learning Satisfaction: Hypothesis 2*

The structural model and second hypothesis, 'blended learning satisfaction has an indirect, positive effect on overall course satisfaction mediated by performance in design courses,' is tested using SEM analysis. Six indices are used to measure whether the results of the model fit well: chi-square, goodness-of-fit index (GFI), adjusted goodness-of-fit index (AGFI), TLI (Tucker-Lewis index), comparative fit index (CFI), and root-mean-square error of approximation (RMSEA). The fit statistics of the model is shown in Table 3 with adequate fit indices: X2 = 61.034, GFI= 0.908, AGFI= 0.901, TLI= 0.902; CFI= 0.901 AND RMSEA= 0.049.

**Table 3: Fit measures for the model**

| | X2 | df | GFI | AGFI | TLI | CFI | RMSEA |
|---|---|---|---|---|---|---|---|
| Model | 61.034 | 31 | 0.908 | 0.901 | 0.902 | 0.901 | 0.049 |
| Acceptable Range | | | >0.90 | >0.90 | >0.90 | >0.90 | >0.50 |

As illustrated in the hypothesized model of the study (Figure 1), the variables are included from three groups: performance (P), overall course satisfaction, (OCS), and blended learning satisfaction (BL). Figure 3 illustrates the standardized path coefficients and the significance of the relationships of the variables in the model. Blended learning satisfaction is found to have a significant direct influence on performance ($\beta = 0.86$, $p = 0.001$, at the %95 confidence interval). However, the direct impact of blended learning satisfaction on overall course satisfaction is not found to be statistically significant ($\beta = 0.02$, $p = 0.966$, at the %95 confidence interval). The blended learning satisfaction has an indirect, positive effect on overall course satisfaction mediated by performance in design courses is supported. According to the structured equation model, performance does not have a significant direct influence on overall course satisfaction ($\beta = 0.03$, $p = 0.843$, at the %95 confidence interval). Table 4 illustrates the parameter estimates of the structured model.

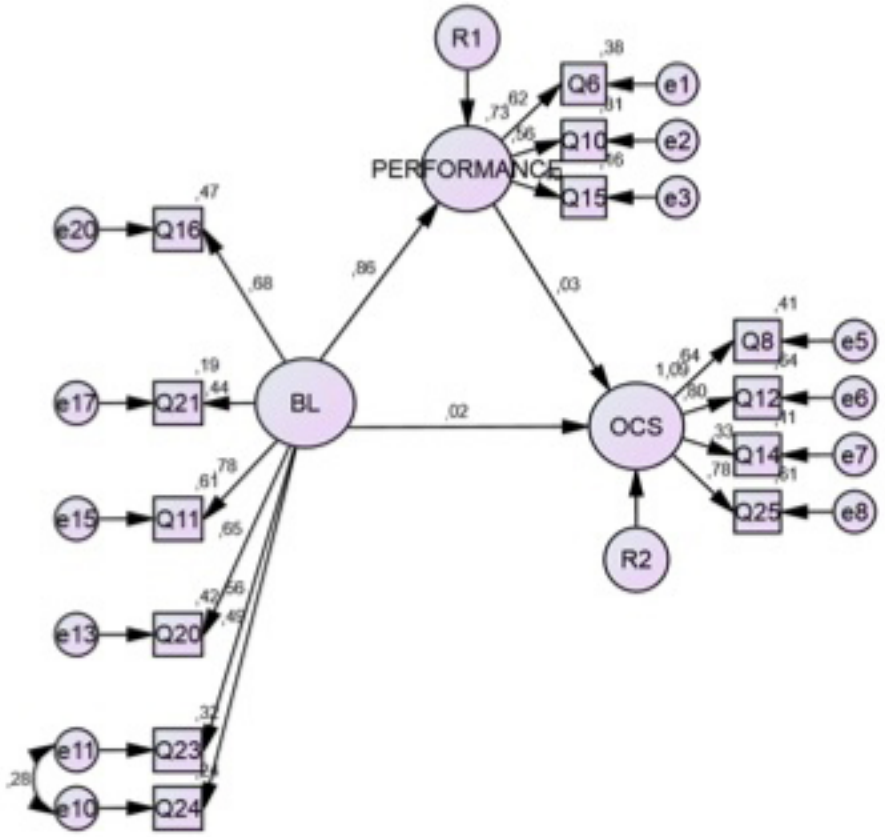


**Figure 3: The standardized path coefficients and significance of the relationships of the variables.**

**Table 4: Parameter estimates of the structured model**

| | | | ESTIMATE | S.E. | C.R. | P VALUE |
|---|---|---|---|---|---|---|
| Performance | <- - - | BL | 1.354 | 0.406 | 3.334 | 0.001* |
| OCS | <- - - | BL | -0.006 | 0.071 | -0.055 | 0.843 |
| OCS | <- - - | Performance | -0.004 | 0.083 | -0.0043 | 0.966 |

* at the %95 confidence interval

In the group of blended learning satisfaction variables, item Q11, 'I am satisfied with how I am able to apply what I have learned in this course', has the greatest impact on students' satisfaction with blended learning ($\beta = 0.78$, $p < 0.05$). However, item Q21, 'the instructor always takes attendance', has the lowest significant effect ($\beta = 0.44$, $p < 0.05$). In the group of performance variables, item Q6, 'I believe I will be satisfied with my final grade in the course', has the greatest positive significant influence on performance ($\beta = 0.62$, $p < 0.05$, but item Q15, 'I enjoy working on assignments by myself', has no significant impact. Regarding overall course satisfaction variables, item Q12, 'I am satisfied enough with this course to recommend it to others', and item Q25, 'I am willing to take another course using the blended learning delivery mode', have the greatest significant impact on overall course satisfaction (respectively, $\beta = 0.80$, $p < 0.05$; $\beta = 0.78$, $p < 0.05$).

## DISCUSSION

This study provides an initial step in gaining a better understanding of how satisfaction with blended learning differs in the course subjects of interior architecture as compared to other course subjects. Most studies on blended learning explore satisfaction or performance independently, but a structural explanation of causal relationships is required for design courses. Different from other studies, this study contributes to the scientific knowledge of design by revealing that learner control over decisions, personalized learning, technology skills, and differentiated instruction in terms of emotional support are the key different factors contributing to blended learning satisfaction in design courses compared to other subject areas.

To test the first and second hypotheses, blended learning factors for interior architecture were developed and the direct and indirect correlations among those factors were analyzed through SEM. Regarding the first hypothesis, the following two factors, Factor 2 ' student motivation' and Factor 3 'technology management', are in line with the other studies (Bollinger, 2004; J-H. Wu et al., 2010) reporting technology and interaction as some of the main factors affecting student satisfaction. However, different from the studies in blended learning satisfaction literature, the study found blended interpretation and experience as significant contributors to impact blended learning satisfaction in design courses. So, the first hypothesis was supported, and the reasons for that could be based on three critical aspects of design education context: interactions between learner, instructor, and content; self-efficacy as relating to students' expectations of the internet in order to accomplish a specific task; and self-regulated learning, in which students are motivated to be active participants in their own learning processes and design courses. Similar to the other studies (Kuo et al., 2014; Naaj et al., 2012), the developed factors of this study confirm the essential role of interaction. However, in this study, the greatest impact value is given to the way that students actively interact with other students, in the context of architectural design, where creativity is essential. Moreover, gaining diverse perspectives and insights through experiences and further reinterpretations of the learning outcomes from a blended design course is also as significant as how well a blended course is designed to develop the cognitive abilities of students. The opportunities to practice in verbal, spatial, interpersonal, and mathematical intelligences promote an efficient learning process. It is crucial in design disciplines that both instructors and students, when solving design problems, clearly communicate the value of learning experiences at the end of each critique. Moreover, in the study, self-efficacy is defined as the students' confidence in their ability to accomplish a task, which appears as one additional blended learning satisfaction factor attribute under Factor 2 'student motivation'.

Regarding the second hypothesis, SEM results of the study show similarities to other blended learning studies (Alshehri 2017; Stewart & Deon, 2009) that e-learning effectiveness and technology management, as the two main components of students' satisfaction with blended learning in design education, have a positive correlation with performance and indirectly affect a student's willingness to take other blended courses. The answer to the question of 'what a significant contribution do SEM results provide to instructors and students in design disciplines with respect to student satisfaction in blended learning' is that student satisfaction with the ability to apply what they have learnt in the course has the greatest impact on satisfaction with blended learning. This result demonstrates that self-regulated learning as an influential component in traditional learning has also a critical influence in the blended interior architecture environment. Similar to Bower, Dalgarno, Kennedy, Lee and Kenney's (2015) study, this study also found that the greater the ease with which students perform tasks, the greater their ability to learn independently, participate in critique activities, and keep alert and focused. Compared to traditional design learning, a blended design course is more student-centered due to online critiques, which require students to be self-regulatory. The more satisfied students are with blended learning, the more positive an effect on overall course satisfaction could be mediated by performance in design courses. The flexible structure of blended learning is beneficial for design students as they can improve their self-regulatory skills and abilities even the critique and feedback sessions start.

## CONCLUSION

The results of this study suggest that design courses should consider how significantly student satisfaction with blended learning directly influences student performance. Although the instructor is not physically present in the online portion of the blended design course, it is possible to increase satisfaction and, indirectly, performance with a more student-centered and interactive instruction. Such instruction creates the opportunity to prioritize students' expectations during a critique session rather than focus on the needs of the instructor. Moreover, as discussed in Factor 2 -'Student Motivation', as one of the developed blended learning satisfaction factors, a satisfactory blended learning experience can enhance student motivation by eliminating the barriers that hinder student participation in a studio environment, such as the fear of presenting his/her own ideas in pin-up sessions. Since *learning by doing* (Schon, 1985) is a key statement in interior architecture as in other design disciplines, students engage more with the critiques and design problems while navigating between different modes of blended instruction. Therefore, this study emphasizes that students' satisfaction with blended learning in challenging learning environments like interior architecture provides learners with choices to develop more student-centered instruction and increased performance and engagement.

The current study has its limitations. The most significant limitation of the study is the number of participants. To address this limitation, future studies should be conducted with a larger student population representing diverse design disciplines, such as industrial design, architectural design and urban design. The second limitation of the study is that the study was conducted in Turkey. Cross-cultural studies could provide different results. The third limitation of the study is that it focused on the mediating effect of only one variable, which was performance, but in further studies more variables, such as experience, learning strategies, and retention, could be investigated as having mediating effects on student satisfaction in different blended learning models in design courses. In addition, the interrelationships among these need to be examined to better understand design students' attitudes towards blended studio courses in order to maximize student academic performance and the reciprocal benefits of traditional and online learning.

There could be the following two recommendations for educational practice and future blended learning research. First of all, since students acceptance of a new technology is closely related to their attitude and behavioral intention to their willingness to accept the challenge, it is advisable to explore the blended learning behavior of international design students compared with national students. Cross-cultural studies could be conducted to find correlated attributes of blended learning and student behavior responses during different stages of the design process. Second, creativity as an integral dimension of design education could be investigated in terms of how it is influenced in blended learning environments. It is essential for design related fields to explore potential implications of computer-mediated feedbacks on creativity. Investigations on how design students interact with immediate feedback in online environments and how it influences student success and motivation and correlates with better learning outcomes could reinforce numerous findings for future blended learning studies.

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## APPENDIX- SURVEY

This survey aims to collect data about student experiences with the blended learning in a studio course. Blended learning is mixed mode learning, which means the integration of the MOODLE environment of Bilkent University with traditional face-to-face class activities in a planned and valuable manner.

**Part A:**
**Background information**

Name & Surname:
Age:
Gender:
Course:
GPA:

1. Your familiarity experience with a blended learning course (please indicate the course and the department)?
   a. Not familiar
   c. Somewhat familiar
   d. Familiar
   e. Very familiar
2. The number of blended learning courses taken during undergraduate education
   a. more than 3
   b. 3
   c. 2
   d. 1
   e. None
3. Your usage of MOODLE?
   a. using it everyday
   b. using it two or three times a week
   c. using it only when it is required by the course
4. Do you want more blended-learning courses in your department?
   a. Yes
   b. No
5. MOODLE usage of the course has saved my time?
   a. Yes
   b. No

**Part B:**
**Please indicate whether you agree or disagree with the following statements:**

| | | Strongly Disagree 1 | 2 | 3 | 4 | Strong-ly Agree 5 |
|---|---|---|---|---|---|---|
| Q1 | A blended learning session keeps me always alert and focused. | | | | | |
| Q2 | I cannot interrupt the lecturer to ask a question when he/she is on the other side of the blended-learning classroom. | | | | | |
| Q3 | I am satisfied with the quality of interaction between students and instructors. | | | | | |
| Q4 | I am dissatisfied with the process of collaboration activities during the course. | | | | | |
| Q5 | I am satisfied with the way I interact with other students. | | | | | |
| Q6 | I am satisfied with my participation in the class. | | | | | |
| Q7 | The use of blended learning technology in this course encourages me to learn independently. | | | | | |
| Q8 | I am satisfied with the level of effort required by this course. | | | | | |
| Q9 | I am dissatisfied with my performance in this course. | | | | | |
| Q10 | I believe I will be satisfied with my final grade in the course. | | | | | |
| Q11 | I am satisfied with how I am able to apply what I have learned in this course. | | | | | |
| Q12 | I am satisfied enough with this course to recommend it to others. | | | | | |
| Q13 | Compared to face-to-face course settings, I am less satisfied with the blended learning experience. | | | | | |
| Q14 | I am willing to take another course using the blended learning delivery mode. | | | | | |
| Q15 | I enjoy working on assignments by myself. | | | | | |
| Q16 | The instructor makes me feel that I am a true member of the class. | | | | | |

| | | Strongly Disagree | | | | Strongly Agree |
|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 | 5 |
| Q17 | I am dissatisfied with the accessibility and availability of the instructor. | | | | | |
| Q18 | The instructor uses blended learning technology appropriately. | | | | | |
| Q19 | Feedbacks on assignments were given in a timely manner. | | | | | |
| Q20 | Discipline is highly observed when the lecturer is on the other side of the blended learning classroom. | | | | | |
| Q21 | The lecturer/supervisor always takes attendance. | | | | | |
| Q22 | The technology used for blended teaching is reliable. | | | | | |
| Q23 | Course content shown or displayed on the smart board is clear. | | | | | |
| Q24 | Technical problems are not frequent and they do not adversely affect my understanding of the course. | | | | | |
| Q25 | Overall, I am very satisfied with the course. | | | | | |

| **Part C:**<br>**Please state your thoughts, comments, and opinions about how to create a more efficient blended learning system for the future.** |
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## BIOGRAPHY

**Yasemin Afacan** currently works as an associate professor and is the chair of the Department of Interior Architecture and Environmental Design in Bilkent University, Ankara, Turkey. She holds a PhD in interior architecture obtained from Bilkent University in 2008 and master of architecture obtained from Middle East Technical University in 2004. Before joining in Bilkent University, she has worked as a lecturer in Queens University Belfast, UK. She has published in Applied Ergonomics, Journal of Engineering Design, Knowledge-based Systems, and Design Studies and in various refereed journals internationally. She teaches design processes and sustainable design for interiors, and her research interest has been focused on inclusive design (processes, tools, and methodology), aging studies, and architectural design education.