Yıldız Journal of Art and Design
Web page info: https://yjad.yildiz.edu.tr
DOI: 10.47481/yjad.885703

Original Article

An evaluation of internet-based design studios in the context of learning styles

İnternet tabanlı tasarım stüdyolarının öğrenme stilleri bağlamında değerlendirilmesi

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ARTICLE INFO

Article history
Received: 23 February 2021
Accepted: 28 June 2021

Key words:
Virtual design studio, e-design studio, hybrid design studio, blended design studio, learning style inventory.

Anahtar kelimeler:
Sanal tasarım stüdyosu, E-tasarım stüdyosu, hibrit tasarım stüdyosu, harmanlanmış tasarım stüdyosu, öğrenme stili envanteri.

ABSTRACT

The integration of technology into design studios generates questions that have long occupied design pedagogy research. With the COVID-19 pandemic and the worldwide transition to distance education, the future of design studios is again a controversial agenda. In order to discuss the future of the design studio, first, the potential of Internet-based studios must be understood. Starting with this purpose, this study classifies the Internet-based design studios conceptually. Afterward, design studio samples and their evaluated outcomes based on scientific research are examined with the purpose of understanding which learning methods they supported. Thus, Internet-based studio models that can be matched with learning styles can be discussed over their potential to a future studio. As a result of this evaluation, it is discussed how these studio models, which are revealed to support different learning styles, can be integrated into education and what their contribution can be to the face-to-face design studio.

ÖZ

Teknolojinin tasarım stüdyolarına entegrasyonu, tasarım pedagojisi araştırması uzun süredir meşgul eden sorular üretir. COVID-19 salgını sonrası dünya çapında uzaktan eğitime geçişle birlikte, tasarım stüdyolarının geleceği yine tartışmalı bir gündem haline gelmiştir. Tasarım stüdyosunun geleceğini tartışmak için öncelikle internet tabanlı stüdyoların potansiyeli anlaşılmalıdır. Bu amaçla yola çıkan bu çalışma, internet tabanlı tasarım stüdyolarını kavramsal olarak sınıflandırmaktadır. Daha sonra hangi öğrenme yöntemlerini desteklediklerini anlamak amacıyla, çıktıları bilimsel araştırmalarla değerlendirilmiş tasarım stüdyosu örnekleri incelenmektedir. Böylelikle öğrenme stilleri ile internet tabanlı stüdyo modelleri eşleştirilebilmektedir. Bu sınıflandırma ve inceleme ile internet tabanlı modellerin gelecekteki tasarım stüdyosu için sunduğu potansiyeller ortaya konulmaktadır. Bu değerlendirmenin sonucunda, farklı öğrenme stillerini desteklediği ortaya çıkan bu stüdyo modellerinin eğitime nasıl entegre edilebileceği ve yüz yüze tasarım stüdyosuna katkılarının neler olabileceği tartışmaya açılmaktadır.

Cite this article as: Iavarone AH. An evaluation of internet-based design studios in the context of learning styles. Yıldız J Art Desg 2021;8:1:33–42.

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INTRODUCTION

Design studio involves the collective construction of knowledge through rigorous dialogue between designers/teachers and the students and teaching/learning through reflection-in-action (Schön, 1983). This definition expresses the indisputable place of design studios in education. On the other hand, the design process cannot be separated from digital tools in today's design practice. This raises the question of how design studios, which constitutes the natural environment of design education, will adapt to the rise of digital media. Gul (2011) claims that the education of design today is varied, therefore no system could support in-depth for all areas of design education. Based on this view, it can be suggested that talking about a single Internet-based education system is not possible due to the nature of design education, nevertheless based on the characteristics of these systems, differentiating education models can be established for different design abilities. Within the framework of this view, this article examines the relationship between different studio methods and learning styles, based on the presented Internet-based design studios. As a result of this examination, it is aimed to discuss the potential of design studios at different levels and methods to transform face-to-face design studios.

This research explores: (I) Types of Internet-based design studios. (II) The functioning of these studios and learning environments they provide through examples. (III) Which learning methods can be supported by these studios according to Kolb's learning styles. (IV) Discussions for the future of the design studio.

In order to conduct such research, it is necessary to consider different Internet-based design studios first. In order for the studies to be evaluated systematically, initial results of the research show that the majority of the concepts such as hybrid, online, blended, virtual, cyber, augmented reality, media supported, etc. are used interchangeably, away from their current semantic dimension, and this situation creates inadequate and contradictory literature to describe design studios. For this reason, this study reveals the set of "Internet-based design studio methodologies" by first matching these studios with the correct terminology with an over-reading of existing studies.

THEORETICAL BACKGROUND

Design Studio as a Learning Environment

Design studio is an essential learning environment and a pedagogical methodology in design education (Crowther 2013). Design studio as a learning medium provides a social learning environment where students can replicate design problems. This environment provides face-to-face interactions with expert practitioners, and studio tutors support them during the design process (Schön 1987; Kimbell 2011).

The educational model applied in design studios, according to Oxman (2006) generally employs a simulation of praxis as a didactic model, while according to Schön (1987), the visual reasoning in the design as a "dialogue with the materials of the problem" is still the dominant model for teaching in the design studio. Therefore, it can be suggested that face-to-face education of studios both supports dialogue with the design problem and didactic education at the same time. Furthermore, the fact that the design studios still employ knowledge-based and typologies as a conceptual and explorative medium (Oxman, 2006), is also discussed within the conflict of traditional design studios.

The ongoing discussions, however, do not address the indisputable position of design studios in design education, but the revision of design studios with current teaching methods. Our understanding of design studios is still developing, and with relatively recent studies, it is advancing based on pedagogical approaches (Houghton 2016). In the literature of design education, the complexity of design study is being investigated in many ways, and yet it is still possible to mention a growing literature on its potential progress and development in terms of pedagogical aspects.

Inevitable Transformation of Design Studio

Design studios have to transform by the requirements of the age, this creates a need for change and renewal. Along with design methods, design studios are constantly questioned and improved. The fact that design studios have undergone many changes in the process until they reach the current education understanding is proof of this situation. Studio culture is based on the process that begins with the master-apprentice relationship in design education (Uluoğlu, 1990). With the changing studio structure, developments such as the inclusion of jury evaluations in the process (Ecole des Beaux-Arts education), and the increasing prevalence of learning by doing (Bauhaus education) have transformed design studios over time. With the influence of these schools, design studios are based on an education model that aims to increase the level of awareness, understanding, and ability of students, in line with the principle of learning by doing more.

On the other hand, there are also criticisms directed at the current state of design studios. Although the methods applied in design studios vary and are mostly updated in line with contemporary educational models, there are opinions that design studios do not provide a sufficient environment for designers to equip them with certain qualifications. Among these criticisms are the lack of communication and teamwork in the design studios, the failure to communicate with users one-to-one, the technical issues, cost and budget not being taken into account, the students inclination to focus on the final product rather than the process, and the lack of one-to-one practice in the studio (Salama, 1995; Sahin, 2013). Basically, these

shortcomings are based on the idea that the traces of the traditional design studio, which was built on a didactic and hierarchical teaching environment, are out of date in today's conditions.

Moreover, the questions posed to the design studio today have switched the paradox with the rapid integration of technology. Design education is also required to be adapted to digital media tools and opportunities. Therefore, digital media usage and its abilities are inseparable from the design studio context. Many studies focused on the design education of computer-aided systems before. Now there is a growing literature on new media, digital representation tools, and design interfaces with design education relations. As the world changes, education systems and practice has been changing as well. The new generation of designers will be attached to the media and digital interfaces more than ever so the way of information sharing, spatial experiences, and even perception of the designers will be different. Design education should follow the current aspects and be prepared for future designers' needs and attitudes.

As Oxman (2006) mentioned, theories and methods of digital design can no longer be conceptualized only as a merge of computational tools with conventional formulations of design thinking. The concept of design studio in the age of digitalization and the issue of media interaction with design education cannot be considered independent from the tools and equipment used, therefore, the need of rethinking the nature of design in relation to digital design media is essential. As a result of the pandemic and sudden transitions to online education all around the world, once again the necessity of design education to adopt new education models has brought to the agenda, and adapting design education to this new technological-social-psychological framework opened to the discussion (Ozguven et al., 2020; Yorgancıoglu, 2020; Milovanovic et al., 2020). The researches during the pandemic period show the necessity of reconsidering the studio pedagogy on the technology axis, as Oxman (2006) has suggested much earlier.

In the ongoing literature, even before COVID-19 pandemic, it is a subject of discussion that communication and information technologies bring new challenges for design education, and they require contemporary methodologies of new pedagogical approaches (Gul, 2011). Along with the obligation of design studios to follow up-to-date educational models, the paradigm shift created by the technological revolution and the effect of the current pandemic environment has brought the future of design studios back to the agenda. In this context, examining the relationships the design studio has established with existing technologies and discovering which learning methods they support are part of a prominent research area. In this context, the conceptualization of design studios that have changed with Internet technologies is considered.

INTERNET-BASED DESIGN STUDIOS CLASSIFICATION

As a result of the expansion of the use of internet technologies in the field of design and the acceleration of technological integration in education, we can say that there are Internet-based design studio experiments that have expanded in the literature. Especially in the exciting atmosphere of the transition to Web 2.0, the fields of architecture and design have started to test the limits of what they can do. The variety of design tools used and the potential to go beyond Euclidean geometry is also reflected in the architectural design studio. In this context, Web 2.0 is a technological communication network that provides new strategies, tools, and techniques in many fields, as well as design studios (Pak & Verbeke, 2012).

Our understanding of these studios developed relatively recently due to various samples of technology integrated design studios. Nevertheless, it is seen that the current conceptualization does not establish a systematic linguistic unity in the sample studies. As underlined in the introduction, it is seen that many concepts such as hybrid, online, blended, virtual, cyber, augmented reality, media supported, etc. are used interchangeably, away from their current semantic dimension, and this situation creates inadequate and contradictory literature to describe design studios. For this reason, this study reveals a set of "Internet-based design studio methodologies" with the correct terminology, by doing an examination of existing studies.

Based on the idea that digital media transforms architectural practice and education, the article "Integrating Digital Media in Design Studio: Six Paradigms" (Gross & Do, 1999) stands out as the first study in which design studios are classified according to digitalization formats. In this study, 6 different models are proposed under the title of 'Digital design studios', whereas, given that the CAAD tools did not change the organization of the face-to-face design studio and that Internet and media technologies have progressed enormously since 1999, this classification appears to have lost its validity. Although it is a study that stands out as an attempt to classify different methods in terms of concept, since there is no similar classification study in the Post-Web 2.0 period, a serious concept confusion is seen in the literature. For this reason, it is believed that the recovery of this classification under the title of Internet-based design studios is important both in the present paper and throughout the literature of design studio research.

It is essential to provide competent studio examples to evaluate the benefits of Internet-based studio experiences. In order to conduct such research, Internet-based education model suggestions should be evaluated in their own classes. On the other hand, there is no such classification in the literature, and it has been observed that most concepts are used interchangeably. In order for the research to reveal a systematic set of concepts, firstly, Internet-based design

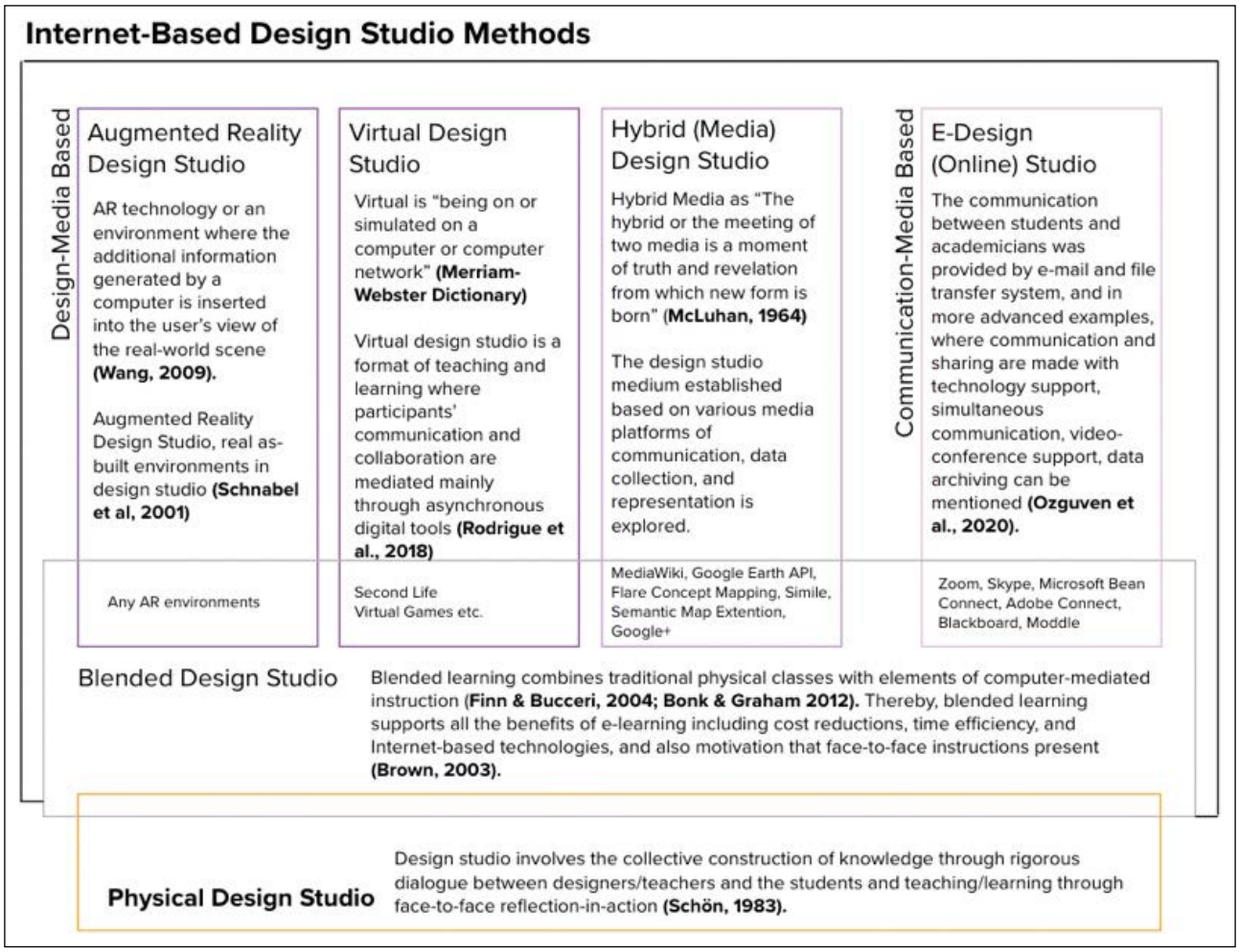

Figure 1. Internet-based design studios classification.

studios were classified, and their features were defined. These studios are divided into 5 groups as (I) Augmented Reality Design Studio, (II) Virtual Design Studio, (III) Hybrid (Media Based) Design Studio (IV), E-Design (Online) Studio, (V) Blended Design Studio. This methodological classification is explained in the graph below in relation to the terminology (Fig. 1).

Augmented Reality Design Studio

Augmented Reality (AR) is a technology that supports the information generated through a computer that is inserted into the user's view of the real-world scene. (Wang, 2009). Augmented Reality systems can combine the real space and virtual space through augmented body interaction display devices. This technology provides visual integration of the design into the built environment as if it is built. Due to this unique performance of 3D imagining, current AR systems help design offices as design assistants (Kansek et al. 2000; Freitas & Ruschel, 2013). Even though there are experimental usages in the education of design (Schnabel et al, 2001; Kieferle & Herzberger, 2002), due to economic costs of these technologies, and integration problems, there are no research of full semester experiences of an AR design studio. Due to this limitation, although the present paper included AR design studio on the Internet-based design studio classification, it has been excluded from the sample review stage.

Virtual Design Studio

The virtual design studio is a model of studio and learning environment that students' communication, production, representation, and collaboration are mainly mediated through virtual space by the usage of digital tools (Rodrigue et al., 2018), whereas "virtual" means "being on or simulated on a computer or computer network" (Merriam-Webster Dictionary, Url-1). Therefore, it refers to the studio where the design process takes place in a virtual environment, not the studio where the technology integration is made. Schnabel (2011) suggested that a virtual design studio can stimulate creativity, support expressions, explorations, and assist 3D imaginations skillfully. Design interfaces, virtual games, virtual media sharing, and production programs that offer a virtual environment are used for the virtual design studio in this context. It is one of the prom-

inent features of the virtual design studio that not only the design environment uses virtual space, but also the design communication occurs over virtual communication platforms. The implementation of these studios may generate interaction and collaboration by overcoming geographical or spatial barriers. (Gul et al. 2008; Livia, 2011; Schnabel, 2011; Rodrigue et al., 2018). Gul et al. (2008) pointed out the affordances of virtual environments as learning mediums that seek to provide a shared "place" that designers collaborate and communicate. As Gul (2011) suggests, virtual learning environments succeed to create innovative and effective education mediums, by supporting debate environments, simulation games, role-plays, group discussions, and project-based group work when they support collaborative design studios.

In her study, Gul (2011) presents an international design studio where design processes take place in a virtual environment and the processes and facilities of this studio. "Designing IN Collaborative Virtual Worlds" is a design course between the University of Newcastle (Australia) and Rangsit University (Thailand). During the course, the online game Second Life's virtual environment is used for the design environment. By using the wide range of synchronous and asynchronous design and communication tools of Second Life, it was aimed for students to develop the abilities of collaborative design by using 3D virtual worlds. The task of the design was "Virtual Home" which is given to provide opportunities for students to practice collaborative housing design in the virtual environments of Second Life. In this design studio, while the design process takes place in a completely virtual environment, it is aimed to have designers from two different geographies to communicate through the virtual environment and create a collaborative design environment. When the outputs of the study are evaluated, it is seen that the students' evaluations for decision making and design development processes are divided. While some students defined the process as "entertaining," "helpful" and "collaborative", some students believed that face-to-face intercourse was not a substitute. Nevertheless, the potential for the development of the virtual design studio is demonstrated from Gul's (2011) framework in two main conclusions. Firstly, 3D virtual worlds support the examination of the spatial arrangement of the design elements so that the students gain the skills and ability to think in 3D space. Secondly, virtual environments also have the potential for creating collaborative design studio environments.

E-Design (Online) Studio

The concept of "virtual design studio" was originally proposed by Mitchell and McCullough (1991) and the first example in the literature is the "Distance Collaboration" (1992) studio, which was realized with the participation of British Columbia and Harvard University students and academicians (Ozguven et al., 2020). These studios constitute the earliest distance education-based design studies, but conceptually these applications should be called "e-studios", not "virtual". Because in the context of the technology, communication between students and academicians was provided by e-mail and file transfer system, and an asynchronous education was applied. In more advanced examples, such as the "Virtual Village" project where communication and sharing information are made with technological support, there are also features such as simultaneous communication, video conference support, data archiving. (Broadfoot & Bennett, 2003). As mentioned above, again, these studios are distant design education models that communicate with network technology, not using the virtual environment as a design interface. Despite the conceptual confusion in the literature, design studios that switched to Internet-based education after the COVID-19 pandemic should be referred to as online e-design studios for the above reason. Studios where augmented reality, virtual space, or multi-media applications (hybrid) are not used, but where communication and studio sharing are done with online communication tools such as Zoom, Skype, Microsoft Bean Connect, Adobe Connect, are included in the online e-design studio class.

It would be appropriate to exemplify an e-design (online) studio through a studio model carried out under pandemic conditions. The spontaneous "repair process" and transformation in design studio conducted in the course of online education of the Faculty of Architecture and Design at Maltepe University in the spring semester of 2019-2020 were discussed in the article "A Repair Experience in an Architectural Design Studio" (Ozguven et al., 2020). Online E-design studio of functioning and examples about the impact on students constitute this study is similar to the model applied by the different architecture departments in Turkey. The process of the design studio, where communication take place through Blackboard application, aims to form a basis of future studio scenarios in the context of time/place/method, by expressing it as a "forced break" and "repair process". According to the outcomes of the evaluation, even if the advisor wishes, they cannot intervene in student projects as much as before. In this case, the student reflects what he understood and interpreted from the verbal statements of the executive to his design. The evolution of project interviews into flexible processes reshaped the relationship between the advisor and the student and created a consultant-architect candidate relationship that is more suitable for the nature of architecture. This situation somewhat "fixed" the vertical hierarchical studio setup. In the study, it was also highlighted that students who had to use modeling programs instead of traditional representations such as models and sketches, rapidly developed digital expression formats in a short time and could communicate with the executive through the representations with the use of new generation media (Pinterest, Instagram). It has been stated that these detected situations are practices that trigger cre-

ative production. On the other hand, the differences in the level of usage of 3D modeling programs have eliminated the random design decisions that can be obtained by modeling, and the decision-making process by the model has turned into solid models with an effort to express design. Therefore, it has been observed that an environment, which third dimension thought can be supported, cannot be created.

Hybrid (Media) Design Studio

As an accepted name in media literature McLuhan (1964) conceptualized Hybrid Media as "The hybrid or the meeting of two media is a moment of truth and revelation from which a new form is born". Relatively recently hybridization of the media creates a new medium in design and the combinations of different design software determinate hybrid media as a norm. While hybrid media changes the way we look at the image and design (Atiker, 2012), design education also adopts these tools of media combination. Thereby, various hybrid media usage establishes hybrid design studio structures. In the next example, the design studio medium established based on various media platforms of communication, data collection, and representation is explored.

Pak & Verbeke (2012), suggest "Design Studio 2.0" related to the possibilities of Web 2.0 technology and conceptualized the framework of the Internet-based atmosphere of the design studio. The main hypothesis of their work was through the design of a learning experience with web 2.0 technologies, it is possible to help the students to develop a deeper understanding of the materials at hand, motivate them to learn from other students' works, and improve the quality of their designs. The framework of a long-term research project, web-based geographic virtual environment model (GEO-VEM), is based on the usage of combined Semantic MediaWiki and Google Earth API for representing textual data, imagery, concepts maps, 3D models, and time-based information. By using these web-based materials during the design process, and creating the connected sharing interfaces, they evaluate the potential design studio settlements. In this design studio, which was carried out as part of the research project supported by the Brussels Innovation and Research Institute, the majority of the design process (data collection, concept development, criticism, sharing, representation production) was carried out through web interfaces supported by defined applications. Along with the term outputs, student views were evaluated, and the possibilities of the design studio were revealed. It is concluded that students are motivated for collaborative work and media interfaces support the design processes.

Blended Design Studio

Blended design studio as the final classification of Internet-based design studios is used for studios where one or more of the aforementioned classifications are used in combination with the traditional face-to-face design studio method. Blended learning combines traditional physical classes with elements of computer-mediated instruction (Finn & Bucceri, 2004; Bonk & Graham 2012). Thereby, blended learning supports all the benefits of e-learning including cost reductions, time efficiency, and Internet-based technologies, and also motivation that face-to-face instructions present (Brown, 2003). Also, a blended studio has opportunities to combine different design media as well as face-to-face studio benefits.

Steinø and Khalid (2017) explored the blended design studio in an experimental bachelor design studio of Aalborg University. In addition to the existing Moodle-supported (Modular-Object-Oriented-Dynamic-Learning-Environment) studio, they integrated Google+ as an interactive learning environment, while they continue their face-to-face studio hours. Through the experimental design studio, they investigated the question of what are the students' perceived problems, benefits, and expectations with regard to achieving a more interactive learning experience by blending Google+ in-studio project courses. To analyze the blended design studio experience in the study, as a methodology a student workshop using an adapted problem-tree analysis is constructed. It can be concluded that Moodle (as an online learning environment) does not support the learning environment without Google+. The reason for that is Google+ facilitates blended learning functionalities for design studios such as graphics, peer to peer, and instant communication very well. The implications of this study reveal that the applications that provide an online education environment are not sufficient alone, and that the studio should be enriched with different online sharing environments together with face-to-face training.

LEARNING STYLES THEORY

Learning can be defined as an internal process that differentiates for each individual (Demirbaş & Demirkan, 2003); hence divergent learning styles had to be conceptualized. Many theorists worked on learning styles such as Lewin (1948), who suggested that learning has a four-stage cycle; Dewey (1934), who suggested that learning is a dialectic process integrating experience with concepts, observations; Piaget (1970), who divide the learning process in four-stage cognitive process. Kolb (1984) developed the Learning Style Inventory model based on these foundational studies.

Kolb's (1984) Learning Style Inventory (LSI), a revised version of the original model from 1976, presents a methodology for the measurement of students' learning styles (Fig. 2). With 12 questions about the ways in which one learns best and 4 answers for each question determines the learning styles. Mainly learning methods are listed in line with two axes consisting of two opposite learning styles: Concrete Experience (CE) vs. Reflective Observation (RO) and Abstract Conceptualization (AC) vs. Active Experimentation (AE).

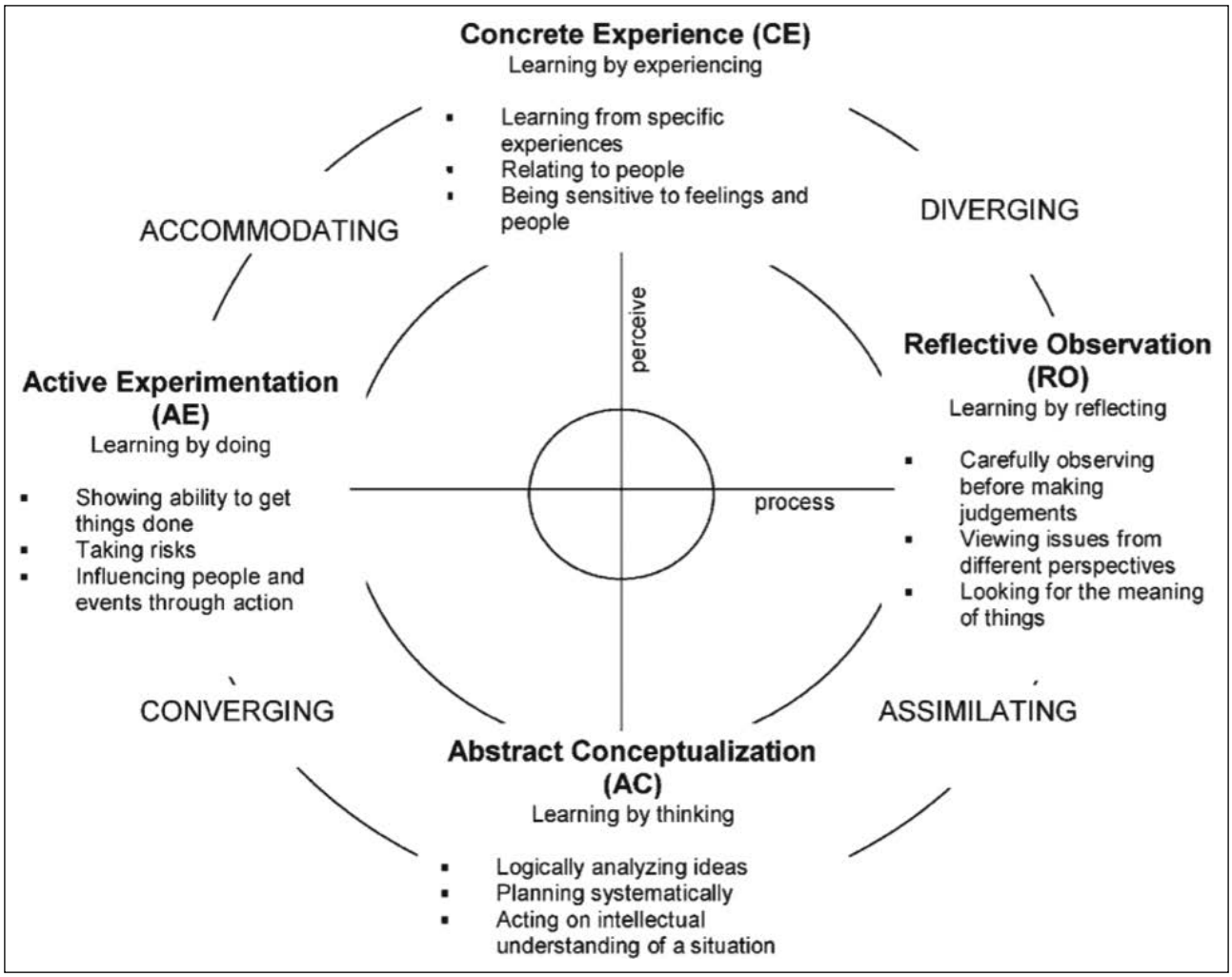

Figure 2. Four learning modes of Experiential Learning Theory (Kolb, 1984).

According to Kolb's Experimental Learning Theory (Fig. 2), major learning activities for individuals are:

CE learning style: Major learning activities include new experiences, games, role-playing, peer-group discussion, and individual work.

RO learning style: Major learning activities include the opportunity to examine the subject from different angles with the role of an observer, and test situations consisting of objective test items that measure the individual's knowledge of the subject are suggested.

AC learning style: Major learning activities are working alone, reading theories, and presenting ideas in a structured way.

AE learning style: Major learning activities are practical works, small group discussions, individual learning activities, and educational situations that include projects.

EVALUATION

The studies about learning styles mostly focus on the traditional design studio. Nevertheless, today's design studio is evolving, so that new research should be made to evaluate the paradigm shift in studio literature. In this section, first of all, the outputs specified in the case studies given to Internet-based design studios are separated. The outcomes of the reviewed studies, summarized above, were divided into components and matched according to student learning outcomes as follow:

Virtual Design Studio:

- 3D virtual worlds support the examination of the spatial arrangement of design elements so that the students gain the skills and ability to think in 3D space. (Learning by doing) + (Supporting skills such as touching, doing, etc.)
- Virtual environments also have the potential for creating collaborative design studio environments. (Working in groups)
- While education becomes more fun with games in a virtual environment, communication with avatars can also be increased. (Experiences, games, and learning by role play)

E-Design (Online) Studio:

- Even if the advisor wishes, they cannot intervene in student projects as much as before. In this case, the student

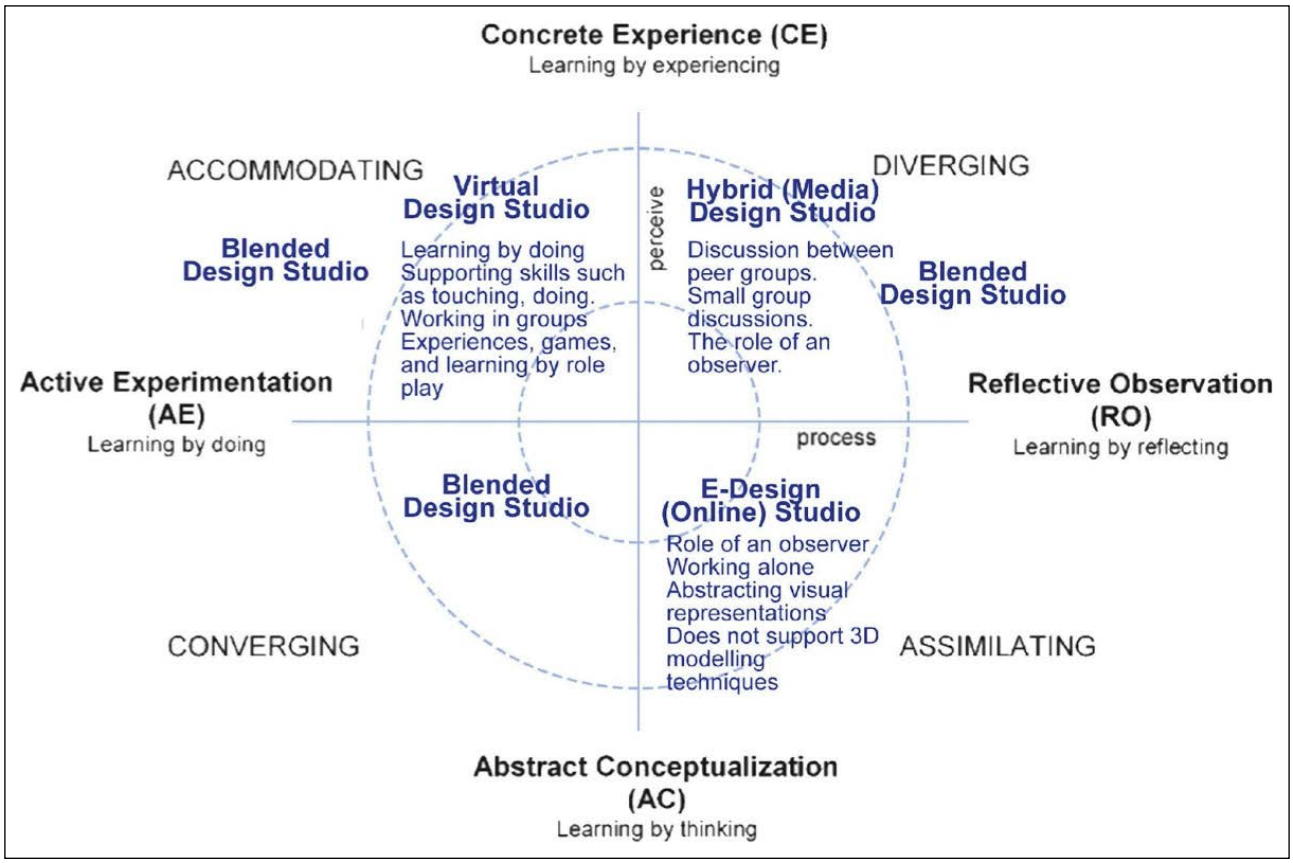

Figure 3. Evaluation of Internet-based design studios on four learning modes of Based on Kolb's Experiential Learning Theory.

reflects what he understood and interpreted from the verbal statements of the executive to his design. (role of an observer) + (working alone)

- Supports communication with the executive through the representations with the use of new generation media. (abstracting visual representations)
- The differences in the level of mastery of 3D modeling programs have eliminated the random design decisions that can be obtained by modeling, and the decision-making process by the model has turned into solid models with an effort to express design. (Does not support 3D learning by doing method.)

Hybrid (Media) Design Studio:

- Hybrid Media supports learning from other students, motivates collaborative work, improves the quality of the group designs. (discussion between peer groups) + (small group discussions)
- Provides various analysis findings, sketches, photos, maps, studio presentations and texts describing. (the role of an observer)
- Provides both individual working space and group works.

Blended Design Studio:

- Face to face education benefits (learning by doing) + (peer learning) + (learning by observing)
- Learning environment alone with media integration (learning-teaching activities that give the opportunity to examine the subject from different angles with the role of the observer)
- Online sharing opportunities (learning as an observer) + (Learning through experience)

Learning styles matching the learning outcomes specified in four separate studies in the text above are summarized in the graphic below (Fig. 3).

The graphic above shows the studio experiences and their matching learning styles. According to the data of the studio outputs (Fig. 3), it has been observed that the Blended Design Studio model, which supports learning by doing and thinking, may change depending on the media interfaces used, and can support "Converting", "Accommodating", and "Diverging" learning styles. E-Design (Online) Studio seems to support the "Assimilating" learning style, which learns by thinking and watching, due to its nature (not media-based learning interface). Virtual Design Studio, which allows games, concrete visuals, and group work, is in parallel with the "Accommodating" learning style that supports active life and learns by doing and feeling. With the large number of visual and auditory stimuli that it creates and helps students to work in small groups with different media uses, The Hybrid

(Media) Design Studio supports the "Diverging" learning style, as it supports the learning actions by reflective observation and watching.

The mentioned situation can be interpreted from several angles. First, considering that the traditional studio supports "Converting", "Accommodating", and "Diverging" models, it can be said that the models blended with media will appeal more to the learning style. In this direction, secondly, it is thought that Online Studio can be useful for "Assimilating" learning style, nevertheless, the models directly supported by Hybrid Media Studio and Virtual Design Studio are undeniable. For this reason, it is critical to equip the studio to provide a high proportion of all training models. Two models can be proposed in line with these findings: I. Different Internet-based studio models can be constructed in different stages of design education. II. The same level students, separated according to their learning styles, can study together in micro studios blended with different media. Thus, technology integration of design studios can be designed to increase the quality of education by supporting learning methods, beyond being experiments on students.

CONCLUSION

In summation, this paper seeks to explore the Internet-based design studios in two main axes: the terminological classification and supported learning styles. Due to the technology integration differences, it is important for the literature to make this classification with the correct terminology. At the same time, understanding which learning styles these methods support most is important for discussing the future of the design studio. After the classification study, based on the evaluations of the students, the samples selected for each design studio model were classified according to the learning methods supported by the studios and then matched with Kolb's learning styles. Ultimately, it appears that they have more potential to support different learning styles.

These evaluated studies should not be seen as single examples, but as studio experiments for design studios that can be established with different media and learning technologies integration. "What is the future of the design studio?" "How should the technology-supported design studio be structured pedagogically?" Such questions occupy the world of design education, especially with online education, which is on the agenda again due to the pandemic. This research may also argue in outgoing debates on distance-learning, as it seeks to conceptualize the existing method in previous works.

In spite of that, it can be stated that an Internet-based studio does not entirely replace face-to-face communication in the design studio Pak & Verbeke (2012); rather it creates opportunities to develop the learning process of the studio. The students can learn from comments on each other's projects, create their designs in virtual environments, share their data online, create a collective understanding of the design, and so on. This kind of finding is also directly related to Kolb's learning styles. Because of the fact that not everyone learns with the same methods, as Kolb mentions, different aspects of Internet-based studio methodologies may help us build infrastructures that support different learning styles in the design studio.

Acknowledgement: This paper is produced based on the topics covered within the scope of Epistemology of Architecture in Cognitive Context course conducted by Prof. Dr. Belkıs Uluoğlu in İstanbul Technical University.

Ethics: There are no ethical issues with the publication of this manuscript.

Peer-review: Externally peer-reviewed.

Conflict of Interest: The author declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Financial Disclosure: The author declared that this study has received no financial support.

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