



Guiding Architecture Students to Take an Active Role in Design Studios

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ABSTRACT

In an architectural design studio, there is a dynamic process of reciprocal and synchronized learning between the two major actors of student and tutor. In this study, the equilibrium between student and tutor is evaluated in terms of learning patterns introduced by Kolb. According to Kolb's model, students complete a learning cycle comprising the four phases of concrete experience, reflective observation, abstract conceptualization, and active experimentation. Correspondingly, tutors can be located on the axis created by the poles of reflective observation and active experimentation. During the process of learning in design studios, students are expected to be active participants, and tutors are expected to accompany students' improvement. This article also discusses tutors' methods of learning and teaching, in addition to their task of organizing students' course of learning. The structure of architectural design studio is established upon conceptual studying, and students are supported with self-actualization practices. Consequently, an active learning experience is discovered that enriches studio work, promotes and increases creativity, and provides convenience for the assessment process.

Keywords: active learning, student-tutor relationship, teaching and learning, creativity

INTRODUCTION

Countless research has been conducted on how to enhance creativity (Cross, 1997; Wong et al., 2010; Paiva et al., 2010; Hargrove, 2011) and how motivation is influential in design studios (Collins and Amabile, 2004). Moreover, how differences among students



on their learning and thinking styles affect design education has also been discussed (Cano-Garcia and Hughes, 2000). The organization of a studio curriculum depends on these parameters. This article bases its argument on the relationship between two essential constituents – tutor and student – throughout the design process, which includes both desk and jury critiques. The balance in this relationship requires not only consideration of individual traits on both sides, but also study methods. In a design studio, both sides learn and the tutor's method of self-learning and self-teaching is a major factor in determining the study method of a design studio.

In this study, the necessity of a tutor to act as an observer to facilitate students as active learners has been examined. Furthermore, it is argued that a student-dominant learning structure enhances both a free studio environment and productivity, and by this freedom, students take the responsibility of self improvement. By means of Kolb's Experiential Learning Theory (Kolb, 1985), it is evident that the concepts students develop to express themselves become their own assessment. Consequently, students develop their design work by staying connected to concepts they produce, as a means of boosting motivation, becoming zealous learners, and internalizing their designs.

THE ROLES OF THE STUDENT AND TUTOR IN A DESIGN STUDIO

The experience of an architectural design studio is a kind of border game between tutor and student that lasts the whole semester. In the relationship between student and tutor, it is known that both sides influence each other's learning (Ancess, 2009; Cheng et al., 2009). As the main component of design studio, a tutor's decisions and behaviours determine the method of study (Gross et al., 2013). Still, students as well as tutors have particular duties to transform the tutor-active studio into a student-active one.

The foremost target of design studio is to raise the cognition and creativity of the students. Tutors should facilitate a studio environment where students learn from each other by means of idea generation and product diversity. The tutor's role as observer and turning studio environment into a fertile field are influential in granting three prominent factors: self-actualization, motivation and active learning.

Self-Actualization

In a design studio group, students are differentiated from each other in terms of character, knowledge, interest, ability, and learning models. Self-actualization is possible, even within the same group, by differences in the final products, as outcomes of the individual skills of perception, comprehension, thinking and doing.



Self-actualization is defined by Goble as “the desire to become more and more what one is, to become everything that one is capable of becoming” (Goble, 1979) as stated in Abraham Maslow’s theory of basic needs (Maslow, 1943), which is fundamentally equivalent to the goals of education, learning environments, and creativity. These goals emphasize learning in relation to creativity, incubation, play, imagination, analogy, flexibility, optimal experience, joy, well-being, and adequate challenge. Along with these features, self-actualization should be the priority of studio work.

Motivation

The second crucial factor for efficiency is motivation. Together with self-actualization, self-awareness and intrinsic motivation are also fundamental to learning and creativity; there is a synergistic cycle between the two (Hennessey and Amabile, 1988). Skinner and Belmont draw attention to the importance of the student-tutor relationship, especially interpersonal involvement, upon optimizing student motivation (Skinner and Belmont, 1993).

Hennessey and Amabile suggest a structure consisting of three components within the individual that leads to creativity: intrinsic motivation, domain-relevant knowledge, and creative skills. Moreover, there is a fourth environmental component encompassing the external setting, extrinsic motivation and rewards, social interactions, and time pressure. Social and environmental factors affect creative performance. There exists a strong and positive link between a person’s motivational state and the creativity of that person’s performance. And in large part it is the social environment, or at least certain aspect of environment, that determines this orientation (Hennessey and Amabile, 1988).

The tutor is an extrinsic factor of the social and environmental setting by the way they organize the studio and curriculum. As an external factor for students, the tutor is the one who motivates students by creating facilities of social interactions, and determines time limits for feedbacks.

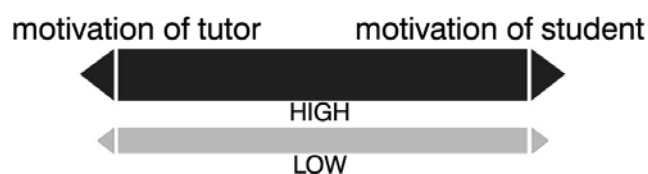


Figure 1: The motivation effect between students and tutors

There is evidence that tutor motivation is influenced by student motivation and behaviors. Tutors have more enthusiasm when their students are motivated. Similarly,



tutors are discouraged when their students exhibit low motivation. Therefore, tutor and student reciprocally influence each other in terms of motivation (Wong et al., 2010). (Figure 1)

Active learning

A third significant factor is a tutor's role in helping students become active learners. "Project centered learning" requires tutors to "facilitate, listen and draw out," which leads students to discover and experience on their own. This approach can be identified as "responsive assessment" instead of "prescriptive assessment" (Orr et al., 2014). Dineen and Collins make explicit the significance of creating a field for students to take control of their own designs:

The teaching styles most conducive to the fulfillment of creative potential are those which encourage student responsibility through ownership, trust and low levels of authoritarianism, providing opportunities for individual attention and opportunities for independent learning (Orr et al., 2014).

Svinicki points out to a similar argument:

Thinking of ourselves as passive learners does not fit with our personal experiences. We believe that we are in charge and actively directing the course of learning (Svinicki, 1999).

Orr et al have concluded from the analysis of the UK "National Student Survey" that students are aware of their responsibilities of their "own" work in a studio based design education. Contrary to lecture classes that consist mostly of theory, studio classes are "emergent and co-produced" (Orr et al., 2014).

Students are, therefore, aware of their own learning. Education is an "empowering process as students come to learn how to work honestly owning their success and failure." It makes students take responsibility of their own work, and the "project centered learning" promotes "ownership," which is the distinctive aspect of design education (Orr et al., 2014).

In order to create an active and student centered approach in a design studio, both tutors and students are responsible for doing so.. Kolb's theory, which is taken as an exemplary model in this study, distinguishes between the positions of reflective observation and active experimentation that should be pursued by tutors as well as students in a design studio. On the one hand, tutors should be conscious of the distinction between merely orienting students and forcing them to produce. Tutors

should also choose and execute their instructions to the students in a suitable way. On the other hand, students should be aware of their boundaries and protect themselves against manipulations. The active attitude of tutors might be an obstacle for students to gain the self-experience necessary to initiate a self-vision. (Figure 2)



Figure 2: Active-passive roles between student-tutor

Nigel Cross has criticised tutors' role as specialists. Traditionally, design tutors have been practicing designers who pass on their knowledge, skills and values through a process of apprenticeship. Design students 'act out' the role of designer in small projects, and are tutored in the process by more experienced designers. These tutors tend to be firstly designers, and only secondly and incidentally educators. This model may be defensible for specialist education, but generally in education all tutors are (or should be) firstly educators, and only secondly, if at all, specialists in a field (Cross, 2001).

The role of the experienced designer should not prevail over the position of the tutor who directs the design process with tactics and strategies. Oh et al argues that the relationship between a tutor and a student can be constructed in three ways as "master-apprentice," "user-designer" and "peer critiquing." In the master-apprentice model, the tutor is seen as the one who has the knowledge and experience to provide the student solutions as they develop their own solutions. In the user-designer model, the tutor does not act as an expert, but virtually becomes the user to comment on the design. Peer critiquing is where other students also participate with their comments in a discussion about a project (Oh et al., 2013). In all three methods, orienting students to produce individual solutions and ideas is possible. However, the user-designer and peer critiquing relationships are more suitable for producing the processes of self-actualization and active learning, because they reduce the number of decisions that a tutor must make.

LEARNING IN STUDIO ENVIRONMENT

In a student-tutor relationship, although learning is considered to be the students' responsibility, the tutor as an individual also possesses a particular way of learning along with teaching. In other words, a reciprocal and synchronized learning between student and tutor is possible in a design studio that is a realm allowing intense interaction. The tutor's enduring learning is as important as the students' education. For this reason, the

attitude of a tutor who aims to fruitfully direct the design process with an awareness of a learner's ways of learning, impacts the final product's success.

Behaviorism, cognitivism, constructivism and experiential are the learning styles that have been identified in theories of learning. In order to properly guide students, an awareness regarding their learning styles is essential (Kırcı, 2013). In the context of this study, the "Experiential Learning Theory" of Kolb can be used in defining and organizing a design studio, because it promotes student-centered learning aimed in the particular case study exemplified here. Kolb's model of learning consists of four areas divided by two lines, one of which is "Concrete Experience" (CE) on one pole and "Abstract Conceptualization" (AC) on the other. The second line perpendicularly intersects the first and contains the poles "Active Experimentation" (AE) to "Reflective Observation" (RO). The first line indicates a mode of grasping experience, while the second is linked to transforming experience. Learners can have one of four learning styles, which are: Converging, Diverging, Assimilating and Accommodating (Kolb, 1985). (Figure 3)

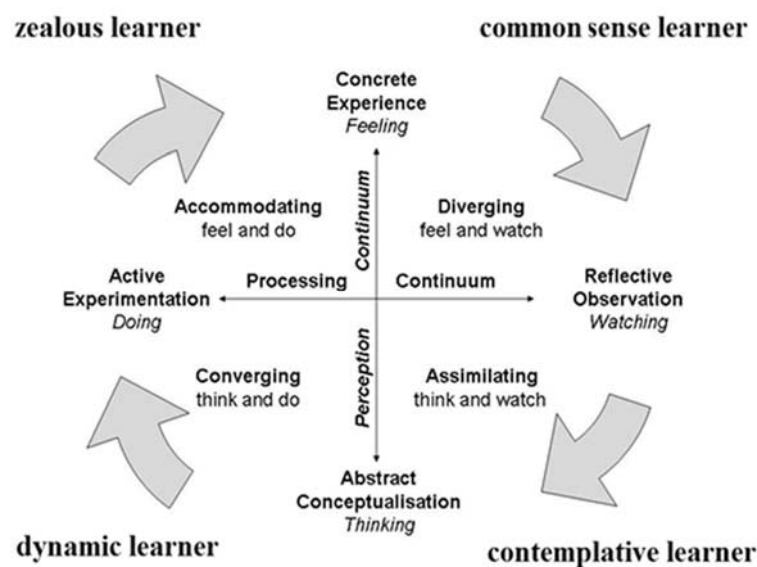


Figure 3: The ELT of Kolb

- Throughout the sequence of the four stages, it is possible that students may pass through all of them.
- The tutor's role moves along the line from "Active Experimentation" to "Reflective Observation"

A tutors' position along this line determines a student's learning and achievement through their performance and perception. In this way, design is meant to be a self-actualization process of the student, not of the tutor. The tutor should avoid reflecting his/her knowledge, skills and experiences. Instead, what is essential is a student's self-



exploration and self-actualization. When the tutor is in the Active Experimentation state, at the end of semester, it is a contradiction if they evaluate the products that they have dominantly interfered with. On the other hand, when the tutor is in the Reflective Observation state, students gain freedom from actualizing themselves and the tutor's evaluation will be objective. (Figure 4)

active experimentation (AE)  reflective observation (RO)

Figure 4: Tutors' teaching position in design studio process

Process: From "Feel-Watch" to "Feel-Do"

In the Gazi University Department of Architecture, during the 2014-2015 spring term, within the scope of M 202 "Architectural Design Studio IV," 2nd year architecture students developed proposals for a "Welcome Center" located in Çanakkale, TURKEY.

Because second year students are not yet quite experienced and accustomed to architectural thinking since they had only taken first-year courses where they had performed preliminary design tasks. Being the first experience for students to deal with a real architectural problem, it is believed that a main way of improving students' ability to bring about an architectural proposal is to work with concepts and try to develop them into a spatial design.

The given design problem was defined as a Welcome Center. The site of the project was a central location surrounded by Çanakkale's main cultural, touristic and recreational spaces. Moreover, the site was in the midst of the main traffic of the city, consisting of pedestrians, vehicles, and also ferry passengers. Since the context of the project were the city center, consideration of a relationship between the resulting architectural object and its surroundings was one of the main prerequisites.

Therefore, students were expected to take into account projects that were integrated within a broader area exceeding the limits of their projects' particular spaces. They all came up with proposals that created a composition of diverse spaces, responding to both the needs of city residents for their routine activities and offering new usage spaces for the users of the building developed along with their own design decisions for a welcome center. The steps to complete a semester of an architectural design studio are generally understood to be: originating ideas relying on self-experience, expressing these in words, turning them into architectural presentations with the help of representation tools, and evolving the whole idea into an architectural product are all s

To accomplish this process, the following stages were applied in the studio, having referenced the learning processes that Kolb's theory suggests (Figure 5):

- Feel-Watch process: evaluation of values of the city
- Think and Watch process: peer learning and team work
- abstract conceptualization process: analysis and concept for the site and the subject
- Think and Do process: development of projects through conceptualism and design
- Feel and do process: representation

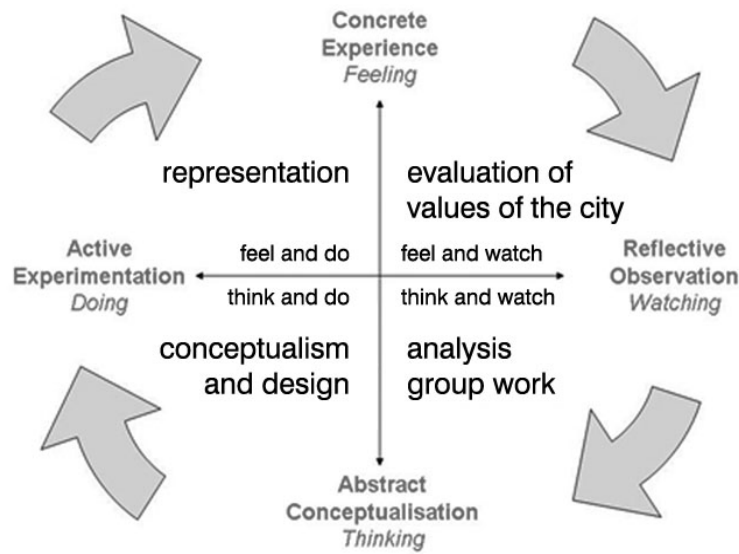


Figure 5: The Process of studio work derived from ELT of Kolb.

The Feel-Watch Process: The Evaluation of Values of the city

Çanakkale is one of the most important cities in Turkey for its characteristic as being a multi-component city. One of the components which makes Çanakkale a critical and special setting is the battles happened there during WWI, where more than 250,000 Turks were killed or wounded. About half of those who passed away were from Ottoman Empire (Gallipoli-1915, 2015). Since 2015 is the 100th anniversary of "Battles of Gallipoli," the local municipality has started to work on projects to display and put forth the importance of Çanakkale. In this regard, an actual "Welcome Center" (not an architecture-school project) is considered to be designed at one of the main public spaces of the city, the quay area. The anniversary of the end of these WWI battles is commemorated every year in April, and Çanakkale hosts Anzacs coming from Australia for such commemorative ceremonies. What is expected from students was a design for Çanakkale to put emphasis on thinking about war and peace.

The “Welcome Center” was also supposed to function as a landing area for ferries carrying people and vehicles and provide access to the historic peninsula and nearby touristic islands. (Figure 6)



Figure 6: The Dardanelles (Hellespont/Çanakkale Boğazı), city center and the quay

This quay is opposite to another one on the historic peninsula that is regarded also as a symbolic gate to the Dardanelles (*Çanakkale Boğazı*) at its narrowest point. On the other side, Kilitbahir (“lock of the sea”) Castle is located. At the tip of the peninsula, just at the corner of the entrance to the Dardanelles, there is another castle called Seddülbahir (“wall of the sea”). During WWI, these two castles took on a task of preserving Gallipoli, as their nicknames “locks” or “walls” suggest (Saliha, 2010).

The location and the function of the study area, the quay, made it a significant public area. As a result, this place became a crowded urban space which is being used very frequently by its inhabitants. The area needs to be a guide to Anzacs, who are visiting Çanakkale in April each year.

“Feel-watch” is a period of the design process that begins with site analysis and continues with studio work. At the initial studio period, a mini-survey examining the values of Çanakkale was prepared in order to assess Kolb’s feel-watch process. Students were oriented to think about the city’s attractive and remarkable features and to find out words defining it, through survey questions.

The city of Çanakkale is a home to many civilizations that can be traced by its different cultural strata, a site shaped after many wars and historical and mythological stories, a unique environment depending on its location and climatic factors, and finally a peaceful city which embraces people from many countries to celebrate and emphasize the significance of peace, friendship, and brotherhood.

The Think-Watch Process: Peer Learning and Teamwork

Until the semester’s first jury/review, students have studied in groups on the analysis of context. They thought about the benefits and drawbacks and have watched other groups



work on similar issues. The think-watch process provides an environment to share, discuss, and criticize. As a result, students have the opportunity to complete the parts lacking in each other's analyses. The analysis phase takes its form as peer learning. During and after collective discussions, individual discussions start to appear.

The Think-Do Process: Development of Projects and Abstract-Conceptualization

The conceptualization process is the backbone of the design process since it is seen as the expression and realization part of the process. Improvement depends on the creation of an intrinsic motivation and thus assimilation of design work. External motivation and challenge environments provided by a tutor accelerate the think-do process.

At the very beginning of the semester, students were asked to produce concepts and express them in words. Later, they were asked to transform these into two- and three-dimensional sketches. How each individual student handled the concepts and how each of them preferred different representation tools determined their own design processes.

At the end of the study, the conceptual frameworks constructed by students regarding their experience of the city and its daily life, and the city's touristic and historic aspects provided unique and differentiated products of design. (Figure 7)

<p>Connectedness A signal system similar to a “star map” created by connection of city spots that are found significant.</p>			
<p>Border Violation War is a border violation. Walls indicate borders.</p>			
<p>Routes Routes pursued by soldiers from all around world. Çanakkale becomes the intersection and meeting spot.</p>			
<p>Coalescence Coalescence via togetherness of ethnic and religious differentiations in Çanakkale.</p>			
<p>Multiplicity Multiplicity of different nations involved in battles of Çanakkale, and different groups currently living there is indicated by a multi-faceted shell.</p>			
<p>Çanakkale is Impassable The wall signifies impassibility. The blocks located around a sunken void at underground level symbolizes the losses of the wars, buried in the soil of Çanakkale.</p>			
<p>Destruction Abstraction of the two sides of the Dardanelles also points to the sides in a war. Destruction of war affects both sides; no one wins, only loses.</p>			
<p>Mixture Movement and intermingling of the built mass and the ground reveal the aim of mixture.</p>			

Figure 7: Initial works, sketches and models

The Feel-Do Process: Representation

This stage is the period at the end of the project when it is determined to what degree each student’s proposal meets the academic requirements, the process of harmonization with the spirit of Çanakkale, and the realities of the study area.



Different from the “think-do” period, the “feel-do” period demands keeping the links between feelings on the context and concepts produced from perceptions within the resulting project. Students will happen to actualize themselves if they complete this period with success.

Representation is a crucial part of both the “feel-do” and “think-do” processes, since it acts as an abstraction of the perceptions, ideas, and conceptualizations of the students. Representation “coincides with the essential nature of making,” which is “bringing into being of something that did not previously exist” (Vesely, 2004). “Bringing into being” is related to creativity. It originates from a creative mind. Representation thus becomes a field of creativity where students express and communicate their design ideas, goals and their solutions to the problems.

Students who have constituted their concepts on their own and have made strict bonds with them, have usually maintained the link of their concepts with the theme and context of the project. By means of this association, they have reached a finale after completing their design studio processes.

FINDINGS

Second year architecture students were given the design task of a Welcome Center in Çanakkale, a city possessing significant historical and cultural values. The studio process has benefitted from Kolb’s ELT (Experimental Learning Theory).

- In the first phase of Kolb’s theory, namely “feel-watch (diverging),” students are encouraged to feel the spirit of the context and take advantage of its potential.
- The subsequent phase was “think-watch (assimilating),” where peer learning through analysis and discussions took place.
- The abstract-conceptualization studies lead to the “think-do (converging)” phase. Students have created their own conceptual frameworks by giving references and by

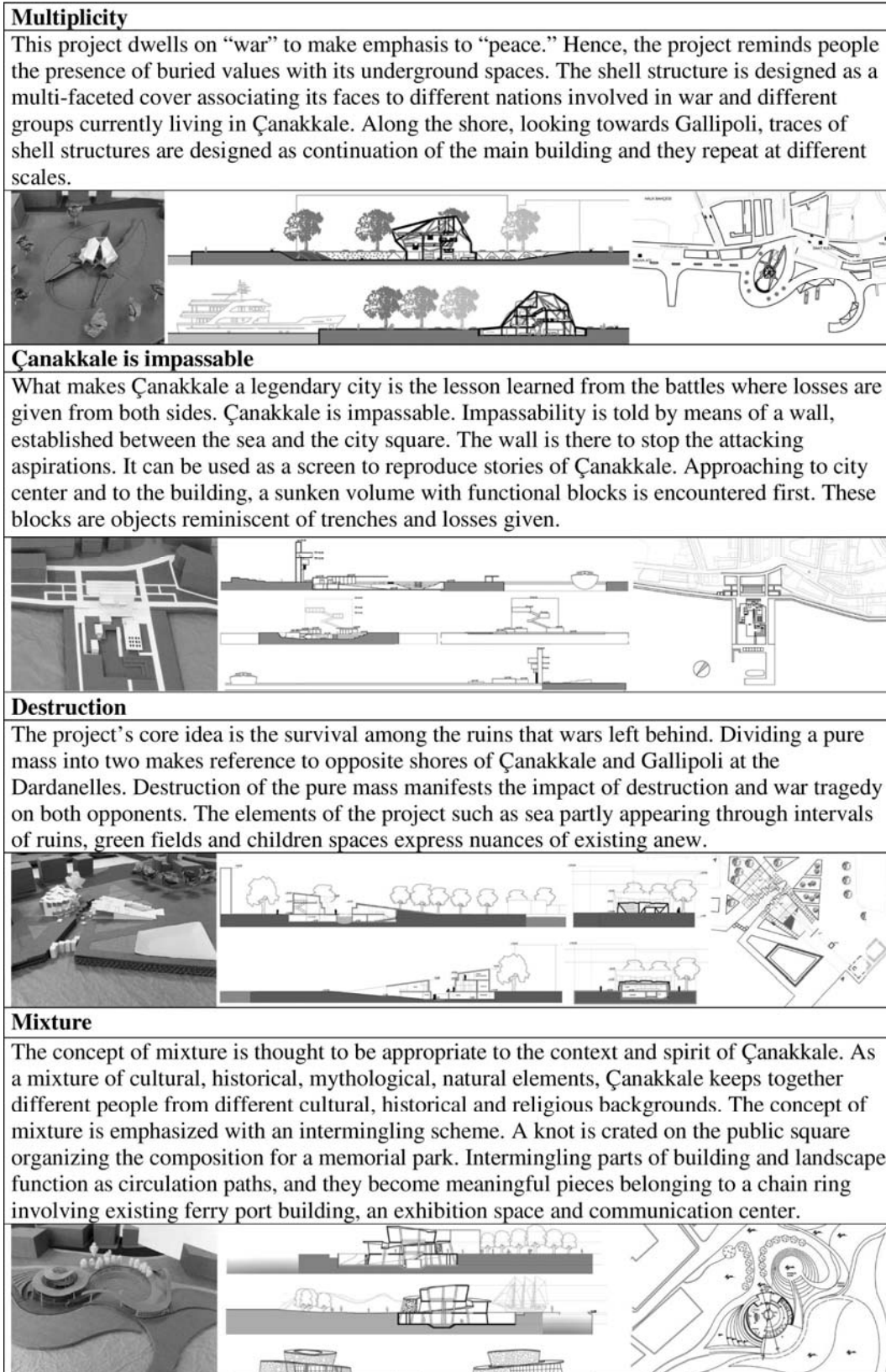


Figure 8: Final works, representations

- drawing attention to the values of Çanakkale such as culture, social and everyday life, tourism, war, etc.



- The “think-do (converging)” period is when the students realize that their concepts are limited by the limitations of architectural projects. They have approached the problem diversely and reached to conclusions of different forms, functions, and urban space. The degrees of integration to everyday life change according to the public space they have proposed or to the existing function (ferry terminal).
- While struggling with the difficult problems of the site, students proceed to the “feel-do (accommodating)” phase and re-consider their designs in order to preserve their links with the first stages of the study.

It is believed that the examination of different aspects of a single design problem that relies on conceptual considerations allows students to develop various and differentiated results. The study results have shown that the conceptual approach enables students to reach multiple options in order to continue to the next step in the design process. (Figure 8)

The role of the tutors became visible after the students brought their conceptual proposals relying on their own experiences and ideas to the context and the design problem. This particular studio process, which depends on conceptual considerations developed by students and participation of the tutor as a reflective observer, paves the way for a self-actualization for the students.

DISCUSSION

The architectural design studio is a game established between student and tutor. In this game, it is important that rules and roles should be shared correctly. Many studies using diverse methods have investigated ways of raising student creativity, with the idea that students express themselves using their own creativities and achieve self-actualization being the most supported. Equally important is that this case is mostly bound to the attitude of the tutors.

Students are the official learners of an architectural studio. In fact, studio work can be defined as a reciprocal educational practice between tutor and student. Therefore, the theoretical knowledge on learning is to be interpreted both for these two actors. This study makes use of Kolb’s Experiential Learning Theory in order to understand the learning and teaching tendencies of tutors as well as students. As described in Kolb’s theory, a tutor’s approach is positioned in between the opposition of “active experimentation” and “reflective observation.”

Those tutors adopting active experimentation undertake a dominant role in the educational activity of the studio. Contrary to this, tutors who locate themselves at the pole of “reflective observation” enable the predominance of students.

In architectural design education, a tutor-dominant approach has its disadvantages. One of them is the risk of an infertile studio environment that produces repetitive projects that only pursuing the interests of the tutor. Another issue is final assessment, where such tutors encounter their own ideas.

Contrary to this tendency, a student-centered education model with the support of tutors in an observing role leads to a self-actualization by students and simultaneously enhances the studio environment. This freedom given to students allows for a diversity of projects targeted for the end of the semester.

The nature of architectural education necessitates individual investigation, which brings about originality since every student has a unique approach to handling problems. Constructing conceptual schemes should be considered as the strengthening of the previously-mentioned model of learning that relies on student’s own learning, research and decision practices.

In a student-tutor relationship, the learning role primarily belongs to the student. Hence, the tutor’s position in Kolb’s learning cycle must occupy a small space. That is, students should complete their own learning cycle themselves. Tutors should stay in the observing zone and avoid getting involved in the students’ own learning processes. (Figure 9)

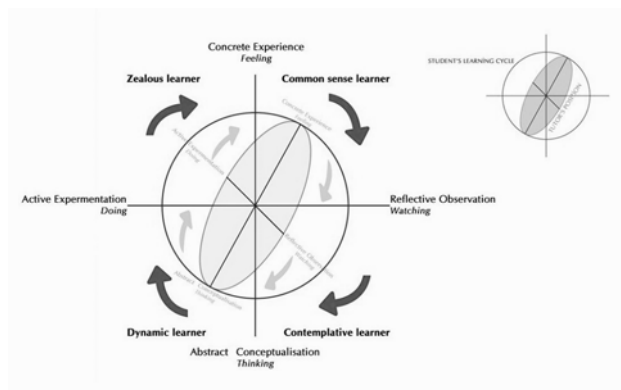


Figure 9: Learning cycle showing the roles of student and tutor

In the end, design education is not limited by conceptual studies. The completion of Kolb’s circle is essential for a design project to gain an architectural character. The “feel-



do" process functions as an element controlling the "think-do" process. Simultaneously, this condition implies that the freedom of self-actualization turns into a responsibility.

During the architectural design process, students gain an awareness and comprehension that, if they do not idealize their thoughts and concepts to improve, they will not be evaluated by their tutors as successful because their concepts are the main criteria for their assessment, both internally and externally. This former assessment is done by students themselves while the latter denotes a jury/review evaluation. Students should maintain their concepts into their final proposals in order to not encounter manipulations coming from invited jury members, extrinsic to the design process, that weaken their core ideas.

Consequently, ensuring a self-expression environment for students is compulsory for having diversity and freedom in an architectural design studio. Therefore, the conceptual thinking stage is not to be neglected, and must be concluded by the accommodating (feel-do) stage. Without holding onto self-produced ideas, students are neither expected to progress efficiently, nor are tutors expected to do justice assessing student works if they have amply manipulated them. In this regard, thinking and studying with the aid of conceptualization should be considered as a key to both creativity and objective assessment at the end of an architectural design study.

REFERENCES

- Ancess, J. (2000) The Reciprocal Influence of Teacher Learning, Teaching Practice, School Restructuring, and Student Learning Outcomes, *Teachers College Record*, Vol. 102, No. 3, pp. 590–619.
- Cano-García, F. & Hewitt Hughes, E. (2000) Learning and Thinking Styles: An analysis of their interrelationship and influence on academic achievement, *Educational Psychology: An International Journal of Experimental Educational Psychology*, Vol. 20, Issue 4.
- Collins, M. A. & Amabile, T. M. (2004) *Motivation and Creativity*, *Handbook of creativity*, ed. Sternberg, Robert J. Cambridge University Press.
- Cross, N. (1997) Creativity in Design: Analyzing and Modeling the Creative Leap, *Leonardo*, Vol. 30, No. 4, pp. 311-317.
- Cross N., (2001) Designerly Ways of Knowing, *Design Issues*, Vol. 17: 3, Summer.
- Gallipoli-1915.(2015) Gallipoli-1915 Website. From <http://www.gallipoli-1915.org/zaiyat.htm>



- Hargrove, R. (2011) Creating Creativity in The Design Studio: Assessing The Impact of Metacognitive Skill Development on Creative Abilities, *Art, Design & Communication in Higher Education*, Vol. 10, Number 1, pp. 7-31.
- Hennessey B. A. & Amabile T.M. (1988) *The Condition of Creativity, The Nature of Creativity: Contemporary Psychological Perspectives*, (ed.) Robert J. Sternberg, Cambridge University Press
- Kirci, N, (2013) *How the Student Learns and How the Tutor Assesses*, Lambert Academic Publishing.
- Kolb, D. A. (1985) *Learning Style Inventory: Self-Scoring Test and Interpretation Booklet*, McBer and Company, Boston, MA.
- Kowaltowski, D. C. C. K.; Bianchi G. & Paiva, V. T. (2010) Methods That May Stimulate Creativity and Their Use in Architectural Design Education, *International Journal of Technology and Design Education*, Vol. 20, Issue 4, pp. 453-476.
- Lam, S.; Cheng, W.; R. Y. K. Ma, W. (2009) Teacher and Student Intrinsic Motivation in Project-Based Learning, *Instructional Science*, Vol. 37, pp. 565-578.
- Maslow, A. H. (1943). A Theory of Human Motivation, *Psychological Review*, 50, 370-396.
- Oh, Y.; Ishizaki, S.; Gross, M. D. & Do, E. Y. (2013) A Theoretical Framework Of Design Critiquing In Architecture Studios, *Design Studies*, Vol. 34, No. 3, p. 305.
- Orr, S.; Yorke, M. & Blair, B. (2014) 'The answer is brought about from within you': A Student-Centred Perspective on Pedagogy in Art and Design, *iJADE*, Vol. 33.1, NSEAD/John Wiley & Sons Ltd.
- Skinner, Ellen A. & Belmont, Michael J. (1993) Motivation in the classroom: Reciprocal effects of teacher behavior and student engagement across the school year, *Journal of Educational Psychology*, Vol. 85(4), pp. 571-581.
- Svinicki, Marilla D. (1999) *New Directions in Learning and Motivation*, *New Directions for Teaching & Learning*, issue no. 80, Jossey-Bass Publishers.
- Wong, Y. L. & Siu, K. W. M. (2010) A Model of Creative Design Process for Fostering Creativity of Students in Design Education, *International Journal of Technology and Design Education*, Vol. 20, Issue 4, pp. 453-476.