

THE TRANSFER OF KNOWLEDGE THROUGH INTER-DISCIPLINARY SEMINARS AS A SOURCE OF CREATIVITY IN THE DESIGN STUDIO

^aNAZAN KIRCI

Gazi University, Faculty of Architecture, Department of Architecture, 06570 Maltepe Ankara, Turkey
email: ^a nazkirci@gazi.edu.tr

Abstract: Bacon has famously stated, “knowledge itself is power.”. This study investigates how power is invited into the design studio, underlining the importance of inter-disciplinary cooperation as the source of creative activity and innovation in architectural education. Using seminars that feed the cognitive aspects of design and the relevant applications in support, a design studio set-up undertaken with inter-disciplinary contributions was realised. Shared knowledge from seminars on engineering, landscaping, interior architecture and sculpture were transformed in accordance with their respective fields by architecture students and then re-constructed using constructivist learning to fit their respective purposes.

Keywords: knowledge, inter-disciplinary, creativity, innovation, design studio

1 Introduction

Sir Francis Bacon (1561–1626) has famously stated, “*knowledge itself is power.*” Dutton claims that knowledge is not a neutral entity. Like any commodity, it is produced and distributed according to particular voices situated in relations of power that are asymmetrical. To talk about knowledge, then, is to talk about power, and therefore the legitimization of some forms of knowledge due to their association with forms of power over others. Thus, it is more accurate to talk about dominant and subordinated forms of knowledge (Dutton 1987).

What Simon is suggesting that the study of design could be a fundamental, inter-disciplinary study accessible to all those involved in creative activity of making the artificial world. According to Cross, it is the challenge for design research to help construct a way of conversing about design that is, at the same time, both inter-disciplinary and discipline-bound. Conversations that fail to connect across discipline, that fail to reach common understanding, and that fail to create new knowledge and perceptions of design are not wanted. This is the paradoxical task of creating an inter-disciplinary discipline (Cross, 1999).

Norman believes that there should be a new form of design education “with more rigor, more science, and more attention to social and behavioral sciences, to modern technology” (Norman, 2010). As a result, new kinds of designers will emerge, those who can work across various disciplines, who understand human beings, business, and technology (Fartushenko, 2012).

Throughout history, architecture has been influenced by social, political, economic and artistic factors and has renewed and changed itself accordingly. Architectural education has both complied with such circumstances and has also led the way at times. Although the theme of the fields that the architect has related himself to has changed and renewed over time, the habit of relating to them has remained unchanged.

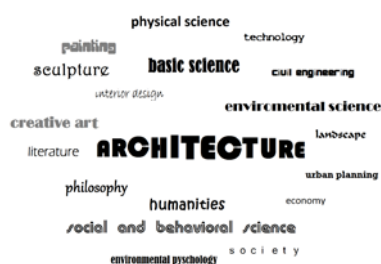


Figure 1. Architecture fields and its related (Kirci, N, 2016).

Looking at just the past century alone, architecture had close links with painting, sculpture, literature, philosophy and industry. (Figure 1)

Cubism had its influence on De Stijl (Hollingsworth, 1988), Purism (Frampton, 1992) and Modern Architecture. The art of painting and sculpture also influenced the design of Russian Constructivist architecture (Figure 2). The constructivists came under the influence of abstract works of artists such as Lissitzky, Kandinsky and Malevich who were working in architectural schools and on the other hand used mental constructivism methods and produced dynamic three dimensional objects (Russian Futurism). The artists who left Russia, after some time with the new duties that they had been assigned to within the education program, had a say on the structuring of Bauhaus (Peel, Powell, & Garrett, 1989). The education program of Bauhaus being an extremely effective establishment on the teachings and implementations of 20th century architecture, is full of arts, crafts and industry. It was composed of twelve representatives of leading handicraft companies and artists whose aim was the cooperation of art, industry and crafts in the ennoblement of commercial activity by means of education, propaganda and united stand on pertinent questions (Dorste, 2002). The founder and eponym of de-constructivism Jacques Derrida is a philosopher and it was architect Bernard Tschumi who established the link between Derrida's thoughts and architecture (Proudfoot, 1988)



Figure 2. Examples of the relationship between painting, sculpture and architecture. a. Mondrian painting, (Mondrian, 1921) b. Schröder House (Rietveld, 1924) c. Tatlin Tower (Tatlin, 1920) d. Rusakov workers club (Melnikov, 1928)

Today's architecture is still taking advantages of knowledge coming from other disciplines. There are mainly two ways to acquire such a knowledge: One way is the architect's himself being another specialism beside architecture. For example; Buckminster Fuller was also a mathematician, surveyor, ecologist and a poet at the same time. (Sharp, 1991) Santiago Calatrava is an engineer and Daniel Libeskind is a musician (Libeskind). Rem Koolhaas has worked as a journalist and a screenwriter (Lacy, 1991). Hadid studied mathematics (Hadid, 1). Another way is to collaborate with people who has other specialities. For example; SOM is the pioneer and the most influential architecture firm in which architects collaborate with engineers, interior designers, urban planners and technicians (SOM). Gehry and Partners relies on the use of digital project, a sophisticated 3D computer modelling program originally created for use by the aerospace industry, to thoroughly document designs and to rationalize the bidding, fabrication, and construction processes to able to build Gehry's sculptural design (Gehry). Zaha Hadid's interest is in the rigorous interface between architecture, landscape, and geology as the practice integrates natural topography and human-made systems that lead to experimentation with cutting-edge technologies. Such a process often results in unexpected and dynamic architectural forms (Hadid, 2).

As can be followed from the explanations above, the professional field of architecture lends itself to working directly or consecutively with other disciplines. The practical abilities of providing solutions together, within the work group and assessing the problems using different points of view should be brought forth during the education itself without getting delayed for working life. The Unesco/UIA Charter considers this same aspect: that educators must prepare architects to formulate new solutions for the present and the future as the new era will bring

with it grave and complex challenges with respect to social and functional degradation of many human settlements. In the same document, the areas of co-operation are underlined: “one of the objectives of architectural education is that architecture is a discipline which draws knowledge from the humanities, the social and the physical sciences, technology, environmental sciences, the creative arts and the liberal arts” (Unesco/UIA 2011). Figure 1 depicts the fields to which architecture is related.

In this context, stretching the boundaries of architectural education programs in accordance with the versatility of professional life is both a sort of richness and necessity. When the above given information is evaluated, the flow of information coming from different disciplines has been thought of as a source of riches for architectural education capable of developing critical thought and having a contributing role in creativity for the production of the new ideas and forms. Inter-disciplinary support is not a novelty of today. Instead, the flexibility of the boundaries of the profession of architecture and the comprehensiveness of its education has already been there.

The design studio, being the venue where free and experimental studies of a whole architectural program can be undertaken, is the heart of architectural education. Gazi University's Department of Architecture in Ankara, Turkey, organises its design studio hours within a system whereby the students from the 4th, 5th, 6th and 7th semesters share a common design studio (they are not split up by their year of study). The working methods and implementations of each atelier in this system purposely differ from each other, in order to provide a varied experience for the students over the years. The focus of this study is Atelier 6 (A6).

The following projects were assigned according to the semester of the student: 4th semester – wedding hall, 5th semester – art gallery, 6th semester – district education centre, 7th semester – city council building in the multi-semester environment of A6. A working strategy had been built for the purposes of feeding the design studio works and the cultural environment. In this article, how this diversity has been achieved, reflected into design studio works and how the results were evaluated are the subjects that have been touched upon. The heart of architectural education is the design studio and the main objective of the design studio is to produce solutions to define potential problems by way of improving creativity.

Firstly, the following aspects should be scrutinised in respect to an inter-disciplinary approach:

- whether or not inter-disciplinary educational methods trigger creativity
- how inter-disciplinary could be transformed for use in design education
- how inter-disciplinary could be incorporated into the design-studio education scheme.

2 An inter-disciplinary approach to creativity

Even though it is difficult to exactly define creativity, the answer to the first question (whether or not an inter-disciplinary approach increases creativity), is hidden in what exactly creativity is. It is obvious that an inter-disciplinary approach requires synthesising. Some experts believe that the process of synthesising contributes to the production of novelties, which are a part of the definition of creativity. For example, Saebo et al has concluded, “Creativity is a state of mind in which all of our intelligences are working together. It involves seeing, thinking and innovating” (Saebo, Mc Cammon & O'Farrell, 2006).

Creativity is often defined as the development of ideas or work that have the quality of being both useful and original (Amabile et al 1996¹; Elton 2006²; Mayer 1999³; Paulus & Nijstad

2003;⁴ Sternberg & Lubart 1999)⁵, or plays an important part in the process of cultural reproduction, technological advancement, innovation and intervention (Runco 2004). A significant force for innovation and change is design, of which creativity is considered a key element.

Casakin also claims that creativity enables the talented designer to transcend conventional knowledge domain[s] so as to investigate new ideas and concepts which may lead to innovative solutions; it enables the designer “to perceive a problem from unorthodox and innovative perspectives” (Casakin 2007). In brief, inter-disciplinary work requires synthesis of knowledge that contribute to innovation for creativity in design process.

- The acquisition of new information
- The transformation of knowledge
- A checking of the pertinence and adequacy of knowledge (Bigge & Shermis, 2004).

The main source of cognitive knowledge in the design studio is theoretical classes. This knowledge is transformed and constructed within the design process. Schön describes design as a reflective conversation with the design situation, thus addressing the human thought-processes and the language used to make design decisions (in the case of architectural design studio: drawings and models) (Schön, 1988)

The transfer of knowledge into other fields is unfortunately not easy. Piaget has taught us that knowledge is not a commodity to be transmitted. Nor is knowledge simply information to be delivered from one end, encoded, stored and reapplied at the other end. Instead, knowledge is experience, in the sense that it is actively constructed and reconstructed through direct interaction with the environment. The understanding of knowledge is similar, in many ways, to the ideas expressed by various scholars associated with “situated cognition”: for example, to know is to relate (Ackermann, 1996). For constructivist learning implementations, architectural design studios are valuable fields of experiment. However, stimulants such as reminders are required. Such reminders could be in the form of encouraging research by way of triggering curiosity or in the form of providing knowledge.

Creativity has been characterised by “the sudden interlocking of two previously unrelated skills, or matrices of thought.” More precisely, creativity is the result of a relationship between a working (short-term) memory and a long-term memory, based on a process of “selective emphasis” (Koestler 1975)⁶. In brief, knowledge needs to be interpreted, related, structured and transformed. Using this point of view, as the contribution of inter-disciplinary co-operation, it is expected that knowledge placed in the short-term memory be the source of new works in the future from the long-term memory.

3 How can an inter-disciplinary approach be incorporated into the design studio?

Another important question is how an inter-disciplinary approach can be transferred into the design studio. The Bauhaus is an excellent example in this respect. Whitford has emphasized that the continuing influence of The Bauhaus in art and design education takes the form of a faith in the efficacy of foundation courses of one kind or another, and in carefully designed projects given to spur a student's creativity (Whitford, 1984). Bauhaus students were classified as either apprentices or journeymen. What differentiated the Bauhaus was a tandem system of workshop teaching that attempted to equate craft with art, and equip graduates with as much technical expertise, as well as

¹ Amabile, T. M., Conti, R., Coon, H., Lazenby, J., & Herron, M.: *Assessing the work environment for creativity*. Academy of Management Journal, 39, 5, 1996. p.1154-1184. In Williams et al 2010.

² Elton, L.: *Assessing creativity in an unhelpful climate*. Art, Design & Communication in Higher Education, 5, 2, 2006. p.119-130. In Williams et al. 2010.

³ Mayer, R. E.: *Fifty years of creativity research*, In Sternberg R. (Ed.), *Handbook of creativity*, Cambridge: Cambridge University Press. 1999. p. 449-460. In Williams et al 2010.

⁴ Paulus, P., & Nijstad, B. *Group creativity*, New York: Oxford University Press. 2003. In Williams et al 2010.

⁵ Sternberg, R., & Lubart, T. I.: *The concept of creativity: prospects and paradigms*. 1999. In Williams et al 2010.

⁶ Koestler, A.: *The Act of Creation*. London, UK: Macmillan. 1975. In: Bonnardella, N. & Marmèche, E. 2010.

theoretical and creative expertise. Apprentices were instructed by masters of each particular craft as well as by practicing fine artists (Wingler 1969).

Although the inter-disciplinary approach was not specifically underlined in Bauhaus doctrines, it existed on a passive level as Bauhaus students were exposed to many different technical, theoretical and creative aspects of art and design. Today, such a model can be planned as a part of an educational program. In such an implementation, different departments support each other by way of theoretical and practical classes. The synthesis of knowledge, coming from multidisciplinary areas, continues to be a challenge in the typical design studios of most architecture schools.

However, when an inter-disciplinary approach has not been established in the structuring of academic departments, there are administrative difficulties finding professional practitioners of different scientific fields as the assigned persons during studio hours. As part of the current research, organising an architectural design studio under these inter-disciplinary circumstances required finding practical solutions to this problem. As has been mentioned by Linser, Naidu & Ip out of the four basic learning methods for architectural education, “the seminar” has been found the most appropriate (the other three being “target oriented,” “role oriented” and “web oriented” communication and co-operation) (Linser, Naidu & Ip, 1999).

3.1 The seminar as a method of flowing knowledge into the design studio: The acquisition of new information

Most of the time, typical studio works are based on the bilateral relationship between a tutor and a student, who is an architect-to-be. From time to time during the semester, juried reviews are held with the goal of strengthening the weaker areas of the students using jury members’ knowledge and different points of view. However, aspects such as not being able to talk about exactly the same points for every project, the lack of conveying basic knowledge in a simultaneous, qualified and standardised manner and the students not sitting through and listening to all of the jury critiques render making an equal use of the such jury reviews impossible. Although how jury critiques will be going to be used depends on the student, the transfer of knowledge to all of the students simultaneously, without an intermediary (like a juror) and without any subjective interpretations can only be possible through theoretical classes and seminars.

In this study, making use of the condition in which the boundaries of theoretical and practical habits inherent in the respective professional and educational fields nested within each other has been considered to be a pragmatic approach in accordance with the grounds that have been provided above. Thereby, knowledge that has been included in the course program and not being included into the design process and knowledge that has not been included in the education program and being a part of the design world has been invited for contributions to the studio works. The moment that what type of knowledge is wanted is decided upon, what type of power is going to be possessed is also decided. In accordance with Dutton’s definition (Dutton, 1987) an interpretation could be made that alongside the dominant knowledge of architecture in architectural education the knowledge coming from other disciplines could be subordinate. Relations were established with the below-mentioned fields, considering that, in order to increase creativity, the design design and production studio should be fed with knowledge coming from genetically similar areas of study in terms of:

- Civil Engineering (For managing structural design of the architectural form)
- The Art of Sculpture (For enhancing 3D plastic expressiveness of architectural form and evaluating it within urban pattern)
- Landscaping (For awaking environmental awareness of the students and integrating topographic properties in accordance with the purpose of the design)

- Interior Architecture (To ensure harmony between function and meaning of architectural space, using colour, light, shade, texture, material in interior design)

Special care was given so that these seminars were scheduled on particular dates throughout the semester when students were available, needed the information and were also able to make the most use of it. The following section of this essay is a brief explanation of the contents of these seminars.

3.1.1 The consequence of structural systems in architecture

In this seminar, the basic principles of setting up structural systems in buildings were introduced. A balanced load distribution and a symmetrical geometry were the main criteria in an appropriate structural system design. The estimation of external disturbances and loads, and the assembly of an accurate load transfer mechanism were the issues that were underlined. While establishing their structural systems, the students’ projects were appraised on stability, strength, functionality, cost and aesthetics. Balanced load distribution and a symmetrical geometry were clarified with examples from nature and remarkable visual materials selected from well-known architectural masterpieces.

As part of a fictitious scenario, a typical reinforced concrete building with a regular and symmetrical structural system was introduced. Subsequently, the structural behavior of the building caused by unexpected loads or other external disturbances is demonstrated. The structural behavior of the building in the symmetrical and asymmetrical form has been compared using mathematical models developed for computer analysis. In this manner, the healthy structural behavior of buildings is proven to depend not only on its geometrical symmetry but also on the symmetry according to the center of rigidity of the structural system. The objective of this seminar was to instruct the students when and how to use in the design studio the theoretical knowledge that they had been given during various classes of their architectural education.

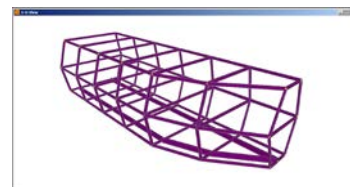


Figure 3. Structural modelling and computer-aided mathematical modelling of a student’s project (Unay, A.I., 2016)

3.1.2 Sculpture and architecture

Sculpture is a three-dimensional form created through an artistic point of view. Although in general terms, nature and human beings are taken as the sources of inspiration and interpretation in classical works, the relationship of sculpture and architecture is more obvious in abstract sculptural works. Surface and texture, design components studied in basic architectural education classes, are also studied in this seminar. Parameters such as geometry, mass composition, ratio and proportion, depth, light and shadow effects are also challenged.

In this seminar, the students undertook a study led by a visiting artist/sculptor for the purposes of investigating the three-dimensional effect of form, composition and movement using the plastic and easily-shaped characteristics of clay. The students produced countless number of clay models during and after the study, which was realised in order to develop their three-dimensional thinking and shaping skills. It was been observed that these models are the tools for trying out their design ideas in respect to their project subjects, and at the same time tools for producing design ideas. The models produced by some of the students in this seminar actually defined the main characteristics of their final projects.

3.1.3 Landscaping arrangements

The objective of this seminar was to establish a consciousness for the conservation and planning of the natural environment. Architects, landscape architects and all professionals whose work is linked to the environment around us should reach a level of consciousness where they are more constructive than destructive. For urban landscaping to be successful and sustainable, one needs to first undertake an inventory study. At this stage, it is important to determine the social and cultural infrastructure, the qualities and density of the users, along with the natural and physical data of the place. It is also important to make an appropriate use of this data. Micro-climates caused by the density of architectural structures in urban settings can be changed and in some cases controlled with the application of planned landscaping. In the project site, the balance between the allowed hard landscaping and green spaces was not allowed to be disturbed and the area was to be made useful with the use of correct plantings. For example, any form of water creates a cool effect in the city centre, thick textured plants provide sound insulation, plants with tall forms create a shelterbelt, and using plant groups placed on firm ground creates gathering spots. Examples of landscaping arrangements on the student projects have been provided below.

3.1.4 The effects of interior spaces

In addition to being a physical object of Cartesian status, space produces meanings and creates relationships. Its function and dimensions, the profile of the user, the colours, textures, lighting and materials used and the location of the furniture all affect the meaning of a space. One should be aware of the psychological effects to be created with space during the design of interior spaces.

If the message that the architect would like to give within the wholeness of a building is not supported with its interior spaces, then an incompatibility could arise between the content and the essence. The colours, textures, materials, dimensions and locations and the relationship between them that have been selected in order to achieve such compatibility affect the quality of the space and would be reflected in the behaviours realised in that space. In this seminar, using various examples, the effects of colours and matching and mismatching colours are explained. In addition, the effects of varying the dimensions of the space (width, length and height) compared to the human body are explained by way of providing many examples.

4 How inter-disciplinarity could be transformed for use in design education

4.1 The transformation of knowledge

As mentioned, 4th semester students were asked to design a centre where wedding and wedding reception organisations could be held. (Figure 4) The site was Kurtulus Park in Ankara. For this group's projects, the contribution of landscaping knowledge was very important. In addition to presiding over the relevant seminars, the landscape architect also took part in site visits and studio studies. Examples of the influence on the student projects of landscaping arrangements and the sculpture seminars have been provided below.



Figure 4. Proposals for a wedding hall in a city park

5th semester students were asked to design an art gallery. (Figure 5) In addition to including the different areas for the exhibitions, these students' designs discussed the art gallery itself to become an object of exhibition for a residential area. For

this reason, the students made better use of the sculpture seminars, in comparison to the other groups.

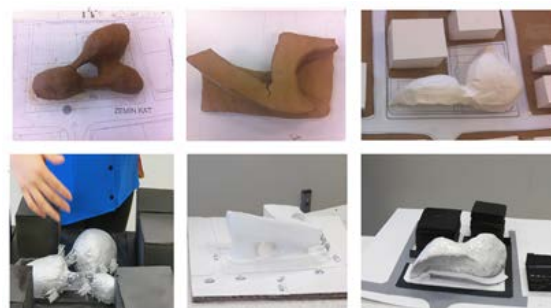


Figure 5. Proposals for an art gallery

The 6th term students were asked to design a social centre where the residents could pass their free time engaged in social activities. During the study, the students also looked for ways that the centre could attract attention and be easily reached. The contribution of landscape architecture proved to be effective in the use and design of the outer space as a social venue.

7th term students were asked to design a City Council Building. It has been discussed that the social areas of this building would include facilities to allow for meetings, celebrations, gatherings and protests. Again, the contribution of landscape architecture proved to be effective in the use and design of the outer space as a social venue.



Figure 6. Proposals for a city council building

4.2 The contribution of the seminars to the architectural projects

The students answered survey forms in order to make their own evaluations about the contribution of the seminar before the final delivery of the projects. In order to allow the students to express their views freely, it was optional for them to give their names. However, they were still asked to identify on the form in which term they were. At one part of the survey study, they were questioned about their general satisfaction in respect of the seminars held during that term and whether these seminars had a direct impact on their projects.

All of the 28 students taking part at the survey said they approved of the seminars. A vast majority of the students approved that the seminars had contributed to their works. (Table 1)

Table 1 Evaluation of the seminars

Evaluation of the seminars	Yes	Undecided	No
Do you approve the seminars that were organised during the term?	28	-	-
Do you think the seminars had a direct contribution had a on your work?	23	5	-

Besides the above-mentioned questions, the students were asked to elaborate the reasons for their remarks as an answer to an open-ended question. Some of these comments are presented as follows.

▪ 4th term students

A: After the seminars, we were able to spot the points that we weren't able to think otherwise before. By this means, we were

able to approach our designs with new ideas and thoughts and tried to develop our designs further. We saw that real architecture is not consisting of the crust alone.

B: I believe that this method and form of gaining information is going to make greater contributions to my work in the future than it does now. The seminars were very useful in terms of getting to know these lines of professions and experiencing the importance of co-operation. I think that this system is very useful, and for it to be even further useful it is necessary for the persons who are presiding over the seminars to pay attention to the projects of the students on a one-on-one basis. We worked like this with the landscape architect, and the results were very efficient.

- 5th term students

C: This had been a study where we were fed through other disciplines during the development of my project. The seminars warned us about the aspects that we should be careful about.

D: I did my best to include the subjects of the seminars in my project.

- 6th term students

E: Since the seminars were held in order to inform us on certain subjects, they had a big impact on my study. I learned things that I didn't know before. I tried to use the things that I learned on my project.

F: Seminars give new ideas. They helped me to be bolder in my designs.

- 7th term students

G: In fact we already receive frequent warnings/criticisms from our tutors on some of the subjects of the seminars. However, since they were presented to us in the form of seminars, it helped us to see their importance.

5. Results

When we see the latest prominent examples from all around the world, it does not seem to be right to evaluate architecture as just architecture. Today, to collaborate with other disciplines has become nearly a necessity for the practice of architecture therefore different disciplines now and then work simultaneously and consecutively. When including all these disciplines in the curriculum is not possible, the reflection of this polyphony on architectural education could be through the design studio studies at its fastest and most effective form.

In this study, transferring knowledge from different fields to the design studio through seminars had been scrutinised. In this method, which is far from the subjectivity of the bilateral relationship between tutor and student, knowledge is simultaneously given to all of the students in the same quality.

As for the transformation of all this information onto the final product, without a doubt the personal characteristics of students had an effect as well as the means and requirements of the subjects studied. Admittedly, these informative studies that have been squeezed into one semester were not adopted into all of the projects to their fullest extent. Still, the lid has been taken off with this study and the students have been given a sufficient amount of triggers to get into detailed research studies later. When similar studies are conducted, they will have similar effects on students who participate in the studio at that time and will reinforce the knowledge of students who had already previously gone through the experience.

In addition to the inter-disciplinary seminars, it is expected that knowledge that has been placed in the short term memory to be the source of new works from the long term memory in the future. It may also help to prepare students working directly with other disciplines or consecutively with other disciplines in their professional life. The main mission of education is to teach how

to learn and to develop critical thinking. A tutor should let the students find their own ways not only by showing them the current limits of present but also by showing some possibilities hidden in tomorrow.

Acknowledgement

I owe my words of gratitude to Prof. Dr. Ali Ihsan Unay and to sculptor and Lecturer Dr. Ayhan Yilmaz from Hacettepe University, Department of Sculpture, Master Landscaping Architect Derya Polatkan and to Zeynep Bora who is a post graduate student at Bilkent University, Department of Interior Architecture who contributed to the culture of the A6 studio students.

Literature:

1. Ackermann, E.: *Perspective-Taking and Object Construction. In Constuctionism in Practice: Designing, Thinking and Learning in a Digital World*, (Kafai, Y., and Resnick, M., Eds.). Mahwah, New Jersey: Lawrence Erlbaum Associates. Part 1, Chap. 2, 1996. p. 25-37.
2. Amabile, T. M., Conti, R., Coon, H., Lazwbnby, J., & Herron, M.: *Assessing the work environment for creativity*. Academy of Management Journal, 39, 5, 1996. p.1154-1184.
3. Bigge, L. M., & Shermis, S. S.: *Learning Theories for Tutors*, Classic Edition (6th ed), USA: Pearson Education Inc. 2004.
4. Bonnardela, N., & Marméche, E.: *Towards supporting evocation processes in creative design: A cognitive approach*, Int. J. Human-Computer Studies, 63, 2005. p.422-435. Doi:10.1016/j.ijhcs.2005.04.006
5. Casakin, H.: *Metaphors in design problem solving: implications for creativity*. International Journal of Design, 1, 2, 2007. p.21-33.
6. Conrad, C. F., & Pratt, A. M.: *Making Decision about the Curriculum: From Metaphor to Model*. Journal of Higher Education, 54, 1, 1983. p.16-30.
7. Cross, N.: *Design Research: A Disciplined Conversation*, Design Issues 15, 2, 1999. p.5-10.
8. Corkery, L., Roche, B., Watson, K., & Zehner, B.: *Transforming Design Studio Learning and Teaching through Real World, Interdisciplinary Projects*, International Conference on Design Education- Connected, University of New South Wales, Sydney, Australia. 2007.
9. Cross, N.: *Design Research: A Disciplined Conversation*, Design Issues, 15, 2, 1999. p.5-10.
10. Dorste, M.: *Bauhaus: 1919 - 1933*, Taschen GmbH, Berlin. 2002.
11. Dutton, A. T.: *Design and Studio Pedagogy*, Journal of Architectural Education, 41, 1, 1987. p.16-45.
12. Elton, L.: *Assessing creativity in an unhelpful climate*. Art, Design & Communication in Higher Education, 5, 2, 2006. p.119-130.
13. Fartushenko, L.: *Using an Interdisciplinary Approach to Promote Creativity: Investigating Canadian Post-secondary Design Education*, University of Alberta: 2012.
14. Frampton, K. A.: *Critical History Modern Architecture*, Third Edition: revised and enlarged, London:Thames and Hudson. 1995.
15. Gehry and Partners. <https://www.foga.com/> (23/12/2015).
16. Hadid.1.http://en.wikipedia.org/wiki/Zaha_Hadid. (15/5/2016)
17. Hadid Z. 2. <http://www.archello.com/en/company/zaha-hadid> (15/5/2016)
18. Hall, P., & Weaver.: *Interdisciplinary education and teamwork: a long and winding road*, Medical Education, 35, 2001. p.867-875. DOI: 10.1046/j.1365-2923.2001.00919.x
19. Hollingsworth M.: *Architecture of The 20th Century*, London: Brompton Books Ltd. 1988.
20. Kahvecioglu, N. P.: *Architectural design studio organization and creativity*, ITU A/Z, 4, 2, 2007. p. 6-26
21. Kirci, N., 2016
22. Koestler, A.: *The Act of Creation*. London, UK: Macmillan. 1975.
23. Lacy, B.: *100 Contemporary Architects Drawing & Sketches*, London:Thames and Hudson,1991.

24. Libeskind, D. <http://www.arkimeet.org/engine.php> (23/12/2016)
25. Linser, R. Naidu, S., and Ip, A.: *Pedagogical foundations of web-based simulations in political science*, Ascilite Conference, QUT, Brisbane. 1999.
26. Mayer, R. E.: *Fifty years of creativity research*, In Sternberg, R. (Ed.), *Handbook of creativity*, Cambridge: Cambridge University Press. 1999. p. 449-460.
27. Melnikov K., 1928. Rusakov workers club <http://www.essential-architecture.com/STYLE/STY-M05.htm>. (6/7/ 2015)
28. Mondrian, P., 1921. *Composition with Large Red Plane, Yellow, Black, Gray and Blue*, <http://www.artslant.com/ew/events/show/339089-mondrian-and-colour> (15/5/2016)
29. Norman, D., *Why Design Education Must Change*, Core 77 Design Magazine and Resource. 2010.
30. Paulus, P., & Nijstad, B. *Group creativity*, New York: Oxford University Press. 2003.
31. Peel, L. Powell, P. & Garrett, A.: *An Introduction to 20th Century Architecture*, London: A Quinted Book, Apple Press. 1989.
32. Proudfoot, J.: *Deconstruction and Architectural Science*, *Architectural Science Review*, 34, 1988. p.55-63.
33. Rietveld, G. Schröder House, 1924. http://en.wikipedia.org/wiki/Rietveld_Schr%C3%B6der_House, (15/5/2016)
34. Runco, M. A.: *Creativity*. *Annual Review of Psychology*, 55, 2004. p.657-687. DOI: 10.1146/annurev.psych. 55.090902.141502
35. Russian Futurism: *Design of Building a New World: Constructivism* (Rus Fütürizmi, Yeni Dünya'yı İnşa Etme Tasarısı:Konstruktivizm).
36. Saebo, A. B., McCammon L., & O'Farrell, L.: *Creative Teaching -Teaching Creativity*. Teaching Creativity and Creative Teaching, 2006.
37. Schön D. A.: *Toward a Marriage of Artistry & Applied Science In the Architectural Design Studio*, *JAE*.41,4. 1988.
38. Sharp, D.: *The Illustrated Encyclopadia of Architects and Architecture*, NY: Watson-Guptill Publications. 1991.
39. SOM. <http://www.som.com> (15/5/2016)
40. Sternberg, R., & Lubart, T. I.: *The concept of creativity: prospects and paradigms*. 1999.
41. Tatlin Tower, 1920. <http://galleryhip.com/tatlins-tower.html> (15/5/2016)
42. Unay, A.I., 2016
43. UNESCO/UIA *Charter for Architectural Education*, 2011, Tokyo. <http://www.uia-architectes.org/sites/default/files/%20A%20Charter2011.pdf> (23/12/2015).
44. Williams A. P., Ostwald M. J., & Askland H. H.: *Assessing creativity in the context of architectural design education*. Paper presented at the Conference Proceedings. Design & Complexity: Design Research Society International Conference, Montreal. 2010.
45. Whitford, F.: *Bauhaus*. London: Thames & Hudson, 1984.
46. Wingler, H.M.: *Bauhaus*. Massachusetts: MIT. 1969.

Primary Paper Section: A

Secondary Paper Section: AL, AM