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# Analysis of the Creativity Development and Assessment of Architectural Design Education: A Case Study of Basic Design Studio

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**Abstract.** Basic design education retains its seminal role in most of the architectural curricula today. Having the primary goal of getting acquainted students with knowledge and skills of design basics, basic design education supports the development of creative ways of thinking combined with hands-on learning experiences. The assignments address the articulation of the basic design in 2D and 3D elements such as lines, planes, volumes, structures and forms, while students are encouraged to experiment the potentials of different materials and techniques. Course included 9 different 2D and 3D exercises that focus on design principles and elements together by adding different design problems in process. For instance, structural problems as self-standing or modular 3D units' penetrations and strengthens for complex design problems are added for further assignments in the schedule. In this process 'creativity development' is assessed and evaluated by considering the whole course schedule at the example of individual student assignments. The objective of this paper is to make an analysis of creativity development with regard to the assessment and evaluation procedures, taking the process and products of a basic design studio as a case study. The methodological framework of this paper is based on the examination of two sets of data; (1) 'quantitative data' that includes the grades of assignments that are designed as part of ARCH 101 Design course of architecture program at Özyeğin University Faculty of Architecture and Design in "ARCH 101 in Fall term of 2017-2018 academic program; (2) 'qualitative data' that includes the studio observations and reflective interpretations of instructors regarding the creativity development process for individually student assignments. Grades give the idea of which student exercise has been understood well and reached its learning objectives by considering the whole class. Majority tendency of the grades help assessment of the schedule from the aspect of creativity development. The evaluation of creativity includes manifold aspects of assessment. Teachers' style, schedule of the course, personal factors such as students' personal backgrounds, former education, and the styles of thinking and learning, being individual or collective are all effective on creativity.

## 1. Introduction: Creativity and Assessment Dialectics

There are different definitions of creativity. May (1975) [1], defines creativity as "the process of bringing something new into being." For Clarke and Cripps, (2012) [2], creativity is "a transformative process of knowing, thinking and doing that embodies elements such as risk taking, envisaging, engaging, persisting, observing, experimenting, attending to relationships, taking a benign attitude to error and critically reflecting." While the notions of "innovation" and "originality" are regarded as two



main characteristics of creativity, the underpinning motive of creative processes is to respond to a problem or a purpose [3; 4]. Runco (2004) [5] categorizes creativity under several features such as “personal creativity”, “creative product”, “creative process”, and “environments that foster creativity.” Although creativity can be defined in different ways according to different disciplinary perspectives, it is evident that the development of creativity is regarded as a major educational goal [6; 7]. Nevertheless, the evaluation of creativity is a miscellaneous assessment. Teachers’ pedagogical style, schedule of the course, the individuality of people such as students’ personal backgrounds, former education, and the styles of thinking and learning, being individual or collective are all effective on the notion of creativity. Creativity can be viewed as a product of connectivity, and the collaborative and interdisciplinary space provides an environment for creativity to develop. Nussbaum (2013) [8], identifies two key aspects of creativity: connecting different bodies of knowledge in new ways; and seeing patterns that previously did not exist [9].

Creativity is considered as a key component of 21st century skills and it is learnable. Just as creativity is learnable, it is also possible to assess its development [10]. Analysis of the relationship between intelligence and creativity can be explained with reference to five interpretations [4]; (1) *preparation*: the stage when the creative individual prepares. The adopt freedom of thought by searching, collecting, listening to suggestions; (2) *incubation*: the period of time between preparation and incubation. During incubation the collected material is elaborated and organized within the creative individual’s mind. Sketchbook drawings make this incubation process very fruitful; (3) *illumination*: the point at which the individual realizes the solution. This achieved through clear insight, intuition or sustained effort, (4) *verification*: the stage of acceptance when the validity of the concept is evaluated and the ideas are finalized, fifth and the last is (5) *assemblage*, that creativity cannot be seen in isolation.

Teaching creatively can advance creativity since it gives room for criticism and learning from mistakes. As underlined by Dee (2015) [11], teachers should aim the formation of “an environment that is free of judgment” in a way to support and enhance “an atmosphere of encouragement and of pushing each individual to reach his or her full potential.” Teaching creatively may offer more learning opportunities for students to develop creativity than routine teaching [12]. It has been generally suggested that to implement a lesson, there are basic components a teacher should consider; forming lesson objectives by considering the development of students’ knowledge, skills and attitudes; identifying content and related teaching methods and teaching modes; building a classroom environment; managing time and the classroom [13; 14]. In the view of Danvers (2003) [15], ‘an atmosphere that is supportive, dynamic, and receptive to fresh ideas and activities’ is a prerequisite for creativity to flourish. Clarke and Cripps (2012) [2], underlines a responsibility on the part of lecturer “to harness the range of learning approaches and interests that students bring to their studio learning environments.” Although this manuscript addresses more on focused more on “teaching creativity” rather than “creative teaching”; it also addresses “creative teaching” with reference to course schedule assessment.

Criteria for student creativity assessment have been expanded in Lucas, Claxton and Spencer’s (2013) [16], five sided model of creativity; inquisitive, imaginative, disciplined, cooperative, persistent. Inquisitive refers to wondering and questioning, exploring and investigating, challenging assumptions. imagination is measured by imaginative solutions and possibilities, making connections using intuition [14]. We can summarize those five sided model as below with its sub components in figure 1.

Studies reveal that creative thinking development can be increased through the exercises. The humor of the teachers’ found helper in this process [14]. In the other hand, students’ definition for creativity is important. Students noted that “an open mind”, “right frame of mind”, “motivation” were important attitudes when creating art /design works. Students also consider “peer learning” to be important to begin with [17].



**Figure 1.** CRL's five dimensional creative habits of mind (CRL-Center for Real-World Learning)

## 2. Creativity Development in Design Education

Whilst creativity is seen as a common ground where the production processes of artists and designers meet [15], creativity development has been an essential goal in the fields of art education and design education [4; 18]. When design education is concerned, the notion of creativity addresses not only the personal/instinctive motives of the student as designer, but also the given design problem, the objectives and criteria that are specified in the design brief. Thus, creative design is the one that acts as a problem-solving process. In this process, on the one hand, creativity should be supported with freedom of choice and liberation from doctrines; on the other hand, there are certain criteria/needs/expectations through which the alternative results though multiple possibilities can be developed. In other words, students are expected to develop creative methods to solve given design problems. One fact of the development of creative thing and doing strategies involves a rigorous coordination between eye, mind and hand, and the other involves decision-making activities that inform how to manage creative design process as a whole. Therefore, creativity stems not only the originality of the product itself, but also the innovative or original ideas and practices that come up during the process of design.

Basic design education is the education and teaching of a creative individual in terms of purpose, scope and program. This technique is not an education-teaching, because of its structure, it is the education and teaching of cognitive settlement for visual perception-knowledge-opinion and aesthetic realization, process of exploration-inspiration-creation, developing and raising the abilities of hand-eye-brain, activation of dream-imagination-intuition. There can be said that basic design education is the basic for creative individual. Basic design education purpose is using the basic language of design. One of the most important purposes of basic design education is to teach seeing, hearing, touching, tasting. It is the first condition necessary for a person to understand the environment and lead to formation [19]. As a discipline, design seeks to achieve a balance between form and function, originality and practicality, novelty and appropriateness [9].

It is evident that assessment methods have a direct influence on teaching and learning experiences of the tutors and students in design education. Usually conceived as the "black-box" of design education, assessment is a controversial topic for several reasons [20]. First of all, it is given from more experienced tutor to students as novice designers, which brings forth a hierarchy of roles. This also raises the

discussions whether the evaluations of the tutor are subjective or dependent upon objective criteria. Although creative design process is subjective by its very nature, it is informed by objective criteria, thus the evaluation of the project cannot be subjective. Tutors have a repertoire of assessment criteria; originality and creativity are among them. The formative quality of design critiques enables students to get feedbacks during the making of their projects, empowering them to realize the potentials and problems of their creative design process. The role of the tutor is to ask questions rather than giving answers, which in turn fosters the development of students' critical and creative thinking skills. In this way, assessment in design education welcomes inter-subjective experiences with the participation of tutor and students. Accordingly, the assessment in design education does not only involve grade marking, but also a recognition on the part of students about their progress in the development of their design skills. This makes the link between assessment and learning stronger, compared with summative assessment procedures.

### **3. The Research**

#### *3.1. Objective and scope of the research*

The objective of this paper is to make an analysis of creativity development with regard to the assessment and evaluation procedures, taking the process and products of a basic design studio as a case study. The methodological framework of this paper is based on the examination of two sets of data; (1) 'quantitative data' that includes the grades of assignments that are designed as part of ARCH 101 Design course in Fall term of 2017-2018 academic program at Özyeğin University, Faculty of Architecture and Design; (2) 'qualitative data' that includes the studio observations and reflective interpretations of instructors regarding the creativity development process for individual student assignments.

#### *3.2. Methodology.*

As the methodology we examine two sets of data; one is 'quantitative data' that includes the grades of assignments that are designed as part of ARCH 101 course of architecture program at Özyeğin University; the other is 'qualitative data' that includes the observation and reflective interpretations of instructors regarding the creativity development process for individually student assignments. Grades give the idea of which student exercise has understood well and reached its objective by considering the whole class. Majority tendency of the grades help assessment of the schedule from the aspect of creativity development.

First of all, 6 major assignments that are executed throughout the Fall semester are examined (Table 1). Regarding the assessment of assignments' grades and for examining both qualitative and quantitative data; we targeted the basic design course students in English "ARCH 101 DESIGN COURSE" for the Fall Term of the 2017-2018 academic program. As the quantitative data assessment; a table that classifies assignment subjects and the total grades for assignments is used (Table 2). This gives an idea about the schedule program and the subject assignments whether effective on creativity. As the qualitative data assessment; the observation results for individual student assignments used and explained from the aspect of creativity development (Table 3).

#### *3.3. Limitations.*

There are some limitations of the study; it focuses on just one term of one academic year; the personal backgrounds of students and tutors, which may influence their experiences of learning and teaching, are not included; the influence of the language of instruction as English is excluded. However, there is a considerable number of students that are included on the research (n=80). Besides, the tutors of the two studios under consideration are teaching basic design courses for at least 5 years. The fact that tutors are from the Department of Architecture and Department of Landscape Architecture provides multidisciplinary perspectives to the pedagogical approaches employed in the Basic Design Studio. What is more, the final jury evaluation of the studios included external critics, who have the potential to bring alternative interpretations to the 'products' from fresh and objective viewpoints.

#### 4. Findings and Discussions

**Table 1.** ARCH 101 assignments: objectives, scope, methodology, final products.

<b>Name</b>	<b>design topic</b>	<b>scope and methodology</b>	<b>final product</b>
A1	Composition Analysis; Abstraction; Pattern	Abstraction of organic form, its representation as pattern design; 2D representation of a composition in the form of collage; 3D representation of the abstracted geometric elements through volumetric and structural formation	2D sketch as pattern design 2D collage 3D model
A2	Analysis and 2D and 3D composition of movement	Examination of the structural and volumetric potentials of movement as a way of space formation; testing the potentials of different 2D and 3D representation techniques for movement analysis.	2D composition in A3 format and photograph capturing movement 2D Collage of movement analysis 3D model of movement analysis
A3	Gestalt Theories; figure-ground relations	understanding of figure-ground relations, analysis of solid-void relations, 2D representation (collage) by using basic design principles such as similarity, proximity, and continuity	2D collage of figure-ground
A4	Transformation of 2D shape to 3D form	Examining potentials of form by using different transformation techniques (dimensional, directional, additive-subtractive)	2D sketch of composition 3D Model of 2D sketch
A5	Form transformation- module generation; design of structure out of modular units	Production of units by transforming the form; designing the structural details of units in a way that they compose a uniform self-standing structure; testing material-structural-volumetric potentials of modular wall properties	3D model of modular structure 2D poster of modular wall design which explains the design process
A6	Volumetric Pathway and Structure Through Subtraction from the Whole	Design of part-whole relationship, surface design, development of skills for statics and equilibrium, analyzing materials, analytical thinking, structural design	2D poster design of volumetric structure which explains the design process 3D model of volumetric structure

**Table 2.** Distribution of grades according to assignments

Assignments/G grades	A	A-	B+	B	B-	C+	C	C-	D+	D	F
A1 (Analyses and Abstraction of a composition)	15 (%18,75)	10 (%12,5)	20 (%25)	<b>10</b> <b>(%12,5)</b>	15 (%18,75)	1 (%1,25)	-	1 (%1,25)	1 (%1,25)	-	7 (%8,75)
A2 (Representation of movement in both 2D and 3D)	12 (%15)	11 (%13,75)	13 (%16,25)	<b>17</b> <b>(%21,25)</b>	8 (%10)	-	3 (%1,25)	3 (%1,25)	-	2 (%2,15)	11 (%13,75)
A3 (Figure-ground relations)	<b>14</b> (%) <b>18,6</b>	12 (%) 16)	13 (%) 17,3)	8 (%) 10,6)	11 (%) 14,6)	6 (%) 8)	7 (%) 9,3)	3 (%) 4)	1 (%) 1,3)	-	-
A4 (Transformation of shape to form)	8 (%) 11,4)	9 (%) 12,8)	11 (%) 27,5)	8 (%) 11,4)	6 (%) 8,5)	1 (%) 1,4)	5 (%) 7,1)	2 (%) 2,8)	2 (%) 2,8)	5 (%) 7,1)	<b>13</b> <b>(%18,5)</b>
A5 (Production of modular units)	14 (%) 17,9)	7 (%) 8,9)	9 (%) 11,5)	13 (%) 16,6)	<b>16</b> (%) <b>20,5</b>	7 (%) 8,9)	5 (%) 6,4)	2 (%) 2,5)	3 (%) 3,8)	2 (%) 2,5)	-
A6 (subtraction from the whole)	15 (%) 19,4)	14 (%) 18,1)	7 (%) 9)	14 (%) 18,1)	<b>17</b> (%) <b>22</b>	4 (%) 5,1)	-	4 (%) 5,1)	1 (%) 1,2)	1 (%) 1,2)	-

**A1 project** starts with an analysis and abstraction study as a basic topic in the design studio. It has 3 steps; the first step includes the structural analysis of an organic object and the delineation of how linear and geometric elements repeat in that structure. The next step aims at the design of a pattern based on the set of rules derived from the analysis and abstraction of the organic object; this step ends with the representation of the pattern in the form of a 2D collage. When the grades regarding A1 project are taken into consideration it is observed that the high percentage of students got “B”, which represent a considerable success of learning. Since this study was the first project of the design course, the students had difficulties in dealing with abstract thinking. On the other hand, A1 project helped students to develop 2D and 3D thinking skills through the practice of forming a composition with abstracted shapes in the form of a pattern and transforming the 2D pattern into a 3D model. Nevertheless, students’ knowledge of materials and craftsmanship were poor in this project, since they were at the beginning of design education.

The first step of **A2 project** included the documentation of a moving body changing directions in x-y-z dimensions, the analysis of sequences of the movement, and the representation of the changing volumetric orientation of the moving body. Students were expected to design a 2D composition as a collage that would represent the abstraction of linear and planar elements derived from movement analysis. In the second step of the project, the linear and planar elements that represented the volume occupied by moving body in void were transformed into 3D forms as a model. Model making helped students to develop knowledge of material qualities and detail design, in addition to analysis and abstraction skills. When the grades regarding A2 project are taken into consideration it is observed that the high percentage of students got “B”, which represent a considerable success of learning. In this study, the most challenging point for students was to analyze a holistic movement by dividing it into its sequences and to represent it in 2 dimensions. Since the development of abstract thinking skills was at a very early stage, students have difficulty in how the volumetric space covered by the body moving in space can be represented by linear and planar elements.

**Table 3.** ARCH 101 student projects sample according to weak, moderate and high grades

Assignment s/Grades	D+	C+	A
A1			
A2			
A3			
A4			
A5			
A6			

**A3 project** addressed the design of a composition inquiring figure-ground relations based on Gestalt principles. This study is observed to be a study that students have grasped faster and received higher grades. Previous studies have provided students with progress in the development of abstraction and 2



and 3-dimensional thinking skills. In this study, students were relatively less constrained in designing a composition and were able to produce faster projects. In addition, they were able to implement the skills they gained in the previous 3D model studies in terms of foreground-background-overlap-intersection situations on how the figures were positioned according to the coordinate system and were able to obtain successful results with the highest percentage of “A” degree grades.

**A4 project** took the figure-ground relations issue that was studied in A3 project a step forward and it addressed the transformation of shapes with reference to a set of rules, and then the design of a 2D composition by using transformed shapes. In the final stage of the project, the 2D composition formed in the top view plane is transformed into a 3D model that aims to design the depth of shapes and the composition. In this study, it is observed that students had difficulties in transforming a 2D composition into a 3D model when they were not given references about the depth or Z dimension. They tend to transform 2D shapes into solid geometries only by raising their height, rather than inquiring diverse intersection-overlapping-transparency possibilities of 3D form. On the one hand, they were given freedom to design depth, on the other hand, this freedom turned into a restrictive orientation towards the design of solid geometries. Thus, it is observed that at the early stages of their design education, students are expecting to be guided by references for design. However, this situation is not desirable because it restricts the freedom of design. ARCH 101 Design course is the first course students confront design thinking, which is quite different than the high school education, which is generally based on a passive reception and memorizing of knowledge. High percentage of student got unsatisfactory grades, “F”, from A4 project. In this study, the most difficult points of the students in the sample group were the imagination and design of the depth and height information which were not included in a 2 dimensional composition evaluated as a top view. In A1 and A2 projects, students were able to observe either as an organic object or a moving body in space, which all allowed the derive references about the 3D characteristics of a situation. However, when they were not able to get any reference about the 3D characteristics of a situation as it was the case in A4 project, the imagination of the third dimension was challenging for the students. This was the study that the students in the sample group received the lowest grade, but at the same time, it was the most challenging study contributing to the development of their creativity.

The following **projects of A5 and A6** have been the studies in which high percentage of students in the sample group got the grade of “B- “; the studies were found to be successful in partial. In these projects students were expected to considering many factors at the same time, such as in the modular wall design modules should be able to be inserted in all directions and should carry each other as well as being durable and robust, the degree of difficulty is very high. For the students who gained experience in abstraction, composition, and 2 and 3-dimensional thinking and designing skills in previous projects, projects A5 and A6 were the ones that all of these skills came into play.

In the **A5 project**, the module design and the development of a self-sustaining wall structure by solving the details of these modules by adhering to certain rules forced the students to think about both multidimensional thinking and design with realistic scale. In this study, especially the production / construction dimensions of the design have come to the fore. Projects that have inquired solid-void relations, transparency and multidimensionality have been more successful in module design. However, it was observed that the volumetric potentials of the modules were sufficiently studied in some projects, and the selection and use of materials was not competent.

**A6 project**, which is another study where students receive the grade of “B- “, along with A5 project, all of the skills developed in the ARCH 101 Design course have been used at once to create an integrated structure. However, unlike the A5 project developing from the part to the whole, A6 project aimed to designing an integral form from the whole to be bound by a certain set of rules and to create an internal volume with a defined geometric order. Thus, the students in the sample group have gained awareness

that the design process is a cyclical process that is systematic, not a linear flow, but with different strategies and continuous feedbacks. It is aimed to assist the development of creativity with the abilities of multi-dimensional thinking and management of the design process.

## 5. Conclusions

In ARCH 101 Design course, the given assignments are designed in a way to guide students' design leaning experiences and they specify the use of varied tools and materials in order to do so. The objective and scope of projects spread over 14 weeks' progress from simple to complicated. Among these projects, the A4 project is a "threshold" for the students of architecture and interior architecture of the sample group, since it has been the most difficult work of students. In this project, students' 2D analysis and abstraction skills are evolved into skills needed to create 3D formal and structural composition and the difficulty of design problem was increased in terms of complex thinking. It is observed that students tend to think differently after this threshold. After the students in the sample group exceeded this threshold, in A5 and A6 projects, they were able to get more successful results in terms of 3D thinking and material, technical detail and structure.

The assessment of creativity development in the basic design studio under examination is based on several features: (1) the focus is on learning-by-doing, as students experimented different thinking strategies such as abstract conceptualizations and transformed abstracted ideas into physical 2D compositions and 3D models by testing the potentials of materials and construction techniques; (2) tutors employed "formative assessment" techniques, which means students got feedback from tutors while they were working on their projects; (3) thus, not only the product but also the process has been evaluated; (4) the assessment processes included both one-to-one critiques between the tutors and students and group critiques as well, which fostered a more collaborative learning environment through mutual interaction. Thus, tutors aim to implement a holistic approach to evaluating how conceptions and practices of creativity take place in students' learning processes. These features of assessment processes that are peculiar to basic design education support the development of a climate of critique, in which both tutors and students are free to express their view. Such a climate of critical and reflective thinking gives room for variation and learning from failures.

Studies reveal that creative thinking development increased through the exercises. The humor of the teachers' found helper in this process [14]. According to Amabile's theory; creativity is socially constructed [21]. Amabile's (1982, 1996) [21; 22], consensual assessment technique (CAT) is the most extensively used method for assessing creative products. For teachers; strong, rigid knowledge may hinder creativity [12].

As educators we can and should provide a range of learning experiences and environments in which students can explore their own creative process. What we discovered is that creativity can be fostered however it remains elusive and can work in mysterious unexpected ways. This study highlights that studio-based learning environments need to consider sensitivities related to peer critique in groups and design learning interventions accordingly [17].

The collaborative learning approach magnifies learning possibilities and takes account of the creativity that exists before and after design courses. Also effective teaching which is a complex social system relies on the quality of relationships, has a big importance on developing creativity [2].

As an interpreted idea we can conclude that creativity process needs development of intuitive oriented free design thinking approaches which can be vary for individuals in addition to explained points above.

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