Assessment of Architectural Design Studio: A Review

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Abstract Architectural design is a creative exploit in both academic and professional context. The evaluation of design products is essentially affected by the evaluator's personal preferences and his/her cultural paradigms. Assessing the design studio products, therefore, is mainly subjective; and establishing an unbiased framework for evaluating both qualitative and quantitative criteria of design is always debatable. This paper aims to shed light on the current efforts, trends, and approaches for assessing architectural design studios. While researchers and educators have made several attempts to adopt frameworks or tools for design assessment and validation, this review paper focuses on the literature of the assessment of architectural design studio in terms of criteria, phases, forms, and process. Finally, recommendations were suggested to enhance the overall process of the assessment.

Keywords: architectural design assessment, architectural education, design studio, evaluation criteria


1. Introduction

Design studios have always been the core subject with the highest credit and weekly contact hours within the architectural curriculum; subjects such as visual communication, construction technology, environmental physics and simulation, parametric tools, history, and theories aid students in their journey through consequent design studio courses [1]. In addition, VanWezemae and Silberberger [2] suggested that architectural communication and the subjects of architecture history are the foundation in the early learning stage of architecture that will provide students with basic knowledge of design studio work. Figure 1 shows the relationship between these subjects and the design studio activities.

The design studio is often perceived as a time-demanding learning process. In design studio courses, architectural students gain the skills to work under both intuitive and practical contexts. Students interact, communicate, debate, and co-operate to achieve the intended learning outcomes of each studio course [3]. The learner-centered approach in the teaching of design studio directly affects student learning efficiency [4]. Ozgur et al. [5] concluded that when gestural communication channel is restricted during design sketching, other communication channels will be leveraged as a response to the lack of the required gestural information. They also argue that cross-gesturing enables the communication of mental models and construction of shared understanding during collaborative design sketching [5].

![Figure 1. Relation between Architecture Design Studio and Theoretical Subjects, [2]](image-url)
Learning design is a four-stage circular process that consists of several learning modes, including experience, reflective thinking, abstract conceptualization, and active experimentation [7]. The learning process is illustrated in Figure 2. Students usually go through all modes while producing their designs in studios. The ultimate objective of a design studio is to improve learning and practice. Megahed [6] has divided this objective into three subdivisions, including:

1. Visualization and presentation of ideas and concepts,
2. Description of design through graphic and verbal languages, and
3. Proffering solutions to different design problems.

The teaching of design studio goes through three consecutive phases, including information gathering, problem analysis, and creative studio [8]. Terrence [9] argues that introducing a specific methodology or framework to students during the design development phases can guide them through the design process. Different methods, techniques, environments, and tools are required through these phases. Site analysis, physical environment, climate, cultural environment, spatial requirements, function, budget, and technology are examined in the first two phases of the studio. Furthermore, in the last phase, the traditional teaching mode and the modern educational method vary between teacher-oriented, narrative skills, and explanation. In the traditional teaching model, question & answer and group work techniques were used as the implemented techniques [10]. While in the modern educational method, classrooms equipped with computers and digital tools are used. Student-oriented problem-solving approach is usually implemented in the design development phase or the creative studio phase. Additionally, original ideas are developed, preliminary design sketches are generated, and simulation tools generate the 3D model [8]. Diana et al. [11] claimed that a Design-by-Analogy approach would have potential in producing a high-quality result and improving the novelty of design solutions [11].

2. Creativity within Design

Creative thinking is a knowledge-based way of thinking produced by utilizing knowledge in a new format or structure. At the same time, a creative design solution is achieved through instinctive thoughts to provide a creative solution to a design problem [12]. Thus, creativity in design means assessing, controlling, and managing design attributes during any design process. Bashier [13] argued that architecture design is a combination of rationality and creativity. Joanna et al. [14] concluded that fifty minutes incubation generates a greater quantity of ideas, while extended time aids in developing much more high quality and novelty solutions [14]. Based on the integrated design theory, rational design decisions and creative ideas complement each other in producing a complete design. The typical approach used in design innovation is consensual assessment [15]. Cropley and Kaufman [15] suggested a theoretical model that supports the creative solution diagnosis scale (CSDS). This scale provides a systematic, organized, and precise approach to identify creativity and innovation in analyzing, processing, and solving any design problem. The suggested model could be utilized to evaluate concepts, procedures and identify elements of creativity through an inventive process. Moreover, this model is based on five factors including relevance, efficiency, problematization, impulsion, elegance, and genesis [15].

2.1. Creativity: Culture and Criteria

Creativity is essential for architectural students and for all parties of academic context in the larger sense. Design studio instructors encourage students to be creative in their design ideas and perspective views while utilizing traditional approaches to manage the studio through the established structural learning process of evaluating systems and tools [16]. In addition, creative studio culture must embrace alternative teaching and learning models to provide constructive and beneficial alternatives [6].
Cropley and Kaufman [18] established five creativity criterion factors and defined the relevance and effectiveness factor by correctness, performance, operability, safety, and durability. It is suggested that the most appropriate criteria are recognition, convincingness, pleasantness, completeness, gracefulness, harmoniousness, and sustainability [18]. Rahma and Noraini [17] survey showed a big difference between student's and professor's perceptions of creativity within design phases. Results in Figure 3 and Figure 4 show that most students and instructors perceived creativity in design studio as being able to provide original design solutions, take the risk of exploring unusual ideas, have different interpretations of an idea, work with inspiration, and utilize research and knowledge to solve design problems. Nevertheless, these sustainable solutions do not reflect or mention creativity [3,4,5,6,7,12,14,17,19-23].

Figure 3 and Figure 4 show that C1 to C10 are the personal behaviors to develop design concepts throughout the design studio [17]. These behaviors are:

C1: Solving a design problem successfully
C2: Find original ideas for the design problem
C3: Create sustainable design solutions.
C4: Work with inspiration
C5: Work based on research.
C6: Generate original or odd ideas
C7: Develop the concept in different ways
C8: Self-motivated to develop ideas.
C9: Taking the risk in exploring new ideas
C10: Adopt successfully rejected ideas.

2.2. Aesthetic Assessment

Aesthetic assessment is a process that involves interaction among several cognitive and emotional processes, and the two significant outcomes in these processes are aesthetic judgment and aesthetic emotion [24]. Other researchers argued that aesthetic evaluation is a cognitive process that depends on abilities, such as curiosity, imagination, aesthetic sense, innovative thinking, emotion, and evaluative judgment [5,6,7,17,23,25]. Linda [22] suggested that the assessment approaches may include:

- Assessment of learning outcomes, processes, and inputs and context.
- Objective and subjective assessment.
- Qualitative and quantitative assessment.
- Direct and indirect evident of student learning.
- Embedded and add on assessment.
3. Architectural Design Assessment

Architecture is a discipline in which individual recognition is the reward [26]. The term assessment is used to define the measurement of students' progress. Grading is the ultimate tool used in the assessment and acknowledgement of academic progress. A well-designed assessment plan establishes a reasonable phase of students' workload and allows students to self-monitor, readjust, and self-practice to achieve better feedback [25]. Design studio assessment is currently perceived as a learning tool rather than an evaluation tool. Based on this view, assessment is a learning tool in developing the student's skills and knowledge. It can be conducted through discussions with juries in different ways to acknowledge what they need to do to develop their design. For evaluation, design assessment can be in many forms like observations, interviews, continuous performance, portfolio, and project assessments [2].

Consequently, there is no single definition for architectural design assessment. Many studies concentrate on the assessment processes of architectural work. They tried to answer questions related to architectural evaluation like the definition of architectural quality, the process for selecting the best solution, the main criteria for choosing the best projects, and the evaluation phases of award-winning projects [1-3,5-7,9,10,17,20-23,25,27-32] When design assessment criteria are clear, assessing the design can be done effectively for each criterion precisely. However, in many cases, when the criteria are not transparent or precise, personal preferences (i.e., subjectivity) impact on individual and collective decision-making processes in design quality assessment [27].

Shehata and Elgendy [28] indicated that graduating students and practitioners perceive design assessment negatively, although it has valuable attributes in professional practice. Training and practice to present and write coherently about design to partners and the community are among the main goals of design assessment. Thus, this can be achieved through Juries and educators who can help foster these skills by providing practical and constructive feedback to each student's needs particularly. Traditionally, a jury is the most common assessor of design assessment, where students present their work in front of an audience composed of professors, peers, and invited professionals [28].

3.1. Objectives of Jury

In architectural design, studio education is based on practice and projects. This is why the main teaching techniques are reviews or criticisms. Jury assessment is considered a ceremonial ritual way of architectural design evaluation. A particular case is debated and argued not to choose winner or loser but to select a well-thought solution that solves spatial and social problems. The jury session is a unique collective occasion usually for celebrating the end of a design project. [29] Juries require teaching tools to execute both assessment and to educate students. In jury sessions, students present and defend their design to the jury and receive constructive criticism feedback. It can have several formats; students can participate as discussants, audience, and jurors from within and other institutions [33].

3.2. Assessment vs. Evaluation

A challenging studio learning environment contains aspects like relating knowledge to student experience and vision, a diversity of educational and learning styles, a variety of student-faculty and student-student encounters, an ability to take risks, and an opportunity to share skills to construct new knowledge and transform thinking [21]. If these are some of the activities that form the challenging learning environments, to what extent are such environments undermined by grading? Grading is entirely different from assessment, while criticism is a necessary form of assessment for learning. [19]

The review is a well-established and institutionalized procedure in architectural education that is difficult to either view it objectively or disregard its status and question its conventions [26]. The social organization of criticism impacts the learning experience and may negatively impact the students' performance and learning outcomes achievements. Therefore, design studio culture should promote, among many other issues, successful and transparent methods of student assessment, innovation in creating alternative teaching and learning methodologies [21]. Assessment is a procedure that should be objective, structured, and oriented to examine students' creative efforts to solve a given design problem. Therefore, to properly grasp the assessment and evaluation process, assessment has been classified into two categories: interim and final [2]. While an interim assessment is a corrective tool, the final assessment is an evaluative tool. In addition, student awareness of the design situation is improved through jury assessment and evaluation sessions. Jury sessions can utilize several methodologies based on the objective and location in the studio timetable [6].

According to Tanelia and Toka [30], assessment helps in establishing clear, measurable outcomes of the studio. It also provides learning opportunities to achieve learning outcomes, implement a systematic approach to evaluate the student learning achievements, and objectively assess studio objectives and teaching plans as a base step to improve teaching plans. Wikin [32] suggested that the main problem affecting assessment design studios is the large student numbers. It reduces the available time for reviewing and discussing the design details of each student. This results in the improper assessment of student's performance due to insufficient assessment time. Moreover, studio culture in some schools puts some constraints on the learning experience.

3.3. Assessment Criteria

Instructors of studios are responsible for institutionalizing studio culture that provides students with healthy work habits, creative discovery, and successful learning [21]. Buthayna [34] suggested five assessment criteria for evaluation, including function, form, context, concept, and performance. Each of these five criteria contains two indicators. For example, the function criterion is a function of space and characteristics. Form indicators include the attractiveness of the 2D and 3D composition and the originality and novelty of the produced design spatial configuration. At the same time, context is concerned with the site plan quality and its suitability.
within its surroundings regarding accessibility, landscape design, and parking allocation. The concept criterion is the intangible design layer whose indicators are character and uniqueness in design philosophy, impressions, and symbology. The last criterion is performance which includes building safety and control systems, satisfying users' needs regarding social interaction; and users' experience [34].

4. Forms and Types of Assessment

To effectively assess the types and forms of studio assessment, several formats were designed for student assessment in two different universities [27]. Seymour and Chance [27] suggested three design studio assessments including studio pin-up, written peer evaluation, and written self-evaluation. It is concluded that the most effective assessment is the one-on-one desk critique. These results align with a students' survey conducted for architecture students. It is found out that students benefit the most from the desk assessment where one-to-one discussion is undertaken [20].

According to [3, 4, 6, 7, 11-16, 18-23, 26, 33, 34, 35], the five main types of assessment identified under the interim critique within architectural studios are:

a. Individual Evaluation: This is one of the most common tools used in teaching design studios to achieve its learning outcomes. It usually comes in the early phases of design development. It is conducted through personal contact between the student and his instructor by discussing the student's work as drawings and models. Sometimes, a small group of students participates in the one-to-one discussion to obtain feedback comments on their work.

b. Formative Critique: It is conducted by presenting the design work on a poster or wall on a large scale as a pre-final presentation where evaluative and constructive feedbacks are usually given.

c. Peer Critique: It is commonly conducted in the upper levels of undergraduate design courses. It is usually arranged and structured by the instructor to assess students' discussion and constructability skills. Students benefit from having a brainstorming among their colleagues to identify and solve their design problems. Some studies suggest that peer assessment could be helpful and fair as long as it is constructive and under supervision [4].

d. Group Critique: Students present their work to their lecturer in a group of students where lecturers give feedback only. Students get a chance to learn from other students' solutions and their related comments [6].

e. Panel discussion: This type is used periodically during the semester, where a group of educators and professionals review and discuss selected projects. It is usually conducted in an interactive and participatory environment. Through this process, students get indirect feedback for their designs while getting the experience of presenting their ideas and expressing their thoughts to the community. In addition, this process helps introduce students to the most common basic terminology and concepts of design. Likewise, it provides instructors with feedback about the general development of the studio on the successes or weaknesses of the design problems formulated by the faculty.

5. Phases of Assessment

The different types of assessments are related to the sequential design phases. Studio phases in most architecture schools are composed of the following six phases. These phases are: gathering information, defining design drivers, developing adaptive design philosophy, developing schematic design diagrams, creating design concepts in terms of model and plans, and finally developing concept details in terms of the poster and model report and portfolio [4, 11-16, 18, 19, 20, 26, 33, 34, 35].

The design studio evaluation process is parallel to the sequential design phases. Its phases are as follows, establishing the evaluation purposes, setting performance criteria, defining performance standards, assessing student performance, providing feedback to students, and monitoring evaluation outcomes [31]. Maria et al. [23] argues that randomness can have an interesting role in the design process. It can provide support for some of its phases, by generating suggestive solutions that go beyond pre-conceived ideas or by modifying partial solutions in unexpected ways. Maria et al. [23] also suggest that while exploring randomness, students must take into account functional and constructive considerations, and that is why they have chosen to develop designs that are not the most random ones. Table 1 illustrates the relationship between the size of students' groups and the appropriate assessment techniques. However, the larger the attendees of groups, the more challenging to achieve productive desk critique. As a result, informal critiquing sessions (desk, Peer, and group techniques) tend to be more constructive, while formal critiquing sessions (Pannel discussion and final jury) are more evaluative [6].

<table>
<thead>
<tr>
<th>Number of Students</th>
<th>Critique Techniques</th>
<th>Public</th>
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<tbody>
<tr>
<td>Entire Class</td>
<td>Final Jury</td>
<td></td>
</tr>
<tr>
<td>Small Group</td>
<td>Group Critique</td>
<td>Panel discussion</td>
</tr>
<tr>
<td>Smaller Group</td>
<td>Peer Critique</td>
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<tr>
<td>One by One</td>
<td>Desk Critique</td>
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<td>Informal</td>
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<td>Private</td>
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Table 1. Assessment Sessions Distinguished by number of students, public-private relationship, and informal-formal perspective [6]
As a ritual, each architecture design studio is concluded with a final ceremonial evaluative critique. This critique is referred to as the final jury. In this assessment system, students present, defend their designs before the jury, and get feedback or criticism from the jury members. A jury panel is formed from instructors of other studios or even other schools or professionals. In all architecture schools, a jury session is considered a ritual ceremony [25]. It usually takes place at the end of each design course and is attended by all the students. Traditionally, the critique process is considered the backbone of the design studio teaching process. It is a structured process that provides interim feedback and a practical assessment instrument for architecture students [6]. In modern studio teaching models, the final jury is considered an evaluative tool rather than an educational tool. The jury allows students to learn from their instructors and other students through discussions on their design problems. The jury session is usually embedded into the studio timetable to control and achieve a better design process. Each studio phase requires a different methodology and structure to exploit the design process control and provide better feedback [6].


Rahma and Noraini [17], concluded that panel criticism, without any doubt, is the most preferred assessment technique for first-year students, while juries and individual criticisms are frequently used in the upper years of architectural education. At the same time, most of the studio instructors prefer panel criticism in reviewing students' work. They spend extra time in the evaluation process to achieve equality between students by comparing student-submitted designs. Design studio assessment should be criteria-based in design education. Such criteria should be developed through a committee of studio instructors. Furthermore, the grading of creativity should have the most influencing parameter in architecture education, but this influence might be positive or negative. Assessment is one of the most critical teaching activities because it assesses the success of practical studio design. Design instructors believe that students need technical training to improve their practical design skills [27, 28].

7. Conclusion

For a better education experience, students should be subjected to different assessment techniques and critique methodologies. Students should be involved in the critique assessment process even though they might not be qualified to evaluate each other. As such, they need to be groomed for critique sessions and dialogue-based feedback. It will aid the students to become architectural thinkers who can effectively solve any design problem. The above findings suggest that the formal, official views or critiques have become an essential tool in mainstream architectural education. Thus, it focuses on research related to different approaches for better learning outcomes.

The findings further showed that critique sessions are the most interactive educative tools used in architectural design studio. It can be concluded that the three sequential phases for a design studio and critique exploration are information gathering, interpretation, and schematic design. Each of these phases requires a different type, criterion, and feature arrangement of critique sessions. However, based on the above review, the types of critiques techniques are; individual critique (desk critique), peer critique, group critique (expert criticism), interim critique, final critique (jury system), panel discussion, and finally, a public critique. Thus, these findings are further classified into four design studio phases. The interim critique phase comprises of desk critique in which his expertise is required through all the design process phases, while individual critique is helpful in the analytical understanding phase. Likewise, group critique and panel discussion are useful at the interpretation phase, while individual and group critiques are helpful in the schematic design phase.

The interim critique consists of individual critique, formative critique, peer critique, group critique, panel discussion, while the final critiques comprises of summative assessment and final jury. The final jury session is a ceremonial session where professionals and peers can participate in the project's final evaluation. Selecting critique types in studio design is affected by the following parameters: students' characteristics regarding their number, maturity, and culture related to project type and complexity of instructors' attitudes and visions. Critiques and Juries should not just be viewed as a judgmental role but rather as an educational tool. Consequently, through this process students will learn to present and defend their design solution to lecturers, professional jurors, and other participants. It is a fair and transparent process in which all students are subjected to the same measure and value of jury comments. It involves peer participation through constructive criticism that can add much practicality to the parametric objectives of the jury exercise. However, the process includes a variety of essential determinants in the grading process. A comprehensive, detailed assessment sheet with understandable "rubrics" can play significant roles in the evaluation process. In comparison, qualitative and quantitative aspects of design are critical to evaluate specially with the subjective nature of evaluation. Therefore, Analytical Hierarchy Process (AHP) and Multi-Attribute Utility Theory (MAUT), and Multi-Criteria Decision Analysis (MCDA) techniques can be adopted as a framework for an unbiased evaluation system.

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