

Pathology of Studio Learning Process Based on Analysis of Donald Schön's Research on Design Studios

Omid Dezhdar¹, Iraj Etesam¹, Seyed Gholamreza Islami²

¹Department of Art and Architecture, Science and Research Branch, Islamic Azad University, Tehran, Iran

²Department of Architecture, University College of Fine Arts, University of Tehran, Tehran, Iran

ABSTRACT

Design studio has been seen as the pivotal core in architectural learning and teaching. According to the majority of researchers in architecture profession, research, and teaching, the most efficacious places in teaching and learning architecture with key functions are design studios. Understanding the process of studio learning seems to require comprehensive realization of practices which take place in design studios. Considering the unavoidable importance of this learning environment, there have not been adequate researches on studio processing. This inadequacy has various facets among the most indispensable ones is the absence of appropriate description of studio practices based on an existing teaching theory. Although Schön is considered as the most prominent researcher in this regard who has conducted regular research on describing studio practices, his theories have not been criticized adequately. This study concerns with the pathological analysis of the learning process of design studios from the criticism of Schön's teaching content. Research methodology of the present study is qualitative one using content analysis of Schön's most significant text about design studios. Pathological findings are presented in four expository relationships among epistemological structure and studio pedagogy structure, teacher status in studio, student status in studio, and student-teacher interaction.

KEY WORDS: Design Studio, Studio Learning Process, Donald Schön, Reflective Practice

1- INTRODUCTION

The design studio has been described as "the distinctive holy-of-holies of architecture education" [1]. It is also the place of professional socialization and enculturation, that is, the studio where the ethos of a profession is born [2]. Many students actually spend most of their time in design studio, where they work, study, eat and even sleep [2, 3]. The design studio traces its origins back to the concept of apprenticeship in the atelier and transformed during the Ecole-des Beaux-Arts and the Bauhaus until it evolved into its present form [4].

Traditionally, the studio has been considered a place for individual design work and one-on-one mentoring between an instructor and student [5]. Investigating research contents regarding design studio analysis manifests increasing interest in this learning environment not only in architecture but in other fields of study. Although there have been few studies for explaining characteristics of studio teaching and learning which scrutinize and analyze comprehensive studio practices in a way that a comprehensive perception of design studios is not feasible. Thus, further regular studies are required for examining the interactions among vital components of studio learning. Ochsner [6] points out:

There has been surprisingly little examination in depth of design studio as an educational environment. In particular, there seems to be almost complete silence on two questions: (1) the precise nature of the creative process in which students are asked to engage in design studio; and (2) the character of the interaction between students and faculty that would best enhance the students' learning of design. Little is written on how faculty might enhance this interaction or how they might improve the quality of their design studio instruction.

Schön is one of the most prominent researchers in analyzing and theorizing design studios. His focus on design studios is the result of his attempt for explaining professionals' knowledge and their way of coping with design problems. Hence Schön introduced design studio and showed its process as a model and pattern for other fields. Design studio represents the main foundation of his theory, i.e. 'reflective practice'. His most important work regarding design studios is his book *Design studio: An exploration of its traditions and its potentials* in which with presenting in design studios, he attempts to explain interactions among its various components and find functions for "reflective theory". The most highlighted features of this work include: 1- its text represents whatever happen in design studios and in fact manifests rich studio environment. 2- Schön's exposition of studio practices and its connection with epistemology bases is one of the most comprehensive explanations. 3- In this description nothing has been added to studio tradition and he merely describes studio practices and process.

The majority of researchers consider Schön's expressions in this work as a reference for describing design practice. This public acceptance has blocked the criticism of this theory and thus there are few, if any, criticizing

*Corresponding Author: Omid Dezhdar (PhD). Department of Art and Architecture, Science and Research Branch, Islamic Azad University, Tehran, Iran; Email: odejdar@yahoo.com

studies questioning this theory [7]. It seems that pathology of Schön's theory may lead to a better understanding of studio learning issue and illustrate a more efficacious expression of the potential problems in design studios. This study with a qualitative methodology and using content analysis of Schön's text about design studios tries to give a comprehensive representation of relations among vital components of design studios. In the first section of the study, a summary of introduced ideas regarding studio system and process is extracted and in the second part, studio learning process with an analytical-critical stand and pathologically is studied.

2. Major design studio structures from Schön's point of view

2.1 Explaining epistemological structure of studio: In 1980s Schön in his book *The Reflective Practitioners* introduced novel issues on professional knowledge and epistemology of practice. Schön analyzed the demands of professional practice and showed that in practice most real-world problems are messy and invariably unique [8]. He claims that the instrumental conception from professionals' knowledge- which depends on rational problem solving- emphasizes the issue that general rules can be applied to solve specific problems. But explaining the vast distribution of practices that an expert or professional may deal with, according to this instrumental description, is difficult. On the other hand, this outlook is inappropriate for explaining how professionals such as designers and physicians apply their knowledge in situations and conditions that are basically unsustainable and unorganized. In 1970s and early 1980s, Technical Rationality Paradigm (including rational problem solving and models of design) was considered as the dominant methodological paradigm in design research. It was felt that some of the highlighted aspects of design practice in the related fields of study like architecture cannot be upheld through scientific methodology [9]. Technical rationality believes that professional knowledge comprises theories that originate from systematic research and can apply these theories in problem solving. In this regard, practitioners are problem- solvers who are looking for optimum answers and their relationship with the reality is a sort of instrumental relation. According to the positivists, epistemology of practice, craft, and artistry had no lasting place in rigorous practical knowledge [10].

Schön emphasizes that a kind of knowledge for a directional profession like designing is vital and essential. This knowledge is mostly abstract (intelligent action in professional individuals) and cannot be described with technical rationality paradigm. Schön believes that professional practitioners have a particular knowledge which becomes institutionalized and hidden in their action model. Describing this type of knowledge due to its abstraction is difficult and is hidden in practitioner's activities [10]. This knowledge derived from predetermined rules and procedures for action and "even when he makes conscious use of research-based theories and techniques, he is dependent on tacit recognitions, judgments, and skillful performance" [10]. Schön criticizes this functional view which has its roots in technical rationality and positivist epistemology and instead introduces practical epistemology of work using concepts like reflective practice and reflective practitioner.

When a practitioner is working, he is reflecting on what he is doing. In this condition- reflection along with work- he may encounter unique situations and criticize his own work; reverse the order of conditions and restate the problem and thus keep on doing his work with a novel perception [10]. Schön calls this spontaneous way of reflection and work or doing as "Reflective Practice". Roots of this reflection can be tracked down in constructive epistemology. In Constructive epistemology, perception is a process of actively making a perspective of the world. There is one objective truth, but this truth influences his (subject's) world to a specific extend. Subject conceptions of the world, his goals from making this individual world, have indispensable consequences for this constructing world. Providing a valid conception and description from human behavior without considering this individually constructed worldview is not possible. Based on Schön's theory, public 'scientific' knowledge about design procedures and methods has limited functions in design practice. 'Essence' or 'skillful quality' of design extremely relies on this decision that "when what should be done", "which procedure and method must be applied and in what situation. "Each design situation is basically unique and requires such a decision on the part of the designer.

This new epistemological system in turn requires an educational system for training professionals. According to Schön, an educational system which is the foundation for design studio is an ideal model for this professionals' training. He has exceedingly trained architecture professionals and recognize design studio as a useful paradigm for professional training.

2.2 Explaining educational structure of design studios

How professional knowledge must be taught to students? What are the characteristics of the educational system which Schön has established for epistemological system? Schön believes that when an individual learns a job, he in fact steps into the tradition world of its practitioners. It is there that he learns their limitations, language, chronology, and models of "science-in-action". His reasoning states these prepositions can be taught desirably in his so-called system "practicum". Practicum is an environment in which students are taught through doing projects which simulate the real professional world. They can learn not only facts and techniques, but methods for reasoning and acting in confusing situations.

Design studio is a crystallization of epistemological and educational systems which represent the bases for reflective practice theory and describe the way for training practitioners- for changing into professional and reflective practitioners.

Schön aptly claims that learning takes place in students' architecture design studio from doing practice under the supervision of the studio professor [11]. Basically, practice in design studio builds on doing- individual or group- project. These projects are evaluated during the design process- as a desk crit- or after finishing it- as a jury. In fact, a cycle of supply and criticism in studio process is in action. Schön recognizes two major goals for design studio: 1- realizing this issue that architecture design is a reflection-on-action process, 2- enabling students themselves to do this type of reflection. These two processes, i.e. understanding and doing, are parallel in studio works. Both of them happen when students are designing. These two processes are the main core of educational system in design studios.

Schön lets his reader enter the design studio, where the studio professor (Quist) and the student (Petra) are playing role in an interactive educational relation. In a long script of design studio, he shows that how teaching and learning go on in the form of discussion between the student and the studio master. In this script, Schön precisely delineates that the studio master uses two ways of illustrating reflection-in-action for the students [12]:

1. language of designing
2. language about designing

Language of designing is the same as language of Drawing and talking which are parallel ways of reflection in design [12]. Language of designing is the language of architecture; a language game that the professor devises for the students and in this way reflects his level of expectation of them [12]. When the professor makes use of language for design, his speech is quite general; not only for the moment of designing something. This language is about design; a meta-language which the studio master utilizes to describe some of the characteristics of the present process and on the other hand introduce and illustrate reflection-on-action to the students.

Therefore, foundation of studio education is on this fact that architecture professional artistry is learnt only through participating students in doing design process. Schön provides two major reasons for this issue, i.e. participating students in the initial stages of design work: 1. all basic and important points of design cannot be said; they are abstractly tacit and hidden in the performance and their verbal representation is impossible. 2. In many cases, expressing these rationales is useless; since it seems that it will be more efficacious in terms of educational outlook if student himself is compelled to experience and internalize an event.

Several questions arise here: for instance, what activities on the part of participants are demanded for studio educational system? What type of interaction is established between the studio professor and the student in this system?

3- Explaining types of interactions in design studios

In analyzing Schön's description, four highlighted areas in describing relations and interactions between the professor and student can be extracted: 1. Reflective conversation with design situation, 2. Telling, Listening, Demonstrating, and Imitating, 3. Willing suspension of disbelief, 4. Reciprocal reflection in action

In each of above mentioned issues complicated levels of roles and interactions between the professor and student can be diagnosed:

3.1 Reflective conversation with design situation: At the beginning of design process, student engages with a design problem. During the work time, the studio master has some meetings with student and listens to his words. Schön assumes some roles for the studio professor: a) diagnosing the problem, b) critical reflecting on possible student's framing of the problem, c) reconstructing that framework

This is done by the practice that Schön names it as on- the- spot drawing experiment. By the use of two abovementioned roles, the professor starts an interactive conversation with design situation and attempts to exhibit it [12]. He explains that in this reflective conversation with design situation, the studio master creates conditions that may be potentials for successive reflections; this in turn may lead into creating an unexpected problem that requires subsequent reflections for its solution. Quality of how master displays this process will be explained in next section.

3.2 Telling and listening, demonstrating and Imitating: Schön entitles the studio professor to an artist and justifies it as: he knows the possibility of organization and regulating a complicated setting by the use of practices and regulations for the existing situation and likely future situations [12]. The master is not only in the part of a designer in the studio, but as an announcer. He analyzes students' problems, criticizes their performance, asks some questions, and provides them with recommendations and regulations for later practices [12]. When the master is speaking, student's task is to listen so as to understand and implement it in his work [12]. Schön use "operational attention" term for this type of listening.

Student must be ready to implement whatever he hears; especially in a way that the master wants [12]. Observing the professor's performance and listening along with operational attention can encourage students to modeling and obeying the master's performance and speech [12]. According to Schön, obeying doesn't mean imitating whatever is observed, but it is a construction process in which students must formulate an idea that is essential for the professor and display it in their performance [12]. He uses "reflective imitation" for describing this process. In this reflective imitation student tries to find a way which best adapts his work.

For Schön such a process of reflective imitation may be divided into several "moments". He emphasizes that they are not cleanly distinguished from one another in real practice [12]. These levels include: 1. Comprehending what is important in the master's performance. 2. Doing in exactly the same as the professor and substituting models in a way that student as an observer change into a producer of action. 3. Student reflection on his own performance. By reflecting on his own performance and the professor's, student is looking for producing something in action which is essentially intertwined with the professor's action. 4- Internalizing the master's performance and dominating it.

Teaching designing essentially begins with a paradox: asking students to reflect and act like an architect; while it is conspicuous that students are not capable of doing so. Indeed, they sometimes find the whole experience of the studio mysterious [12]. In this situation the professor cannot really help them since he diagnoses that the students initially do not understand fundamental concepts; on the other hand, these concepts cannot be expressed verbally because basic design concepts are just learnt practically and around design experiences [12].

3.3. Willing suspension of disbelief: A Double Paradox is in progress in studio milieu: on the one hand student doesn't know what he needs to learn, but on the other, student is responsible for his own learning and only when he starts doing can achieve self-teaching. Schön declares that this paradox can be dominated by special mechanism and thus he inaugurates willing suspension of disbelief.

Because the professor cannot convey his understanding and skillfulness except through explanation and illustration, students are asked to act on a set of actions under the guidance of the professor. After doing these actions and with providing suggestions on the part of the master, students can gain authentic experiences. Gradually students begin to understand essential elements in the professor's performance and learn to have wise choices and make correct decisions.

Schön says that students are requested to temporarily leave whatever they know and respect for. He delineates some consequences for this willing: a) confusion and ambiguity of the students. Because they are asked to put their background reflections away and instead, reconstruct them with the professor's assistance. b) Dependence on the professor and hence experiencing a reduction in his self-confidence and qualities. These two prepositions can build a situation in which the student feels lack of self-confidence and quality and sees himself as a person who swims in unknown seas and without any control or perception. A guaranteed training process requires the students to adequately trust the professor's abilities. Schön claims that those students who have higher sense of self-efficacy do not feel a threat from the professor and vice versa, those with lower sense of self-efficacy encounter some problems in dealing with this willing suspension.

3.4 Reciprocal reflection in action: Schön assumes a bilateral nature for interaction between the professor and student and calls it "reciprocal reflection-in-action". That is, the professor: a) speaks, b) gives model and the student: a) listens actively, and b) constructively imitates.

The master is not only engaging in the process of reflective conversation but reflecting on the students' conception using the students' performance as an evidence of their understanding. On the other hand, students try to understand concepts illustrated and expressed by their master and look for translating whatever they have learnt in his performance. In this perspective, every performance is an experiment which is representative of the student's recognition and translation of what he has seen or heard in his performance. This reciprocal interactive reflection will be successful only when it gains its convergence in meaning.

Schön believes that succeeding convergence in meaning demands two conditions: a) environment and context must encourage students to undertake action, b) the process of telling and listening, demonstrating and imitating must fit into a scaffolding of reciprocal reflection-in-action. Schön's description illuminates the most fundamental and in turn, challenging components in the educational system tradition of design studios. Designing instructors and professional architects are seen as professionals who teach architectural designing through learning methods and doing. The student has already started designing before even knowing how to do so; because nothing can be said to him before doing designing. In this process, the professor has the role of a guide for the student. This issue is the main base in the construct of studio education.

4. Pathology of learning process in design studio

The purpose of this section is to establish a critical narrative from displaying way of non-reflective nature of epistemological and educational studio system as Schön puts it. Schön based his work on the criticism of positivism philosophy and is known as a foundation for professional action epistemology. In describing the

idea of professional knowledge and skillful knowledge construct, the term "reflection" has been used and its various and complicated facets have been explained. A part of professional quality and proficiency is the ability of "reflection-in-action"; for instance, reacting to unpredictable situations at the top of professional proficiency.

It can be claimed that "reflective practitioner" has reflective conversation with materials of design situation. This type of skillfulness can be acquired or learnt in a camp which Schön names it "reflective camp". An intact example of these camps are design studios; a place where professors show the process of "reflection-in-action" to the student and then he tries to model the professor through reflection-on-action. Since both professor and student reflect on each other's performance, Schön names this as "reciprocal reflection-in-action". Therefore, the main core in studio learning preposition is "reflection". Generally speaking, pathology of the present study in studio learning process orbits around three major areas include:

- a. Criticizing the way of proving architecture-based presuppositions before beginning of educational interaction in studio system.
- b. Criticizing the establishment of an unbalanced hierarchy between the master and student in studio.
- c. Criticizing the way of discriminating roles between the professor and student in studio

Various dimensions of this pathology are as follow:

4.1 Different connections of the professor and student with architecture knowledge: One of the main and fundamental problems in Schön's description of design studio is his explanation of studio knowledge as a separate subject from educational process. In other words, studio knowledge and educational process are supposed to be two separate subjects.

This separation can be illustrated as follow: the studio professor, like an architect, explain and set up parameters about architecture, architectural design, reflection, and doing. In other words, the professor is determined as a parameter and transporter of these fixed and predetermined ideas. Since there is no discussion on the nature of these concepts, ideas, and activities, the student cannot realize how, why and by whom these concepts are made; whether the master has made them or they are provided only obligatory. As fixed and predetermined features, these parameters are introduced and illustrated to the students. Features that have no reference to the student's background, point of view, virtues and interests. It is obvious here that defining these presuppositions and expecting student's adjustment with these basic presuppositions caused a distinction between educational construct and student's construct.

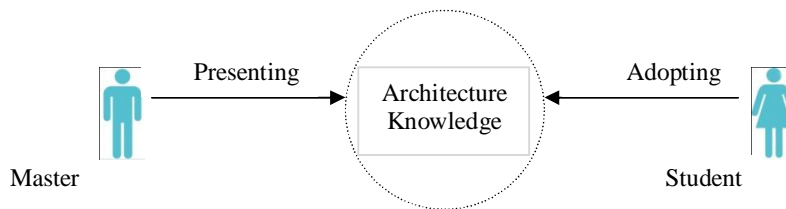


Figure 1. The master and student relationship with architecture knowledge in studios based on Schön's description

Another influential problem in Schön's description is that architecture knowledge in this description is not only predetermined but inflexible. In fact, Schön's procedure ignores the likeliness of multiple reviews and production of architectural knowledge. At the end of this section, it can be concluded that the master's relation with the construct and construction of the knowledge is non-reflective. Consequently, this problem reduces the possibility of the student's reflection on the epistemological suppositions. The student can only accept the presented ideas and conceptions and obey them. He is never invited to participate in design process through reflective and interactive production of knowledge.

4.2. Architecture knowledge and the process of student's design: This procedure of knowledge construction in educational situations has some consequences for the process of student's design. In Schön's design studio, the reference for student's reflection is made, presented, and imposed by the professor. Since the student's perspective may seem unprofessional and inappropriate in the studio, this idea and perspective is compared with that in the professor's mind. In other words, the frame of reflection for the student's reflection is what in the professor's mind. In turn, when the master is evaluating and guiding the student's work, his reference point is the fixed and predetermined ideas about architecture. In this case of Schön's educational state, the possibility of the student's reflection and question about the professor's perspective is highly restricted. Although Schön argues that the professional knowledge is diagnosed through challenges and insecurities, there is no place for such challenging situations in his description of studio.

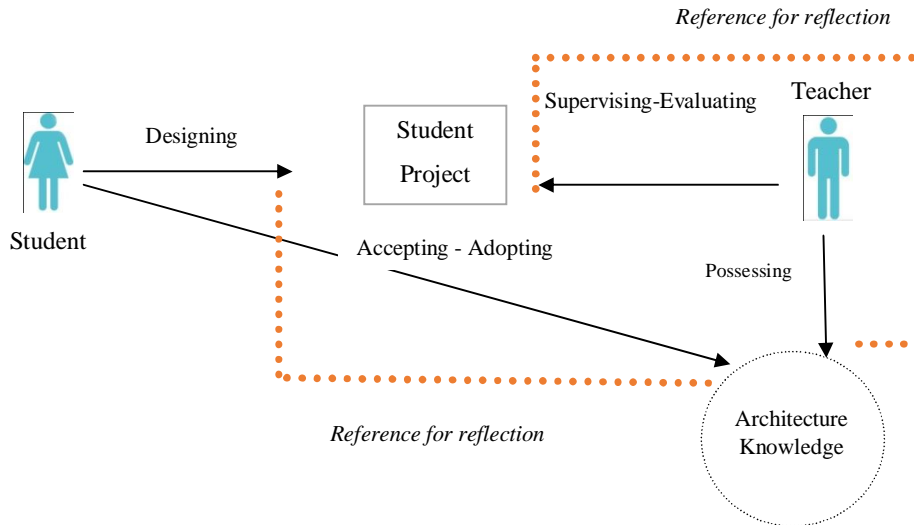


Figure 2. The relationship among professor, student, and design process based on Schön's description

4.3 Master-based approach in knowledge construction: As a conclusion from knowledge construction in design studios, the preposition of reflection in different educational situations can be investigated from two perspectives: a) student's role, b) learning process.

Since the studio learning has been established on the basis of "learning through doing" model, it is expected that the students will be active in the process of learning-teaching. Though it seems critical and active reflection-in-action in the studio milieu is absent. By investigating the language type which Schön has illustrated in his description of educational studio, a kind of instructive teaching can be detected; where the master chooses an interrogative language rather than discussion and conversation with the student; such as "you must", "you are forced". The consequence of such a language is a reduction in the possibility of reciprocal reflection on the problem. As it was explained previously, this reduction can be the result of making inflexible presuppositions about architecture and its knowledge.

One of the key concerns of Schön in the epistemology of professional practice is that the knowledge lacks an external body which enables its application for professional practices; but it is the process of knowing. Considering these explanations, still Schön has externalized knowledge and its construction and production in the studio learning process and made it far from the student's understanding zone; in a way that the knowledge student uses in his design is not "knowing-in-action".

The professor presents the knowledge here and expects the student to put it into practice in a non-reflective way. In other words, it can be claimed that the educational procedure in design studios is master-oriented. This type of relation between knowledge and action, remind us of technical rationality model which Schön himself has criticized it previously.

4.4 Hierarchy in design studio: In Schön's studio the master is speaking and illustrating through reflection-on-action (student's performance), i.e. the project. This is the student's performance which is the aim of the master's reflection; since this performance is supposed to be evidence for what the student knows and can do. The professor in Schön's studio believes that all what he needs for reflection is in the student's performance. In other words, from this perspective student's performance has superiority over his work process. As it was mentioned previously, "reflective imitation" implies that the student is expected to listen attentively to the master and implement whatever he hears or observes in his professor's speech and performance in his design. Schön uses "reflection on teacher's reflection-in-action" for the way of student's reflection in his description. In this case, master gains a central position in the process of studio learning-teaching. In this scenario, where knowledge and values are teacher-centered, the student's freedom is devalued. Such pedagogy reinforces existing patterns of thinking and fosters a sense of dependency in the student upon the tutor [6, 13, 14].

As a conclusion, this point can be acclaimed that two characteristics result in an unbalanced hierarchy in the studio: a) unilateral reflection on the master's performance and depriving the student from expressing themselves, b) student's reflective action gets its meaning from the master's demonstration rather than the student's own activities. In Schön's studio, professor's and student's reflections are considered separated; that is, on the one hand the master thinks he knows the student's performance and hence his mind, but on the other, the master is not concerned about his performance availability to the student or what is happening in the student's mind.

4.5 The professor's and student's different roles in the studio: In the two previous sections, Schön's implementation of fixed presuppositions about architecture and his establishment of an unbalanced hierarchy between master and student were discussed. Another distinction is made between roles and expectations from the master and student. In the following table, a list of roles for the master and student is presented. As a conclusion drawn from this table and abovementioned points, it can be claimed that there is an unbalanced hierarchy in all levels of the design studio: among different characteristics and roles of the master and student, expectations from both sides, knowledge construction, etc. By separating activities from their doers, this hierarchical system creates a situation which prevents bilateral relationships.

Table 1. Professor's and student's roles based on analyzing Schön's description

Master	Student	Master	Student
Teaching abilities	<i>Giving up liberty, dependent, vulnerable</i>	Constructing and memorizing professional knowledge	<i>Suspending knowledge and virtues</i>
Reflection-in-action	<i>Reflection on master's " Reflection-in-action"</i>	Providing frames of reference	<i>Obeying frames of reference</i>
Teaching (interrogative)	<i>Trusting</i>	Telling	<i>Listening, proving (operational attention)</i>
Expecting	<i>Accepting</i>	Illustrating	<i>Obeying (imitating)</i>
Active (in conveying knowledge)	<i>Passive and receiver</i>	Confident	<i>Confused and perplexed</i>
Diagnosing	<i>Having problem</i>	Professional – artist	<i>Admiring</i>

CONCLUSION

Schön, in his reflective action theory, criticizes epistemological system of positivism paradigm due to its distinction between process and product. This distinction and segregation results in the instrumental solution of the problem. The success of this technical process is assessed through the extent of achieving the predetermined goals. Epistemological empiricism separates knowing and doing from each other. However, in the epistemology of the reflective action these two are inseparable: knowing is in action, and reflection and action reciprocally complete each other.

The present study, reviewing the contents of the book *design studio*, explains the prominent and efficacious subjects in the learning process of design studios and then by adopting a critical position investigates the pathology of this process. As a conclusion for this pathology, the following instances are referred to:

- a. The professor's Knowledge is separated from the student's design (doing). This results in a condition in which research and curiosity about knowledge diminishes to the non-reflective imitating and following the professor's Knowledge and action.
- b. Teaching is considered to be separate from learning. This separation is internalized through their exposition in two different ways. Activities such as telling and demonstrating, listening and obeying, presenting and suspending are dichotomies which fade away the reflective interaction between the professor and the student.
- c. Both the professor and student are segregated from their background, a matter causing the student to receive pre-packed knowledge from his or her professor.

ACKNOWLEDGMENT

This article was extracted from PhD thesis of the corresponding author (Omid Dezhdar) titled “Pathology of learning process in architectural education of Iran” researched in Department of Art and Architecture, Science and Research Branch, Islamic Azad University, Tehran, Iran, under supervisory of Dr. Iraj Etesam and co- supervisory of Dr. seyed Gholamreza Islami.

REFERENCES

1. Boyer, Ernest L. and Mitgang, Lee D. 1996. Building community: A new future for architectural education and practice. Princeton, NJ: The Carnegie Foundation for the Advancement of Teaching.
2. Cuff, D. 1991. Architecture: The story of practice. The MIT Press.
3. Anthony, K. H. (1991). Design juries on trial: The renaissance of the design studio. New York: Van Nostrand Reinhold
4. Arida, S. 2010. More seeing in Learning. Cambridge: Massachusetts Institute of Technology. PhD.
5. Yee, S. 2001. Building Communities for Design Education: Using Telecommunication Technology for Remote collaborative Learning. Cambridge: Massachusetts Institute of Technology. PhD.

6. Ochsner, J. K. 2000. Behind the mask: a psychoanalytic perspective on interaction in the design studio. *Journal of Architectural Education*, 53(4),194-206
7. Till, J. 2005. Lost judgment. In E. Harder (Eds.), *EEAE prize 2003-2005 writings in architectural education*. Copenhagen: EAAE, pp.164-181
8. Nicol, D., and Pilling, S. 2000. Architecture education and the profession, In D. Nicol, & S. Pilling (Eds.), *Changing Architectural Education*, London: E & F Spon, pp. 1-26
9. Dorst, K. 1997. *Describing Design: A Comparison of Paradigms*. Rotterdam: Delft University. PhD.
10. Schön, D. A. 1983. *The Reflective Practitioner. How Professionals Think in Action*. Aldershot: Ashgate Arena.
11. Schön, D. A. 1987. *Educating the Reflective Practitioner*. San Francisco: Jossey-Bass Publishers.
12. Schön, D. A. 1985. *The Design Studio. An Exploration of Its Traditions and Potentials*. London: RIBA Publications.
13. Dutton, T. A. 1991. The hidden curriculum and the design studio. In T. A. Dutton (Ed.), *Voices in Architectural education: Cultural politics and pedagogy* (pp. 165-194). New York: Bergin and Gravey.
14. Willenbrock, L. L. 1991. An Undergraduate Voice in Architectural Education. In T. A. Dutton (Ed.), *Voices in Architectural education: Cultural politics and pedagogy*, New York: Bergin and Gravey, pp. 97-119