A THEORY FOR INTEGRATING KNOWLEDGE IN ARCHITECTURAL DESIGN EDUCATION

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Abstract

This paper argues for introducing a theory for knowledge integration in architectural design education. A contextual analysis of the reasons for developing a theory is introduced and reasons are categorized. The milieu of the theory is constituted in several contextual elements. The theory encompasses a number of underlying theories and concepts derived from other fields that differ dramatically from architecture. It consists of three major components: the disciplinary component; the cognitive-philosophical component; and the inquiry-epistemic component. Each of these components encompasses other smaller components integral to the building of the theory itself. Notably, the three components address ways in which knowledge can be integrated, how the desired integration would meet the capacity of the human mind, how such integration relates to the nature of knowledge and how knowledge about it is acquired, conveyed, and assimilated. Possible mechanisms for knowledge acquisition are an indispensable component of the theory, whose aim is to foster the development of responsive knowledge critical to the successful creation of built environments.

Keywords

Architectural education; knowledge integration; transdisciplinarity; design studio; systemic pedagogy.

Introduction: From Knowledge Consumption to Knowledge Production

The theory introduced in this paper is culled from a wide spectrum of issues I have explored over a period of two decades. Since architecture is created in a field of tension between reason, emotion and intuition, I suggest that architectural design pedagogy should be viewed as training toward the manifestation of the ability to conceptualize, coordinate, and execute the idea of building. This act must furthermore be rooted in humane tradition. However, this mandates a comprehensive understanding of the role of knowledge in architecture while comprehending how to integrate different modes of knowledge production. Recent years have witnessed a number of phenomenal and continuous changes in the structure of contemporary societies, the emergence of housing problems and squatter settlements, the deterioration of the built heritage, the rising complexity of large structures and new building types, and the recent interest in environmental conservation and protection. While these phenomena continue to exist, demands for multiple types of

knowledge are clearly on the rise: knowledge of how to create better environments for poor societies; knowledge of how to involve people affected by design and planning decisions in the process of making those decisions; knowledge of how to protect the built heritage; knowledge of how to design environments that do not compete with but complement nature; knowledge and how to deal with problems associated with special populations that form major parcels of contemporary societies such as children, seniors, the disabled, and the poor; knowledge that responds to socioeconomic and sociopolitical issues; and knowledge that responds to advances in building and telecommunication technologies.

This paper conceives two distinct — yet related — types of knowledge in architecture. The first type is knowledge resulted from research that seeks to understand the future through a better understanding of the past — research that tests accepted ideas. The second is knowledge resulting from research that probes new ideas and principles which will shape the future — research that develops new visions and verifies new hypotheses. Still, the typical debate about the role of knowledge and research in architecture as an academic discipline and a profession continues to exist. Within the framework of these knowledge types, the paper calls for a fresh look at architectural design education, and proposes that it should be centered on critical inquiry and knowledge acquisition and production.

A theory is conceptualized that argues for a more responsive architectural design pedagogy, enabling future architects to create livable environments. This theory emerges from and responds to societal, cultural, and environmental needs. In order to contextualize the overall environment in which the theory is developed, the reasons why it is introduced are discussed, followed by a number of aspects that characterize its context.

The theory is based on some alarming figures, the syndrome of viewing architecture as art and only art, and the syndrome of emphasizing the development of skills at the expense of knowledge. Evidently, the reasons for and the context of a theory for knowledge integration suggest a different form of thinking that goes beyond typical discussions of modifying architecture curricula or massaging studio pedagogy and the teaching/learning processes involved. The theory encompasses a number of underlying theories and concepts derived from other fields that differ dramatically from architecture, including philosophy of science and cognitive psychology. Metaphorically, the theory is conceived in terms of a triad consisting of three major components: the disciplinary component; the cognitive-philosophical component; and the inquiry-epistemic component. Each of these components encompasses other smaller components integral to the building of the theory itself. Notably, the three components address ways in which knowledge can be integrated, how the desired integration would meet the capacity of the human mind, how such an integration relates to the nature of knowledge and how knowledge about it is acquired, conveyed, and assimilated. Possible mechanisms for knowledge acquisition are an indispensable component of the theory, whose aim is to foster the development of responsive knowledge critical to the successful creation of built environments. It is believed that by

adopting this theory, future architects will have the capacity to be active knowledge producers, and not just consumers of knowledge developed by other specialists in other disciplines.

Why Introduce A Theory for Knowledge Integration?

Critical to the introduction of a theory for knowledge integration in architectural design education is a discussion of the underlying reasons for developing it. Here, I build on some of my earlier surveys and arguments developed over the past fifteen years in response to the current situation of architectural education and studio pedagogy (Salama, 1995; Salama, 1999; Salama, 2005 a). While the reasons for introducing a theory are many and multifaceted, in order to place the discussion in focus, I categorize and limit those reasons in terms of the following points: admission policies and the skills emphasis syndrome, idiosyncrasies in knowledge delivery and acquisition in architectural education, and some alarming figures on studio teaching practices.

Admission Policies and the Skills Emphasis Syndrome

Discussing admission policies as a theme within the context of knowledge integration in architectural design education raises questions more than providing answers. Architects receive their education and training in hundreds of schools of architecture around the world. Practice is typically locally regulated, but sometimes licensed (Salama, 2005 a). The practice of architectural design education appears to be remarkably similar in many parts of the world due to the overriding primacy given to the studio as the main forum for exploration, interaction, and assimilation (Salama, 1995). Such similarity enables significant mobility of architects among firms, areas of expertise and locales, even where cultural differences are dominant.

A number of important issues are revealed by surveys conducted on admission policies in over 120 schools of architecture worldwide (Goldschmidt et al, 2000; Salama, 2005 a). Results indicate that some admission criteria are more dominant than others. Emphasis is placed on high school records (93.2%). About 40 % of schools adopt a skill-based aptitude test and portfolio submission. While these numbers cannot be generalized, the different admission policies that emerged from the analysis reflect a sustained emphasis on the skills needed for enrolment, while knowledge and critical thinking abilities of applicants as they relate to architecture and the overall built environment appear to take a back seat. This is manifested in the results indicating that only 6.8% of the schools surveyed adopt a written statement approach as part of their admission criteria, and only 9.3% require critical essays as an important admission criterion. By and large, admission policies reflect the tendencies of most schools of architecture to emphasize skills in drawing and form manipulation, an aspect of architectural education that continues to be emphasized throughout the duration of study in schools at the expense of other pedagogical aspects and learning outcomes.

While the preceding figures shed light on some tendencies toward admission policies, understanding the impact of those policies on the performance of students in schools and after graduation, and on their skills and knowledge

needed for creating liveable environments, represent a challenging empirical question. Very little is known about the success or failure of admission criteria and the way in which they may shape the attitudes of future architects. Clearly, more in depth studies are urgently needed.

Idiosyncrasies on Knowledge Delivery and Acquisition

There has been — and still is — a continuous debate among architectural educators about the role of knowledge and research in architecture as a discipline and profession (Salama, 1996; Sutton, 1984). Whether in developed or developing countries, many in architecture still think of researchers as people in white smocks and thick glasses searching for the mystery and the unknown. In response, scholars and educators have emphasized that research should be viewed as part of everyday actions and experiences. They argue, and rightly so, that traditional teaching practices have long encouraged students to develop form manipulation skills by emphasizing intuition, reflective observation, and concept formation (Juhasz, 1981; Salama, 1995; Sanoff, 2003; Seidel, 1994). However, these practices are hypothetical, largely unconcerned with real life situations, and neglect equally important skills that can be enhanced through experiential learning, research, or real interaction with the realities being studied.

In traditional teaching practices, architecture students are typically encouraged to conduct site visits and walkthrough the built environment in order to observe different phenomena. Unfortunately, research indicates that these visits and exercises are simply casual and are not structured in the form of investigation or inquiry (Salama, 1995, 1996, 2005 b, 2006). As a result, students do not know what to see and what to look for in the built environment. The case would be worse when educators attempt to offer students ready-made interpretations about the physical world in lectures and seminar classes, leading to students' inability to think critically or develop their intellectual skills. This handicaps their abilities to gather, analyze, synthesize, and process different types of information. Traditional teaching practices have contributed to the view of architecture as an art-based profession, oversimplifying other critical views of it as a knowledge-based or research-based educational discipline and profession (Salama, 2007 a). In response, current discourses have heavily emphasized the value of knowledge acquisition and of the introduction of research based pedagogy (Fisher, 2004; Groat, 2000).

While architectural educators strive to impart the requisite knowledge necessary for successful practice, the way knowledge is transmitted has significant professional and social implications (Mazumdar 1993; Salama 1998). Concomitantly, there is an urgent need to confront issues that pertain to the nature of reality ("what") and the way in which knowledge about that reality is conveyed to our budding professionals ("how"). Traditional teaching practices suggest that gaps exist between "what" and "how". Along this line of thinking, Amos Rapoport (1994) argues for the need for the discipline of architecture to develop a quantifiable body of knowledge by calling for a dramatic departure from the art paradigm that the profession and its education are based upon, towards one based on science and research. Rapoport introduced a number of questions underlying the heading of "knowledge about better environments"; these are: "what is

better, better for whom and why is it better?" (Rapoport, 1994:35). A set of misconceptions can be envisaged in this context based on reviewing the recent literature on architectural education (Salama, 1995; Salama and Wilkinson, 2007; Seidel, Eley, and Symes, 1995).

Science as a body of knowledge versus science as a method of exploration

When teaching any body of knowledge, educators tend to present it as a body of facts and theories and as a process of scientific criticism. The processes that led up to this product are often hidden and internalized. There should be a distinction between the types of knowledge resulting from research in architecture, and students should be made aware of them and experience them as well. First, we have knowledge that results from research that seeks to understand the future through a better understanding of the past, research that tests accepted ideas. Second, we have knowledge that results from research that develops new hypotheses and visions, research that probes new ideas and principles which will shape the future.

Learning theories about the phenomena versus getting the feel of the behavior of the phenomena

Knowledge is usually presented to students in a retrospective way. Nevertheless, abstract and symbolic generalizations used to describe research results do not convey the feel of the behavior of the phenomena they describe (Schon, 1988). The term retrospective here means extensive exhibition of the performance of the work of an architect over time. In essence, the analysis of precedents as part of the curriculum should be introduced. Integral parts of learning include how projects were created and in what context, what was the client nature and intentions, how the project was delivered, and how construction was undertaken. The story-telling teaching mode carried out by educators in lecture and theory courses tends to ignore these issues.

The real versus the hypothetical

Educators tend to offer students hypothetical experiments in the form of hypothetical design projects, where many contextual variables are neglected. In this respect, learning from the actual environment should be introduced. Real-life experiences can provide students with opportunities to understand the practical realities and different variables that affect real-life situations. Typically, educators focus on offering students ready-made interpretations about the built environment rather than developing their abilities to explore issues that are associated with the relationship between culture and the built environment. If they do, they place emphasis on one single culture, which is their own.

In the context of discussing the preceding idiosyncrasies, it should be noted that recent years have witnessed intensive discussions on the value of introducing real-life issues in architectural teaching (Morrow, 2000; Morrow et al., 2004; Morrow, 2007; Romice and Uzzell, 2005; Salama, 2006; Sanoff, 2003, and Sara, 2000). However, while published experiences have debated innovative practices exemplified by exposing students to primary source materials in studio processes, little emphasis has been placed upon how real life issues could be introduced in theory and lecture courses.

Some Alarming Figures on Studio Teaching Practices

In 1994, I conducted a survey study of approximately 100 studio instructors from different parts of the world, representing 28 schools of architecture in 13 developed and developing countries. The results were less than appealing, and indicate a number of alarming shortcomings. While discussing all of them might go beyond the scope of this paper, certain negative tendencies indicating the lack of a responsive knowledge base should be highlighted.

A considerable number of design instructors view architecture as an art of making, not as an act of making. Therefore, developing communication and form manipulation skills represents 29.5% of the total objectives they have stated. This supports the argument that creativity is defined in terms of creating, inventing, and manipulating formal configurations. Creativity in this sense is limited to only intuition and talent.

On the one hand, drawing skills appear to be the most important ability that determines a student's performance as ranked by majority of instructors surveyed. This supports my earlier hypothesis that many architectural educators focus on issues important to an audience of fellow architects (Salama, 1995) and to this audience only (Cuff, 1991), rather than focusing on issues important to their clients and responsive to users' needs. On the other hand, although 48.6% of design instructors state that they introduce social issues, and the majority mention they introduce aspects related to user needs, special populations, and accessibility, only half of them believe that allowing students to develop the architectural program should be the most important approach. In this context, architectural programming process is referred to as a procedure for developing a set of design imperative that relate to user population. Moreover, 44.7% of instructors tend to focus on the "how" of design, which represents that act of designing after all the major decisions have been made. In essence, this reflects the fact that design instructors tend to be inconsistent regarding their ideologies and what they do to achieve their beliefs.

While 75.7% of design instructors believe that focusing on the design process is more important than focusing on the product, only 32.4% believe that identifying design problems is more important than developing concepts toward solutions. Such inconsistency supports the argument that design studio teaching continues to place emphasis on the design product rather than on exploring responsive methods and techniques for designing. Thus, students have insufficient opportunities to attain the ability of exploring the nature of knowledge and its role in design, where design experience is limited to concept formation and schematic design.

Strikingly, the non-response rate to some of the issues was high, and this reflects a typical negative attitude among design instructors that can be traced to several factors. One factor is that some might believe that their way of teaching is unquestionable; their attitude tends to go like this "We have been doing this for many years and we produced high quality professionals." Another factor pertains to the tendency to consider teaching practice to be an intuitive process (based on some form of improvisation), and based on subjective viewpoints and personal feelings. Another pessimistic factor relates to the fact that some instructors did not have any idea

about some of the issues discussed in the survey, or they do not feel comfortable stating or citing their preferences and teaching styles.

While the preceding figures are drawn from results of a 10 year old survey, my current research (Salama and Wilkinson, 2007) and surveys (and also recent literature) corroborate that the results are still valid and represents a continuous concern for improving the status of design studio teaching and integrating the missing knowledge components in architectural education.

The Milieu of the Theory

Any theory is conceived, developed and may be implemented in a specific context. Such a context may encompass contradicting elements while at the same time may act as a driving force for validating and testing the theory. The context of a theory for knowledge integration in architectural design education can be exemplified by three general aspects: a) Derived from the reasons for introducing a theory there are negative impacts, produced by traditional teaching practices, which characterize the context, b) certain paradigm shifts do exist reflecting new ways of understanding and approaching the design of built environment in education and in practice, c) the negative impacts and paradigm shifts lead to a number of contextual questions that the theory attempts to address.

Negative Impacts of the Current Culture of Architectural Education

Clearly, the reasons for introducing a theory produce negative impacts on the professional environment within which education and practice takes place. Looking at any documented discussion in the literature on architectural education one can comprehend a reference to one or more of these impacts. In my earlier work (Salama, 1995; Salama, 1999), I have identified those impacts in terms of a) architectural education culture; b) its impact on students and practitioners; and c) its impact on the profession's context.

The current culture of architectural education is characterized by high advocacy and low inquiry while most criteria for students' performance and success are ambiguous. It adopts a research strategy shaped by low emphasis on developing or even critically examining current theories of precedents. It socializes its members through high emphasis on form and abstract aesthetics while superficially adopting fragmented pieces of knowledge on technology, ecology, social sciences, sociopolitical and socioeconomic aspects (Salama, 1995).

The impact of this culture on students and practitioners is envisioned in terms of the difficulty they encounter in explaining their work to others, and the inadequate language they use when communicating with non-architects. Moreover, such a culture leads students to learn to develop hypothetical solutions but not to test them; and learning to defend their final product (project) but not to explain the process that led to it (Salama, 1998, Salama, 2005 a). Experience indicates that if this culture continues to exist without true honest intervention, practitioners would continue to have limited understanding of construction technology (traditional and modern), limited knowledge of the impact of buildings on the environment; and limited ability to predict the impact of buildings on users.

What one would expect of the impact of the current culture on the overall profession's environment is that architects will continue to be seen as people with some special talents and regarded as expensive luxury — and in essence, society will continue to place low value on architects. By default, this is leading to buildings that are functionally and economically inefficient, users' dissatisfaction with what architects do, while the general discouragement for seeking architectal services takes place.

The Shift from Mechanistic Pedagogy to Systemic Pedagogy

There is strong evidence that a shift in education and practice does exist (Schon, 1973, 1988; Ackoff, 1974; Salama, 1995, Salama, 2002). Such a shift is best expressed from "mechanistic" to "systemic" pedagogy. Following the mechanistic paradigm, the educational process of architecture is reduced to a large number of disconnected components. Education is decomposed into schools, curricula, grades, subjects, courses, lectures, lessons, and exercises. In this respect, I argue that formal education has never been treated as a whole, nor is it appropriately conceptualized as part of a process much of which takes place within society; a characteristic of the systemic paradigm.

The mechanistic orientation of pedagogy results in the treatment of students as if they were machines with the combined properties and characteristics of tape recorders, cameras, and computers. The student is evaluated with respect to his/her ability to reproduce what he/she has been told or shown. In turn, examinations are tests of the ability to reproduce material previously presented to the examined. They are designed to serve the system's purposes rather than the students' needs. In the mechanistic paradigm, educators make little or almost no effort to relate the pieces of information they dispense. A course in one subject does not refer to the content of another. This reinforces the concept that knowledge is made up of many unrelated parts, and thereby emphasis is placed on hypothetical design assignments (or paper architecture) rather than real-life issues. Inversely, the systemic paradigm focuses on grasping the relationships between different parts of bodies of knowledge.

In the context of relating the systemic paradigm to the need for knowledge in architectural education, one should relate to two important statements made by Alexander (1966) and Habraken (2003). According to Alexander (1966) three basic abilities for investigating and understanding the physical environment are critical. These are: a) the holistic behavior of the phenomenon which we are focusing on, b) the parts within the thing and the interaction among those parts which causes the holistic behavior we have defined, and c) the way in which this interaction among these parts causes the holistic behavior defined. While Alexander introduced these abilities in abstract terms, Habraken's recent statement — arguably while appearing to assert what Alexander called for 40 years ago — addresses architectural educators specifically "We need to teach knowledge about everyday environment. How it is structured, what we can learn from historic and contemporary evidence, how different examples compare, how it behaves over time and responds to change of inhabitation or other circumstances... Teaching architecture

without teaching how everyday environment works is like teaching medical students the art of healing without telling them how the human body functions. You would not trust a medical doctor who does not know the human body. Knowledge of everyday environment must legitimize our profession... (Habraken 2003: 32).

The systemic paradigm introduced some alternative concepts. These are exemplified by: 1) some subjects are best learned by teaching them to oneself, 2) some subjects are best learned by teaching them to others, 3) some skills are best learned through demonstration and instruction, and 4) some fundamentals are attained in seminar discussions guided by one specialized in the relevant area. While the mechanistic paradigm in design pedagogy is based for the most part upon showing-telling modes of communication, the systemic paradigm places emphasis on learning by experience, learning by exploring and doing, while adopting the hidden curriculum concept — a concept that expresses the interactional process and the everyday experiences manifested by the daily routines of students and teaching staff.

All in all, I argue that while the mechanistic paradigm still prevails in most schools of architecture, current discussions on architectural education and its underlying culture reveal that there are some hopes toward adopting the systemic paradigm (Boyer and Mitgang, 1996; Koch et al., 2002; Salama and Wilkinson, 2007).

Knowledge Content Transformations

Several transformations are being witnessed as a reaction to a number of transformations or paradigm shifts. Three knowledge content areas are emerging to reflect continuous shifts in knowledge content. These are: environment-behavior studies (EBS), sustainability and environmental consciousness, and digital technologies or virtual practices (Salama, 2007 a).

For example, environment-behavior studies (EBS) is a knowledge component integral to creating better environments, which can be seen as a response to the shift in thinking from emphasis on things to emphasis on relations between things. It adopts the vision that the properties of the parts can be understood only from the dynamics of the whole. Taking housing as an example, such a shift becomes clearer. The value of housing is assumed to be in the quantifiable attributes of dwellings, sometimes including their immediate environments. This view is already transformed where housing values lie in the relationships between the process, the product, the users, and the social and environmental contexts. After housing has been conceived for decades in terms of what it is, now it is regarded in terms of what it does for local populations and the way in which people interact with their home environment.

As one form of knowledge content transformation, the field of environment-behavior studies (EBS) has emerged in the late 1960s and flourished in the 1970s onward (Altman, 1975; Bechtel, 1997; Moore, 1979; Rapoport, 1969; Sanoff, 1992; Sommer, 1969). Recent literature indicates that it was a reaction to the failure of modernists in addressing contemporary crises such as housing problems, squatter settlements, and the deterioration of historic cities. Many critics called for the reconsideration of the social and behavioral aspects of architecture (Proshansky, 1974).

The disastrous consequences of the Pruitt Igoe project in St. Louis, Missouri in the United States (dynamited by city authorities in 1972 after becoming a social ghetto) are often cited in the environment-behavior literature as a prime example leading to the growth of the field.

Environment-behavior paradigm can be defined as the systematic examination of relationships between human behavior, cultural values, and the physical environment (Moore, 1979). The primary reason of why an explicit emphasis on this field has become an essential part of architecture is simply because the common sense of the architect is not the common sense of the user (Prak, 1977). Considerable research corroborates this view and indicates that the attitudes and values of professionals differ dramatically from those users they are to serve (Groat, 1982; Nasar, 1988; Sanoff 1991; Seidel, 1981 & 1994). This difference was addressed by the international academic community of architecture by implementing several underlying concepts that include pre-design research, architectural and project programming, post occupancy evaluation, user participation, and community design. Recent literature on education shows that these areas occupy a considerable position in architectural curricula world wide (Boyer & Mitgang, 1996; Salama, 1995 & 1998; Sanoff, 2003).

Another form of knowledge content transformation is sustainability and environmental consciousness. In the last two decades, the concept of sustainability has emerged in response to several environmental problems. Ecological consciousness was raised as a reaction to the overall overwhelming global environmental degradation. Many conferences, symposia, and colloquia have addressed environmental issues on the policy-making levels. Law-, policy-, and decision makers have tailored lengthy regulations and guidelines in order to maintain a sense of responsibility toward the environment (Duggan and Mitchell, 1997; Mokhtar, 1999; Salama et al. 2002; Salama and Adams, 2004). The old paradigm has been characterized by three basic assumptions: man is more valuable than nature, man has the right to subdue and conquer nature, and man has no responsibility for nature. The new paradigm, however, is conceived to value the environment alongside economic development, and to value social equity alongside material growth.

Eco-development, ecosystem planning, bioregional planning, and green and sustainable design are all new ideologies and concepts that place emphasis on resolving environmental problems caused by human activities. They address the kind of development that meets the needs of the present generation, without compromising the ability of future generations to meet their own needs (ECE, 1996). Within the realm of sustainability, I argue that it relies on a change in culture, supported by an adapted economic system and fed by appropriately used technology. The same technology that has been employed to subdue and conquer nature needs to be employed for the benefits of nature. It is believed that this characteristic of the new paradigm creates the need for mature and competent professionals. Accordingly, the new sustainable society will need to identify non-material means for non-material needs. In response, professional development will need to include the practice of interdisciplinarity and transdisciplinarity, and to develop lifelong

learning skills. However, it remains to be seen if architectural design education would be able to accommodate such knowledge content in an effective manner.

Digital technology or virtual practice is the third form of knowledge content transformations. Recent years have witnessed advances in the development of telecommunication technologies. Digital technologies and design in virtual environments are re-shaping architectural education and practice (Beamish, 2002; Maher et al 2000; Schon et al., 1998; Yee et al., 1998). Advances in electronic design and communication are reconfiguring the primary educational setting — the design studio, which is the backbone of architectural education. Early experiments that represent this paradigmatic trend have been conducted in the early 1990s by prominent academics: William Mitchell at MIT, and John Gero and Mary Lou Maher at the University of Sidney. Their attempts went beyond the introduction of computer aided design (CAD) courses in architectural curricula to incorporate virtual design practices in studio teaching.

Developments in CAD, visualization, and digital modelling coupled with the advanced technology to communicate data, images, and life action design experiences, have enabled virtual dimensions in studio instruction. Students no longer need to gather at the same physical space and at the same time to solve the same design problem. In virtual environments, critics can comment over the World Wide Web or by electronic mail, and jury members can make virtual visits to architectural students without being in the same room. Thus, the traditional studio setting is changing by utilizing computers and telecommunication technologies with participants reaching across geography, cultures, and regions. Although this trend has started in the mid 1990s, it is believed that its impact on architectural education will be dramatic in the near future.

The preceding discussion of these transformations corroborates my conviction that a new way of thinking about architecture and its education is taking place. They pose themselves on the map of interests of both academics and practitioners, and thus are contributing to the restructuring of architectural education.

Pressing Questions – Urgent Answers

We are living in a complex world, a world in which no one discipline will have the upper hand in solving environmental and societal problems as they relate to architecture and the creation of livable environments. Evidently, the reasons for developing a theory and the context within which such a theory is envisioned —including knowledge content transformations — reveal some critical questions that require urgent answers. They act as a contextualizing mechanism for calling for the need of a new theory. These questions can be stated as follows:

- ***Does the current system of architectural education introduce and integrate different types of knowledge needed for the successful creation of built environments?***
- ***Does the current system of architectural education place high value on research and knowledge acquisition?***
- ***Has it responded to the dramatic changes the profession is witnessing?***

• Has it reacted effectively to the demands placed in the profession by society?
• Has it responded to the knowledge content transformations?

Based on the current context of the profession and its underlying ills, one can answer that the current system of architectural education still socializes its members into predominantly artistic terms. It still focuses on social, technological, or economic terms, still focuses on skill development, still adopts pedagogical methods and design approaches not equipped to efficiently and effectively address contemporary problems. The value of introducing a theory becomes evident when sustaining our thinking of these questions and their answers.

The Theory Apparatus

A theory for knowledge integration suggests a different form of thinking that goes beyond typical discussions of modifying architecture curricula, or massaging studio pedagogy and the teaching/learning processes involved. Here, I argue for a comprehensive theory that encompasses a number of underlying theories and concepts derived from other fields, and these differ dramatically from architecture by including the philosophy of science and cognitive psychology. The theory is metaphorically conceived in terms of a triad consisting of three major components: the disciplinary component; the cognitive-philosophical component, and the inquiry-epistemic component. Each of these components encompasses other smaller components integral to the building of the theory itself. Notably, the three components address ways in which knowledge can be integrated, how the desired integration would meet the capacity of the human mind, how such an integration relates to the nature of knowledge, and how knowledge about it is acquired, conveyed, and assimilated. Possible mechanisms for knowledge acquisition are an indispensable component of the theory, fostering the development of responsive knowledge critical to the successful creation of built environments (Figure 1).

The Disciplinary Component: Beyond Mono-Disciplinarity

"…. Architects who have aimed at acquiring manual skills without scholarship have never been able to reach a position to correspond with their pains…"
Marcus Vitruvius Pollio, Ten Books on Architecture, 100 B.C.

Theorists and practitioners have been discussing the issue of architectural knowledge for several decades. Recent years, however, have witnessed intensive debates in built environment literature. Donald Watson attempted to define a demand for knowledge in architecture and the built environment. He argues that: "The discipline of architecture needs a rigorous knowledge base by which to support its premises and principles that define the relationship between human and community health, and between building and urban design," (Quote from Boyer and Mitgang, 1996). Henry Sanoff confirms this view when he argues that architecture should be based on knowledge of people needs; it should not be based just on the creative impulses of architects (Sanoff, 2003).

Planning and architecture, like other fields of vocational expertise, can be classified as professional disciplines, especially when we regard them as fields of inquiry (Becher, 1989). Ulf Sandström has followed the development in

profession-related studies since he identified two trends in research and knowledge production in the field of professional expertise: one which is oriented towards the production of mono-disciplinary academic knowledge, and the other which is directed towards subjects derived from concrete life situations, these being solution-oriented (Dunin-Woyseth, 2002). King and Burnell offer a broad and convincing representation of what constitutes an academic discipline. They propose several aspects that include a community, a network of communications, a tradition, a particular set of values and beliefs, a domain, a mode of inquiry, and a conceptual structure (Becher, 1989). Another definition, by Toulmin, focuses more on epistemological considerations, presenting disciplines like this "...each is characterized by its own body of concepts, methods and fundamental aims" (Becher, 1989).

The work of Klein, 1998; Ramadier, 2004; and Lawrence and Depres, 2004 suggest that transdisciplinarity is envisioned to tackle complexity while challenging fragmentation. As a mode of knowledge production, it is characterized by its hybrid nature and non-linearity — transcending any academic disciplinary structure. Transdisciplinary knowledge is a result of inter-subjectivity — a process that includes practical reasoning of individuals within the constraints of social, organizational, and material context, requiring continuous collaboration between different

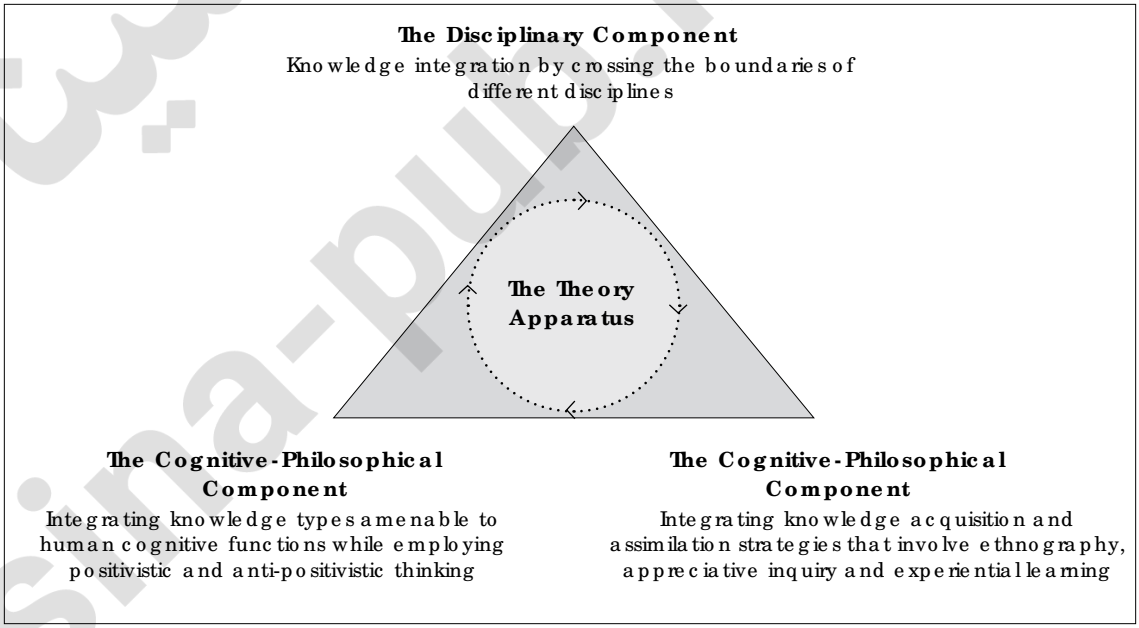

Figure 1: Components and mechanisms of a theory for knowledge integration in architectural design education. (Source: A. Salama).

disciplines (by crossing their boundaries) (Dunin-Woyseth and Nielsen, 2004). Transdisciplinarity entails making linkages not only across disciplinary boundaries but also between theoretical development and professional practice, addressing real world problems and contributing to their solution. As a practice-oriented approach, transdisciplinarity is not confined to a closed circle of scientific experts, professional journals and academic departments where knowledge is produced. Through mutual learning, the knowledge of all participants (from different disciplines) is enhanced, including local knowledge, scientific knowledge and the knowledge of concerned industries, businesses, and non-governmental organizations (Nowotny, 2004). The sum of this knowledge is greater than the knowledge of any single partner. In the process, the bias of each perspective is also minimized (Figure 2).

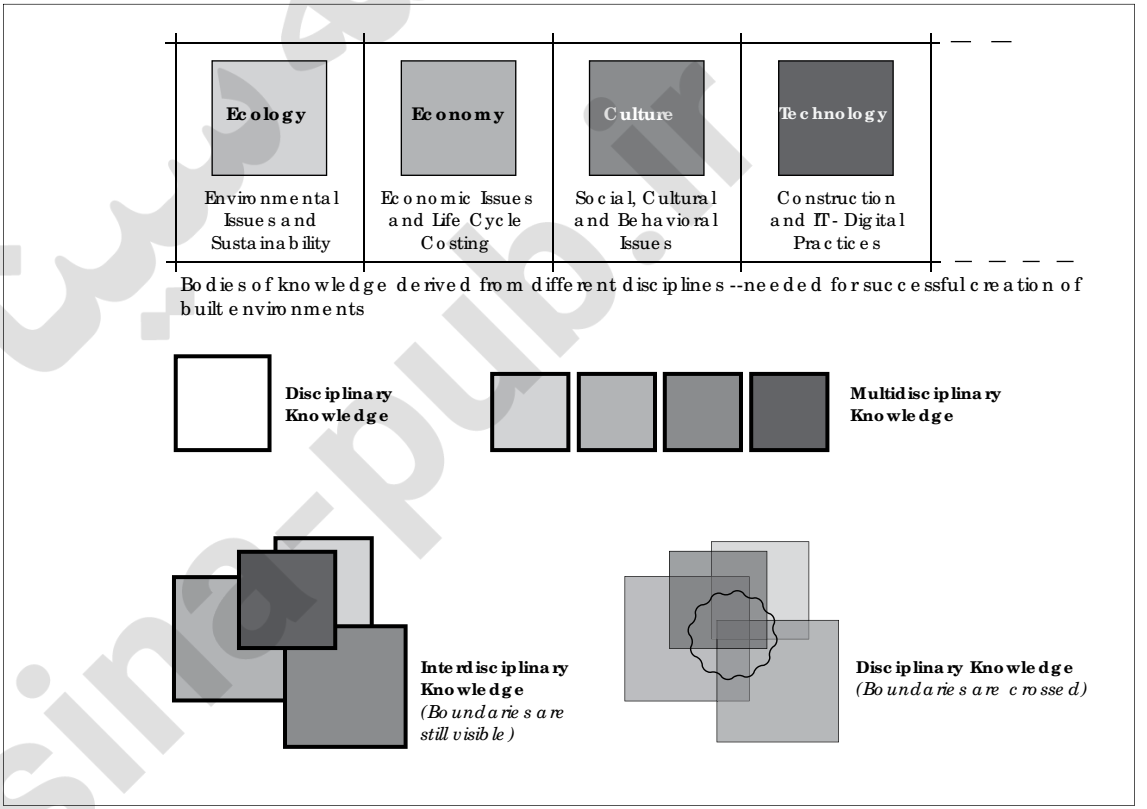

Figure 2: Transdisciplinarity and its challenging to disciplinary boundaries and knowledge fragmentation. (Source: A. Salama).

To date, the development of rigorous theory/knowledge building has been at the edge of the profession and frequently marginalized as something separate from the profession of architecture, that is: environment-behavior studies, building sciences, environment-technology studies, etc. As a result, most practitioners are not well equipped or even interested in understanding the value of their professional services. Concomitantly, the standing of the profession is marginalized in the eyes of the public. I argue here that without research, scholarship and a rigorous knowledge base, the profession cannot take stands on significant health, economic, social, political or ethical issues. In essence, this component calls for a more stable basis for knowledge in architecture and in the creation of built environments. Such a basis would be in the form of more balanced and integrated types of knowledge. The accommodation of transdisciplinarity toward knowledge integration in architectural education is discussed later.

The Cognitive Philosophical Component

Integral to the cognitive philosophical component is the way in which we approach designing built environment based on our capacity as humans, and based on the nature of knowledge about the realities we encounter. Therefore, this component is structured in three sub-theories or body of concepts: the split brain theory, Jungian psychological types (epistemological balance), and the two widely held concepts about the nature of reality and they way in which knowledge about that reality is conveyed.

The Split Brain Theory

Mind research provides insights into the understanding that we possess two different but complementary ways of processing information. A linear step-by-step process analyzes the parts that make up a pattern, working on the left side of the brain; and a spatial relational style seeks and constructs patterns, working on the right side of the brain (Williams, 1983, Salama, 1995; Salama, 2005, b; Salama, 2007 b).

Both sides of the human brain perform cognitive operations, but each is developed or trained for a different mode of thinking. On the one hand, the left side is usually described as analytical, linear, and sequential, moving from one step to the next in a step-by-step manner. This way, it produces knowledge through inferential logic. For example, it deals with number, words, and parts. On the other hand, the right side of the brain is usually described as synthetic and wholistic, constructing parts while recognizing their underlying relationships. It does not function linearly, but simultaneously, dealing with images, patterns and wholes. It produces knowledge through intuitive and imaginative understanding (Figure 3).

Linking the split brain theory to knowledge integration in architectural pedagogy, I argue that architectural education is unique since it requires the full activation of the two sides. It encompasses courses that address bodies of knowledge that are rational, analytical and abstract in nature while implementing them into intuitive and imaginative design activities.

Psychological Types and Epistemological Balance

I refer in the context of this subcomponent to Carl Gustav Jung whose work had a strong impact on analytical psychology (Jungian

Psychology) and also (but with lesser impact) on understanding human thinking and behavior. Jung emphasized the importance of balance and harmony. He cautioned that modern humans rely too heavily on science and logic and would benefit from integrating spirituality and an appreciation of the unconscious realm (Jung, 1987).

The psychological types or the epistemological balance that Jung called for matches the concept underlying the split brain theory (Jung, 1976). Within such a balance, it is postulated that people can feel, think, perceive, and imagine both as individuals and in groupings. However, it is conceived that some human functions tend to inhibit other functions. Thinking and feeling, perception and intuition, and introversion and extroversion block each other. Each function in this balance has its own particular area in which it performs better than in others. According to Stamp (1994), feeling excels at well-being and belonging, thinking excels at distinguishing one's physical surroundings, intuition excels at generating options, introversion produces personal view points, and extroversion enables people to share thoughts and ideas with others.

Arguably, and for the purpose of classification, if architecture as an educational and professional discipline is composed of art and science, then one could assert that the art component is addressed by human functions such as feeling, intuition, and introversion, while the science component is addressed by thinking, perception, and extroversion. This understanding would have strong implication on the way in which architectural curricula and their contents are structured, and also on the processes and procedures adopted in studio pedagogy (Figure 3).

Philosophical Positions

There are two basic philosophies that can be conceived as the basis for understanding architecture and its education: positivism and anti-positivism. Derived from these philosophies, two positions are conceived based on ontology and epistemology. As defined by most dictionaries, ontology is the branch of metaphysics that deals with the nature of being or reality, while epistemology is the branch of philosophy that examines the nature of knowledge, its foundation, extent, and validity. It examines the way in which knowledge about a phenomenon can be acquired and conveyed.

How these two positions are translated to a practical understanding in architectural education is a conceptual challenge. Positivism relating to ontology adopts the premise that objects of sense perception exist independent of the observer's mind. This means that reality is believed to be objective and available for observation by every one. Relating to epistemology, positivism views knowledge as being independent of the observer and as objectively verifiable. Mazumdar (1993) made a perceptive understanding and argued that positivists believe that the best way to learn about a phenomenon is by the discovery of universal laws and principles. In positivism, a building is seen by educators and students as an objective reality with components and parts that every one can observe, perceive and agree upon. Therefore, adopting the positivistic understanding results in an emphasis on the common properties of buildings or

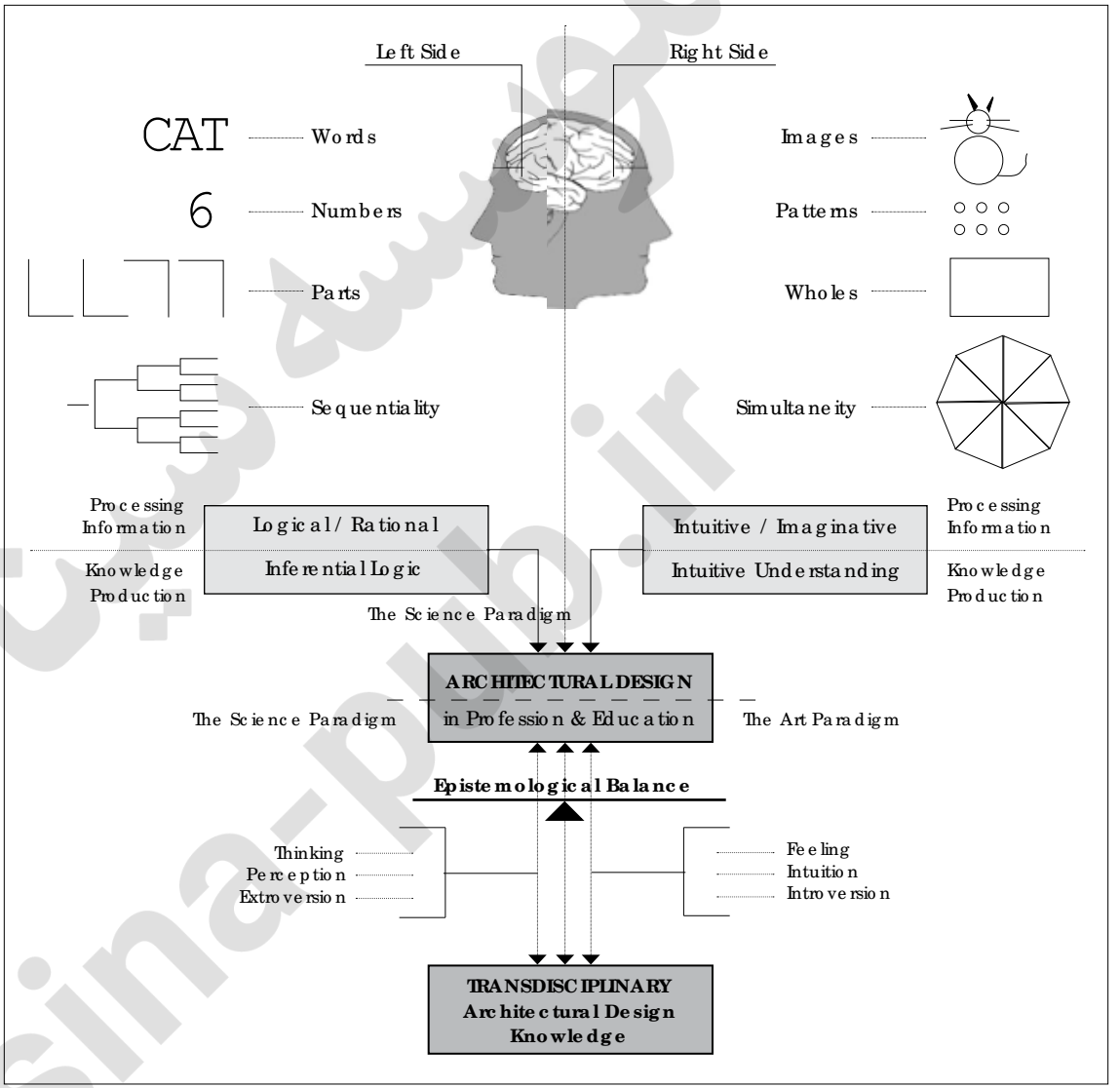

Figure 3: Linking the Split Brain Theory and Jungian Epistemological Balance to architectural pedagogy and learning. (Source: A. Salama).

built environment leading to the suppression of multiple view points, thoughts and voices (Salama, 1999).

Reversibly, anti-positivism relating to ontology involves the conception that universal laws and principles do not exist of the observer's mind. This means that reality is believed to be perceived by people as individuals and as groups. In epistemological terms, anti-positivism adopts the understanding that individuals and groups acquire different types of knowledge about the same phenomenon. This leads to the conception that individual and group differences are regarded as valid and important mechanisms. Concomitantly, adopting the anti-positivistic view would result in an emphasis upon values, preferences, lifestyles of people — who use, perceive, and comprehend the built environment — while leading to the presence of multiple understandings, perceptions, and viewpoints.

The implications of these two philosophical positions are critical for a pedagogy that aims at integrating different types of knowledge as they relate to people. While it is inevitable that certain aspects of knowledge about architecture and designing built environments are conveyed based on positivistic approaches, it is important to think of other aspects that accommodate anti-positivistic thinking. Those have the capacity to instill in future architects the values and convents that their work is basically produced for people to use, see, and perceive, and that therefore understanding them is critical to successful designing.

The Inquiry-Epistemic Component

The inquiry-epistemic component addresses methods and tools by which knowledge is acquired. Integral to this component are three mechanisms or kinds of studies indispensable to knowledge acquisition and assimilation for understanding the relationships between people and their environments, and for developing responsive architecture and planning schemes. Similar and complementary in nature as immersing knowledge acquisition strategies, the mechanisms are ethnography, appreciative inquiry, and experiential and active learning.

Ethnography

Ethnography refers to the genre of writing that presents varying degrees of qualitative and quantitative description of social and behavioral phenomena as they relate to the built environment. The work of Hemmensely and Atkinson (1995) and Johnson (2000) reveals that ethnographic methodologies vary from the use of structured observations, to coding and statistical analysis. In essence, Ethnographic studies are based on the premise that any phenomenon and it underlying properties cannot be well understood independently of its context exemplified by other phenomena.

In architectural design education, ethnographic studies can be utilized in various forms, from the macro level (macro-ethnography) to the micro level (micro-ethnography). These address broadly or narrowly defined cultural groupings according to the scale of design or planning projects. Relating to the philosophical positions discussed in the preceding section, ethnographic studies may involve -emic or -etic perspectives. The Emic perspective represents the way the member of a given culture perceives the environment around them, while the Etic perspective represents the way non-

members (outsiders) perceive and interpret behaviors and phenomena associated with a given culture. These perspectives are important components that students need to understand, and their resulting knowledge needs to be incorporated in their design assignments.

Appreciative Inquiry

Over the past decade Appreciative Inquiry (AI) emerged as a practice for approaching change from a holistic framework (Hammond, 1998; White, 1996; Cooperrider, 2000, 2001; Watkins and Mohr, 2000). Based on the belief that human systems are made and imagined by those who live and work within them, Appreciative Inquiry leads systems to move toward the generative and creative images that reside in their most positive core — their values, visions, achievements, and best practices (Watkins and Mohr, 2000). In theory, AI is a perspective, a set of principles and beliefs about how human systems function, a departure from the past metaphor of human systems as machines. In practice, AI can be used to co-create the transformative processes and practices appropriate to the culture of a particular organization. In essence, a culture of an organization represents the practices involved and the environment that accommodates them. Contrary to problem solving where the primary focus is on what is wrong or broken, AI focuses attention on what works in an organization and on its physical environment (Hammond, 1998). The tangible result of the inquiry process could be developed in the form of a series of statements that describe where the organization wants to be, based on the high moments of where it has been.

Adopting the Appreciative Inquiry paradigm in architectural design pedagogy is not "wishful thinking;" it can be applied in either classroom or studio settings. In classroom settings, students can be involved in a process of identifying positive aspects in specific environments or building types, and they can also perform various research assignments and Post Occupancy Evaluation (POE) studies. These represent a radical shift in the way in which POE evaluation studies typically aim at revealing problems. In studio settings, Appreciative Inquiry can be introduced in various pre-design assignments. That will involve participatory design activities ranging from identifying design and project imperatives involving users' representatives, to precedent studies that aim at unveiling positive aspects found in environments similar to the one they are designing.

Active and Experiential Learning

Over the past decade several studies have emerged to challenge university faculty to develop teaching approaches that represent transformative pedagogies, simply moving away from thinking of students as passive listeners to active learners. However, this would seem "easier said than done." According to Bonwell (1999), in recent years the incorporation of active learning strategies into the daily routine of classroom instruction became a necessity. While there is a surge in the development knowledge on active learning (Judith S. Liebman, http://education.forum.informs.org/active.htm), one would limit this discourse to the characteristics of and the need for active learning.

The major characteristic of active learning is that students are engaged in individual or group activities during the class session including reading, discussing, commenting, and exploring. While these activities are carried

out by the students, they are facilitated by the professor, and students can receive immediate feedback (Bonwell, 1996). Notably, in active learning students are involved in higher-order thinking that simultaneously involves analysis, synthesis, and evaluation of a wide spectrum of issues and phenomena. In the context of the university classroom, active learning involves students in doing things and thinking about what they are doing.

The value of active learning becomes evident when looking at the literature and research findings that were developed over the past several decades. The amount of information retained by students typically declines substantially after ten minutes (Bonwell, 1996). The results of research comparing lecturing versus active discussion techniques indicate that students favour discussion methods over lecture and the one-way mode of knowledge. Dean (1996), Bonwell (1999), and Liebman (1996) all accentuate that students do not learn much by sitting in class, listening to faculty, memorizing pre-packaged and ready-made interpretations; they all agree that students must talk about what they are learning, write about it, and relate it to past experiences.

Several education theorists including Benjamin Bloom; David Kolb; Jean Piaget; John Dewey; and Paulo Freire voiced the opinion that experience should be an integral component of any teaching/learning process. Their work can be traced back to the famous dictum of Confucius around 450 BC "Tell me and I will forget. Show me and I may remember. Involve me and I will understand." Experiential learning refers to learning in which the learner is directly in touch with the realities being studied (Keeton and Tate 1978).

Experiential learning is contrasted with learning in which the learner only reads about, hears about, talks about, writes about these realities but never comes in contact with them as part of the learning process. Mistakenly, some educators equate experiential learning only with "off campus" or "non-classroom" learning. However, in architectural pedagogy a class in history or theory of architecture might incorporate periods of student practice on theory exercises and critical thinking problems rather than consisting entirely of lectures about theories of architecture and the work of famous architects (O'Reilly, 1999; Salama et al., 2002). Similarly, a class in 'principles of architectural design' or in 'human-environment interactions' might involve critical analysis exercises on how people perceive and comprehend the built environment. Both classes might involve field visits to buildings and spaces where students are in close contact with the environment, exploring culture, diversity, people behaviour, and be part of that environment. All of these mechanisms involve an experiential learning component.

Learning through experience involves not merely observing the phenomenon being studied but also doing something with it, such as testing its dynamics to learn more about it, or applying a theory learned about it to achieve some desired results. Evaluation as a valuable research vehicle needs to be introduced both in lecture courses, establishing a knowledge base about the built environment that has the capability of endowing students with more control over their learning, knowledge acquisition, assimilation, and utilization in future experiences (Salama,

1999; Salama , 2007 c).

Active and experiential learning as concepts and instructional strategies appear to be two sides of the same coin. While they differ in terminology, they share similar aims and qualities. They both aim at increasing students' motivation, placing emphasis on the exploration of attitudes and values. In both of them, less emphasis is placed on knowledge transmission but greater emphasis is placed on developing students' critical thinking abilities.

It is evident that three components are the core of a theory for knowledge integration in architectural design education (Figure 3). They represent the theory apparatus and have the capacity to integrate fragmented pieces of knowledge required for the "whole-Architect." While the disciplinary component aims at knowledge integration by crossing the boundaries of different disciplines involved in the successful creation of built environments, the cognitive-philosophical component endeavors to integrate knowledge types amenable to human cognitive function and the overall human capacity in thinking about or creating built environments. However, through ontological and epistemological thinking it attempts to address the nature of knowledge and the way in which knowledge about it is conveyed, acquired, and assimilated. The inquiry epistemic component targets the issue of knowledge integration by introducing knowledge and acquisition and assimilation strategies that involve ethnography, appreciative inquiry, and active and experiential learning. It is believed that these components go beyond the conventional practices that look at the creation of the built environment only in terms of intuition, imagination, and innate gifts and talents.

Conclusion: Strategic Accommodation of the Theory

In this paper, I argued for the introduction of a new theory for knowledge integration in architectural design education. A contextual analysis of the reasons for developing a new theory was introduced and reasons were categorized in terms of admission policies and the skills emphasis syndrome, idiosyncrasies on knowledge delivery and acquisition, and alarming figures on studio teaching practices based on survey results. Based on the belief that any theory is conceived, developed and perhaps implemented in a specific context, I outlined the milieu of the theory. A number of contextual elements were exemplified by the negative impacts of the current culture of architectural education on students, practitioners and the way in which architects are seen by those they serve. Other contextual elements included the shift from mechanistic to systemic pedagogy, and knowledge content transformations. These contextual elements fostered the identification of a number of questions that need urgent answers. Discussing these elements was centered on how architectural education needs to respond.

While certain aspects of any theory remain conceptual, most components of the theory apparatus can be implemented in various forms and at different levels through sound practices. Here, I address some scenarios on the way in which such components can be implemented in architectural design education.

The disciplinary component can be

accommodated at different levels that range from the knowledge delivery level, to studio level, to degree level (Figure 4). At the knowledge delivery level, the typical approach is to offer students different bodies of knowledge in lectures while it is assumed that they will be able to implement them in studios. In this context, there is a clear separation between knowledge acquisition and knowledge application. Adopting the Transdisciplinary approach may offer a panacea to this typical practice. This occurs by reconciling lectures and studios through the introduction of a "new setting" — an alternative to classroom and studio settings where bodies of knowledge are delivered by different teaching staff, while at the same time students apply what is delivered to them in specific design assignments facilitated by the same staff. Here, the content of knowledge is derived from different areas (history-theory, urban issues, climatic controls, socio-economic aspects, structures and building technology, etc.), and is tailored to address the design tasks students are performing. Such a setting would enable the integration of different types of knowledge into specific design activities.

At the studio level, the Transdisciplinary approach can be partially accommodated by introducing graduation thesis projects through Transdisciplinary design studios, where students of different disciplines (planning/urban design, landscape architecture, architecture, industrial/product design, engineering, etc) work in team projects. In this context, the challenge would be to identify projects and processes that can be controlled to meet such a specific pedagogic orientation.

It should be noted that studio processes in the preceding two scenarios need to address the cognitive-philosophical component: the integration of the logical/rational and the intuitive/imaginative capacities of students. As well, they should strike the balance required between different psychological types or cognitive functions introduced by Jung. In this regard, a studio process can be looked at in terms of two major phases: analytical understanding and creative decision making. Each of these phases is constituted in a number of sub phases and procedures that range from exploration and definition of key issues, to precedent studies, information gathering and analysis, to the development of concepts and schematics (Salama, 2007 b).

At the degree level, crossing the boundaries between different disciplines can be accommodated in a transdisciplinary master degree in designing built environments. This would target graduate students and teaching staff from different disciplinary backgrounds. Sustainable planning, design, and development could be the major driver of a degree of this type. Still, the challenge would be to create transdisciplinary knowledge content that can be taught and implemented.

The inquiry-epistemic component can be strategically accommodated in a studio setting when integrating three different types of knowledge that Rapoport called for: knowledge about setting objectives, knowledge about better environments, and knowledge about achieving socio-behavioral goals in design. For these knowledge types to be integrated it is essential to employ the three mechanisms of inquiry, i.e, ethnography, appreciative inquiry, and experiential and active learning. It is

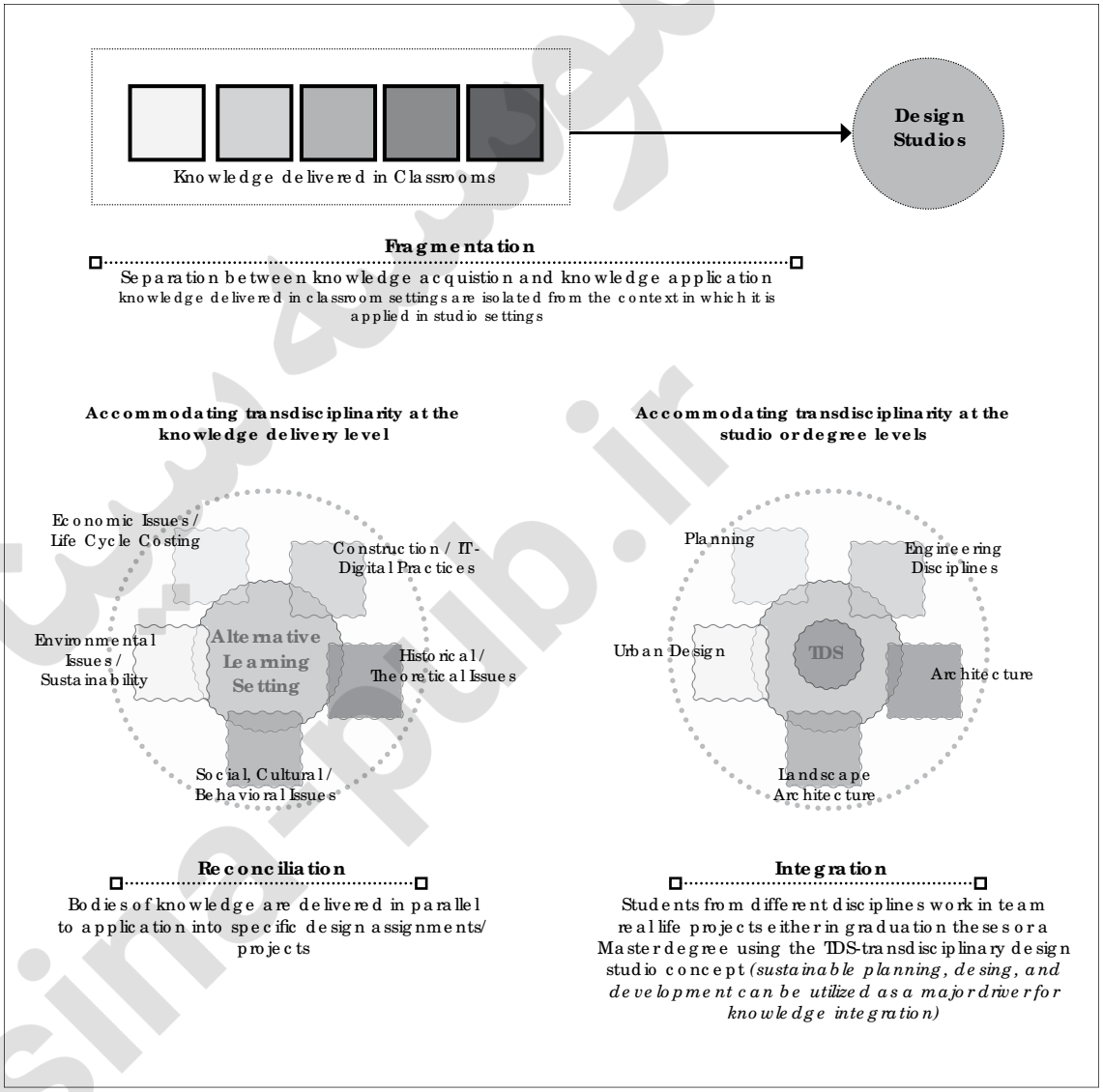

Figure 4: Strategic accommodation of transdisciplinarity at the knowledge delivery, studio, and degree levels. (Source: A. Salama).

important to relate these types of knowledge and the mechanisms of inquiry to the studio level, the scale of the project, and the issues involved. This is envisaged when a studio process involves three major components "what" and "who, how, and why". What and who are characterized by involving students in proposing human activities and are appropriate for certain types of spaces and buildings, how is the act of design itself that is characterized by manipulating forms in response to well articulated and defined spatial needs, and why represents students'

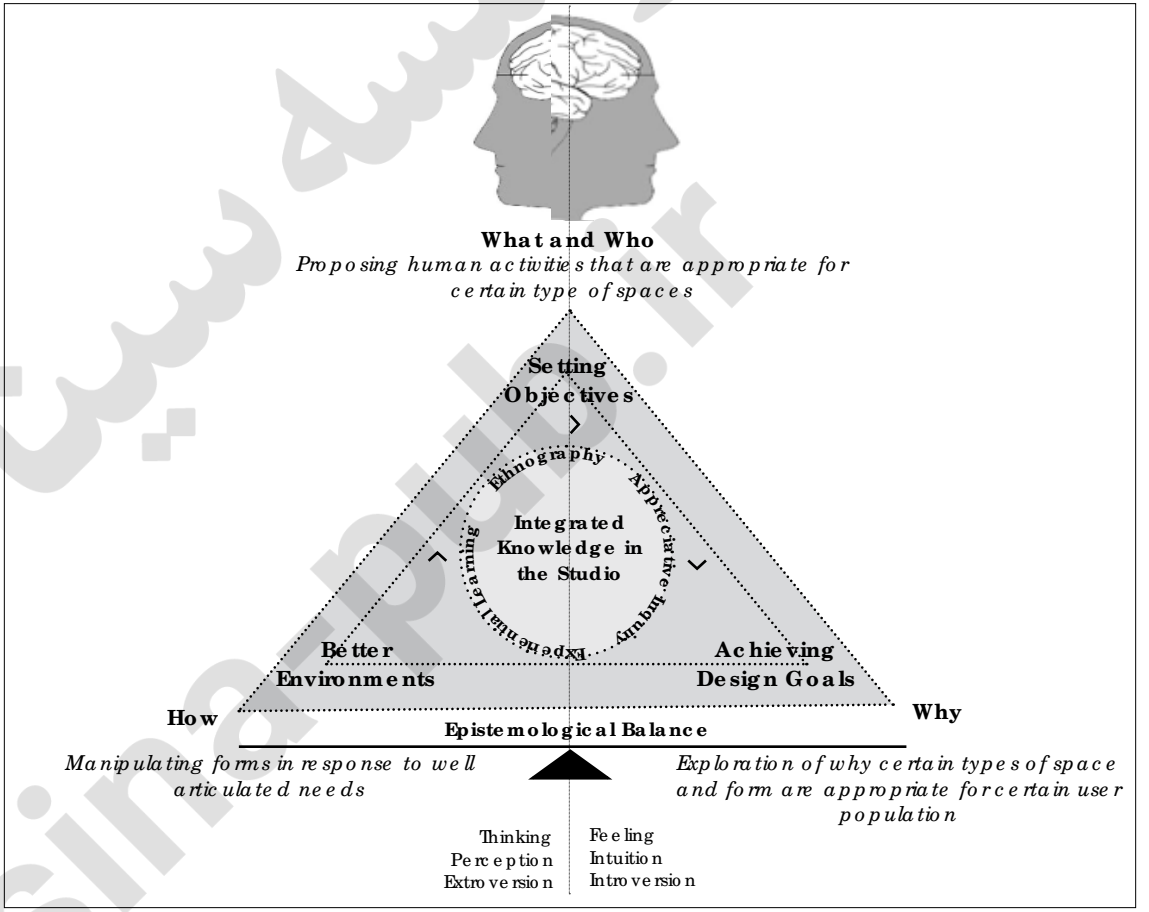

Figure 5: Strategic accommodation of the inquiry-epistemic component in a studio setting. Linking the Split Brain Theory and Jungian Epistemological Balance into different types of knowledge and the studio processes involved. (Source: A. Salama).

involvement in exploring why a certain type of space and form is appropriate for a certain type of user population. Again, the act of design in this process should address the cognitive-philosophical component; by integrating the logical/rational and the intuitive/imaginative capacities of students, while at the same time striking the required balance between different psychological types or cognitive functions.

By adopting the proposed theory for knowledge integration in architectural design education, I believe that several desired aspects can be part of the future of architecture education. Opportunities for reconciling lectures and studios are available, while literature on different bodies of knowledge is incorporated through both simulated and real life experiences into design teaching practices. Students will be in a better position to understand and appreciate the value of knowledge types derived from other disciplines that are dramatically different from architecture, but are critical to the creation of meaningful environments. The abilities to think globally and act locally, and to search and think critically, will be major components of the formation of future architects. Future architects will have the capacity not just to consume knowledge but to produce it.

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