

CREATIVITY-FUNCTION NEXUS; CREATIVITY AND FUNCTIONAL ATTENTIVENESS IN DESIGN STUDIO TEACHING

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Abstract

Can creative forms enclose functionally-efficient spaces? Do functional considerations restrict creative design products?

The question of creative form versus function is one that is very debatable, and has been in question for a long time in both architectural education and practice. Milestone figures of architecture all have their different views on what comes first, form or functional spaces. They also vary in their definitions of creativity. Apparently, creativity is very strongly related to ideas and how they can be generated. It is also correlated with the process of thinking and developing. Creative products, whether architectural or otherwise, and whether tangible or intangible, are originated from 'good ideas.' On one hand, not any idea, or any good idea, can be considered creative but, on the other hand, any creative result can be traced back to a good idea that initiated it in the beginning (Goldschmit and Tatsa, 2005).

However, how can a good idea be classified, which ideas are useful and helpful, and how can they be characterized, are main questions that this research work aims to answer. This paper attempts to discuss and compare various, and often opposing, viewpoints of both students and teaching staff, at the possibility of striking a balance between exciting forms and functional precision in the design studio. The research examines the conflict that students

often face when assigned with a design project, and the difficulties they experience in translating theoretical and fundamentally-important data into a novel architectural interpretation. Furthermore, the investigation aims at relating the continuous, non-linear process of review and modification, customary to traditional design-studio approaches, to the final products students submit as part of their design-studio applications. The final issue in question is the role of criticism and assessment in the forms of juries or crits, assessment criteria, and whether this traditional aspect of design-studio education truly provides architectural students with the constructive criticism they need amid feelings of tension and limited time constraints. The Architectural Engineering and Environmental Design department at the Arab Academy for Science and Technology (AAST) is exploited as a case study for the research work presented in this paper.

Keywords:

Creativity, functional-efficiency, constructive criticism.

Introduction

The dispute of "form versus function" has been argued for a very long time. The relationship between creativity and functional perfection

is one that causes many debates between architectural students and tutors on one hand, and between professional designers on the other. Many prominent architects have reached fame through their vision of what form and function should be in relation to each other. Frank Lloyd Wright, the creator of organic architecture, for example, believed that “form and function are one,” while Louis Sullivan worked with the concept that “form follows function” (Tietz,1999). Another master of architecture, Adolf Loos, believed that “Ornament is Criminal,” (Tietz, 1999) implying that form should be completely ignored, and that the architect should focus on functional perfection in order to create a good design.



Figure 1: Samples of so-called ‘creative’ design proposals in Dubai; forms that immediately question the concepts mentioned in the previous section (Eikongraphia, 2008; Smartdeez, 2008)

Creativity in literature, music and other forms of art is immeasurable and unbounded by constraints of physical reality. Musicians, painters and sculptors do not create within tight restrictions. They create what becomes their own mind’s intellectual property, and viewers or listeners are free to interpret these creations from whichever angle they choose. However, this is not the case with architects,

whose creations are always bound with some physical constraint. Potential restrictions may be related to the building location, social and cultural values related to the context, environmental performance and energy efficiency, and many more. While traditional teaching practices had a role in the scrutiny of oversimplifying Architecture as an art based profession (Salama, 2008), current discourses have heavily emphasized other critical views of it as knowledge based or research based pedagogy (Fischer, 2004, Salama, 2008).

However, architects are said to be the “synthesizers” of ideas, almost by definition (Goldschmit and Tatsa, 2005). They must be trained from a very early stage in their architectural careers to generate innovative ideas, and simultaneously design functional indoor and outdoor spaces, in harmony with human needs. They are the ones responsible for the creation of the building as a product, and the more diverse and wide-ranging the design ideas are, the better the product is likely to be. It is common practice to find that students are taught architectural design in what is described as the ‘studio-approach.’ They are encouraged to explore various ideas and compete at originality, while making substantial decisions to tackle hypotheses and functional requirements. The assembly of the design product often takes place through a non-linear evolutionary process divided into various phases. In architectural schools, this is referred to as ‘the design process.’

The Creative Process in the Design Studio

The design studio as known today is similar to the first studio used for architectural education,

at the Ecole des Beaux-Arts in 19th Century Paris (Chafee, 1997). One-to-one studio interaction is the traditional basis of architectural education, established at this infamous institution, which determined the final culmination of students' projects in the form of a public presentation. This trend in architectural education has been studied in depth by various scholars. Schon (1985) for instance depicted studio communication between tutor and student as an extensive yet rather informal cooperation that is an essential factor participating in the student's ability and progression to create a successful design (Schon, 1985). Salama (1995) dispute that despite the differences in architectural Education all over the world the design Studio remains the forum of creative exploration, interaction, assimilation and the furnace where future architects are molded.

The design studio plays an imperative role in introducing novice architects to architectural disciplines and the profession of solving design problems. Moreover, the studio is a replica of conditions found in professional architectural practices, although constraints of practical reality are considerably minimized (Robinson, 2007). In conventional teaching practices, we often find that design studio education follows an approach that is primarily product-based. Emphasis is primarily placed on the exploration of functional solutions and thus consequential manipulation of form. Students receive constructive criticism from their design tutors, in an attempt to translate these rudimentary and rather tacit proposals into successful designs and optimum solutions. Unfortunately, all but a talented few are able to translate this evaluation into a satisfactory product. Many students are inflexible in adapting their ideas

to suit the criticism they have received. It has been observed by many academics that numerous learners search for an ingenious idea at the last minute, under the impression that this will miraculously transform their poorly-design spaces and unsolved circulatory movements into the A-grade solution that they yearn for (Salama, 2005). Most often than not, the results are exasperatingly disappointing.

It is often noticeable that students and staff members in the architectural institution operate on two different 'sides.' Students sense disapproval at criticism and are unyielding and stubborn in their response. Many feel that the design strategies adopted in traditional teaching practices are stifling. Overwhelming functional requirements and constant evaluation give them little chance to fly away with their ideas. On the other hand, the experienced eyes of professors have the skill to judge student capabilities, and can see that few students will be able to envelope functionally-efficient spaces with ingenious forms.

Table 1 represents the unspoken division between creative aspects of the design process adopted in traditional design-studio approaches, and limitations that functional efficiency place on potentially innovative designs.

Research Methodology, Tools and Techniques

The research work displayed in this paper was originally carried out as a part of the Advanced Architectural Design module (AAD) requirements. This is one of the RIBA part 2 core modules at the Architectural Engineering and Environmental Design Department at the Arab

Academy for Science and Technology (AAST), in Alexandria, Egypt.

Creative Connotations	Functional Limitations
Architectural Conception	Architectural theory Practicality
Symbolism	Functional-efficiency
Inspirational thoughts and ideas	Constraints of reality
Abstract design sketches	Environmental constraints
Originality	Energy-efficiency

Table 1: Creative Connotations versus Functional Limitations (Source: Authors).

The school had to undergo changes in the curriculum in order to satisfy the RIBA part 2 requirements. These changes mainly involve an increase in the contact hours in design studio teaching. Thus a change of the credit hours of the design courses from 3 credits each course to 4 credits took place in 2006 (Elseregy, A. and Elnokay, A. 2007). This has made a tutor-student contact hours of a minimum of 8 hours per week. As a result of these changes this Advanced Design course was introduced. The module focuses on how mature architectural students should be committed with the rationales of the design process, approach and proposal. Table 2 depicts the AAST structure in comparison to the RIBA's parts 1 and 2 structure.

	AAST M.Sc. Arch. (Min. 7 Years - 216 CR)							
	AAST B.Sc. Arch. (Min. 5 Years-180 CR)							
	RIBA PART 2 (Min. 7 Years-204 CR)							
	RIBA PART 1 (Min. 4 Years-144 CR)							
AAST Course Structure	Semester 1	Semester 3	Semester 5	Semester 7	Semester 9	Year 6	Year 7	Dissertation
	Semester 2	Semester 4	Semester 6	Semester 8	Semester 10	Year Out - Practical Training		
RIBA Course Structure		Year 1	Year 2	Year 3	Year Out - Practical Training	Year 5	Year 6	

Table 2: Comparison between AAST & RIBA course structure. Student groups on which the student survey was conducted are highlighted. (Source: Authors).

Students are encouraged to explore the design process as well as design process related aspects (i.e. data collection, site analysis, user definition, functional requirements, architectural programming, environmental aspects, energy efficiency and most of all the development of ideas.) These issues are investigated according to varied themes that they may work with throughout the course of their architectural career. At a later stage of the course, they begin to apply the results of their investigations to a conceptual design project. Two separate sets of questionnaires were designed and sent out to the AAST Architectural Engineering and Environmental Design staff members and students. While the survey was conducted on all staff involved in the design studio, only mature students were asked to fill out the questionnaires aimed at the student-group. These 'mature' students concerned are those who have reached advanced levels of their architectural education, i.e. students of Architectural Design 4 (fourth year) and above. See attached table of AAST curriculum, inserted below. Increased architectural maturity generally implies that students have become familiar with architectural vocabularies, and have encountered the possibility of applying theories, structural analysis, environmental controls and other aspects ultimately taught through class instruction to their design-studio proposals.

On the other hand, it is hardly perceivable that students at more junior levels of their architectural education will have developed a suitable degree of awareness that would allow them to translate a bland design brief into intriguing and diverse architectural proposals. However, it is important to note that both surveys dealt with the same issues, debating the exploration of

functional solution versus the realization of novel architectural forms.

Students-Group Survey

Concerning the students-group sample questioned for this research, the survey was conducted on students of architectural design modules four, five and six as well as those preparing their final architectural design graduation projects. The survey was conducted mainly in the form of a questionnaire, comprising eleven questions that enabled students both to voice their experience of previous design studios, while simultaneously providing the researchers with insight into student learning and thinking styles. Eleven short and concise questions were posed throughout the questionnaire, and students were asked to provide responses within a ten to fifteen minute time span, during the design studio. This precautionary procedure was taken to ensure that all form-recipients gave direct, on the spot and voluntary responses, as opposed to a lethargic delay, or even complete disregard and lack of interest, which may have been the case if students were given a larger time span to fill out their questionnaires.

Aspects explored throughout the student-group survey can be categorized into three main areas. As the research primarily explores creative design as part of the design process, one of the first notions investigated was that of human creativity, the use and meaning of visual imagination and its role, accumulation and pursuit in architectural design. This area was consequently followed by what often seems to be a never-ending argument; the debate of 'data-collection versus form-finding.' Therefore, this area explores the artistic, conceptual and innovative side of architectural form-making,

as well as parallel connotations of context, composition and functional underpinnings. Finally, the students were asked to voice their opinions concerning evaluation assessment, which are often envisioned as disputable issues, core to any novice architect's education. Interim reviews take place throughout the design studio on a personal level through criticism on the part of the instructor on a twice-a-week basis. Architectural Design Studio modules at AAST, on all levels, are taught two days a week, with each studio spanning over a four-hour time period. Depending on student numbers, a variable group of up to six instructors monitor the course simultaneously, at a maximum ratio of fifteen students to one instructor, providing lengthy discussion and constructive criticism.

Tutors-Group Survey

All members of staff at the AAST's Architectural Engineering and Environmental Design Department were asked to complete the questionnaire assigned for design-studio tutors. This is inclusive of instructors at all levels, including professors, teaching assistants and part-time professional architects. Similarly to the student-group survey, issues raised in the tutor-group questionnaire tackled all of the above issues, although the viewpoint was alternatively pedagogic. Once again, features of creativity and inspiration in the context of the design process were examined. Recognition, motivation, encouragement and methods of enhancing creative designs were issues that were heavily touched upon. The perceived and sometimes undermined conflict, often faced by students, between reality and creativity, and limitations that functional perfection undoubtedly force on their ability to 'fly away with their ideas' was also questioned. The

possibility of reaching a pluralistic equilibrium was therefore implied throughout. Finally, the role of assessment and its reflections on architectural design education, from tutors' opinions, were heavily questioned.

Discussion of the Surveys

The following sections portray and analyze various viewpoints in the three main subject areas focused on in both the student-group and tutor-group surveys:

1. Human creativity and how it is reflected in the design studio.
2. The question of data-collection and how it is related to form-finding.
3. The question of assessment, and its role in design-studio education.

Human Creativity and its Pursuit in the Design Studio

The ability to think in a creative manner is firmly associated with one's capacity to critically envision reality, while experimenting with adventurous solutions to arduous and conventional tasks (Csikszentmihalyi, 1997).

Heap (1989) determined creativity as the ability to restructure old ideas into new creations (Heap, 1989). Interaction between staff and students as part of the design studio application helps stimulate creativity in design activities. In addition, this interaction improves students' analytical skills, as well as their perception of design problems from various viewpoints (Casakin, 2007) Throughout the course of this research, it was quite surprising to realize that the majority of students at the AAST's Architectural Engineering and Environmental Design Department seem rather uncertain of

their creative abilities, despite the connotations of the word 'architecture' with 'cognitive design' and 'creativity,' which are arguably considered synonymous.

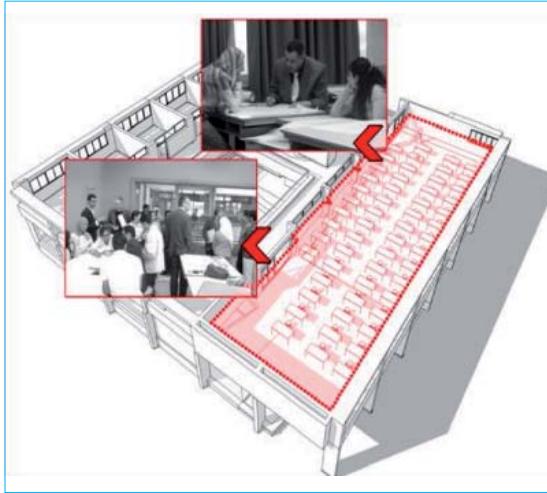


Figure 2: Discussion in the AAST Architectural Design Studios. (Source: Authors).

Only 35% of fourth and fifth year architecture students believed that they have creative abilities, while the majority (43%) responded that they are 'somewhat creative.'

Contrastingly, this sense of doubt was not reflected in the hobbies and pastimes they mentioned. Almost all students questioned choose to amuse themselves through artistic activities, such as drawing, painting, writing and sculpting on a traditional level, as well as experimenting with computer graphics and photography. When asked to provide their personal opinion on what creativity entails,

responses were varied. However, a large group directly linked it to the work done in the design studio, saying that it means 'the ability to use and show imagination' in their designs. Alternatively, a similar-sized group mentioned that creativity is all about 'being different,' in all areas and not just the design studio.

Architectural design instructors at the department largely trace high levels of creativity to natural talent, implying that creative thinking, and the cognitive processes linked to it, are difficult and therefore require patience to train, enhance and improve. This is where the architectural design tutor plays an imperative role. The task of an architectural design studio tutor is different from that of any other educator. Design tutors are required to deeply understand their students' personalities and abilities, if they are to help develop students' abilities and cognitive processes.

On the other hand, researchers into creative thinking and related subjects have suggested that there are methods to sustain and improve one's creative performance. One of these ways is to provide a suitable and motivating environment, which helps develop their expertise in handling and reaching innovative solutions (Morrow et al., 2004; Weisberg, 1993) .

Only 26% of design tutors seemed to agree with this viewpoint, saying that developing students' creative skills was largely the responsibility of those teaching them, as a creative output, in their opinion, depends on teaching methods pursued. A further 12% also believed that primary and secondary school education play a sizeable role in molding an individual's creative output, arguing that schoolchildren's minds have had minimal exposure to real-life situations and are

therefore easy to adapt very early on.

Data-Collection versus Form-Finding

Reality and creativity in the design studio are often perceived as two conflicting issues, never to be united in the single efficient of creating a 'good' design (Morrow et al., 2004). Thus continues this conflict between data-collection and the search for an innovative architectural form. This notion clearly exists between architecture students at the AAST's Architectural Engineering Department. 67% of students who have technically completed four semesters of design studio work find trouble advancing with their proposals prior to the data-collection stage. Feeling that numbers, areas, and functional and contextual requirements frustratingly stifle imaginative creations, they often decide to brush collected data aside and venture with either sketching incongruous forms, or testing various three-dimensional ideas on 3D modeling software. All tutors have noticed this thinking pattern among students, and agreed that, in one way or another, students do face a great deal of difficulty transferring their ideas to a coherent manner after having compiled all data needed and conducted research. Most tutors related this difficulty to individuals' creativity, suggesting that the more creative the student, the easier it would be for him or her to reach an optimum solution that solves problems of both function and form. Conversely, very few tutors attributed this difficulty to teaching methods, the design studio environment or even each individual student's effort at this crucial stage.

Having found that modeling techniques help bring students' dreams back down to earth, many instructors demand students construct

either physical three-dimensional study models of their preliminary creations, or alternative virtual computer models. In several cases, some tutors have even asked their students to create their models in a whip of spontaneity and as a first step, before going back and analyzing the creation, and finding ways of linking it to reality. This step of the design process is pursued both in education and practice. While many professional architects rely on paper and cardboard as conventional model-making tools, many merge traditional devices with digital ones in an attempt to accurately resolve complicated geometries (Hadjri, 2003; Szalapaj, 1999 and Chang, 1999). In addition, many design tutors encourage their students to create a general outline of the building's exterior form, before commencing with solving internal functional aspects related to areas, circulation and functional relationships between spaces. Of these tutors, several argued that the issue of what comes first; function or form? depends largely on the project at hand. While some building designs dictate that the exterior is based purely on functional aspects, for example, in hospitals, airports, etc., many other buildings types are more flexible in their requirements and can therefore accommodate strong and striking forms.

Many students, tutors and even professional architects believe that the key to generating a creative design that simultaneously bridges the gap between function and form lies in the architectural concept (Shih, 2004). Originally derived from the Latin word "concupere", meaning to conceive, this origin symbolizes that conception as an evolutionary process, which continues to grow and develop (Haddad, 2006). Architectural concepts are therefore

meant to help draw inspiration and generate a multitude of possibilities in various directions and according to a multitude of ideologies. Students who took the survey, however, disagreed on how architectural concepts assist them in expressing their ideas and solving problems. 34% of them felt that the concept should only be used as a form-finding idea, as opposed to 16% who immediately related it to the functional problem-solving aspect of architectural design. A minor 10% related the architectural concept to a well-known ideology, theme or trend that has previously been established either by famous architects or through contextual probation. Only the remaining 40% agreed with most of their tutors, in considering the architectural concept a design aspect that brings beauty, functional perfection and sometimes well-known ideologies into a single building.

Criticism and Assessment

Assessment in the design studio, particularly in the form of juries or crits as they are sometimes known, is an aspect of studio culture that has changed little throughout the years, and has woven itself into the intricacies of studio culture. Assessment in the form of the jury is seen by educators as an essential part of architectural education (Lizor 2006; Clefford and Hopkins 2006).

Almost all staff members at the AAST's Architectural Engineering and Environmental Design Department agreed with this viewpoint, stating that the assessment process plays a key role in shaping students' architectural background.

Despite their importance, however, reviews and juries are often viewed as a frustrating

experience rather than a beneficial one, particularly on the part of students, who often sense the existence of a communication gap between them and those called in to assess their work. Students often find it difficult understanding the exact assessment criteria on which their grades are set. This obstacle may be overcome using feedback forms, on which students may propose assessment criteria, thus increasing their understanding of how the final grading is determined, which is not carried out in all crits undergone at the AAST Architecture School.

Cultural aspects further add to this frustration, particularly in the Egyptian cultural context. The educational system in Egypt is generally based on a one-way teaching method, which gives little leeway for communication, brainstorming or debate. As a result, the education system does little to enhance students' skills. This cultural aspect makes it difficult for students to understand the importance of assessment through juries and, instead of benefitting from the experience; they envision it as one to fear. Time constraints further add to this lack of communication, especially when tutors fail to stick to the time-slot schedule assigned to each student before the start of the jury. As a result, a large proportion of students are not given a fair chance of displaying their work, discussing it and receiving the criticism they should. In many cases, and as the day begins to progress, tutors are left with little choice but to prompt the student with one or two fleeting questions, before deciding the final grade, thus massively reducing the student's potential gain from the whole experience.

Over 50% of Architectural Design 4 students and

above reached the general conclusion that tutors do not analyze architectural projects with enough scrutiny. Many believe that assessors are thoroughly impressed by aesthetics, bright colors, extravagant forms and high-quality rendering, and therefore turn a blind eye or sometimes fail to notice functional detailing. On the other hand, the majority of tutors stated that they place about 10% of the final grade on rendering and presentation, dividing the remaining 90% of marks on functional perfection and interesting form.

between 40-60% of the mark on the creation of an interesting form and novel idea. It is without a doubt that these differences in opinion and lack of establishment of assessment criteria further adds to students' confusion, leaving them unsure on how to start their progress and what aspects to focus on in the limited time period available for the design of an entire building. The best way to get around this problem is to hand on to students with the brief of each project what the aspects of assessment on that specific project shall be and roughly on what basis they would be assessed.

Conclusion

Creative design is an aspect that is imperative for the development and advancement of any novice architect's education. It is arguable that undergraduate architects are most able to experiment with their ideas at university level, as architectural practice and profession introduces increasing constraints and limitations. While it is essential that novice architects enhance their creativity, architectural education should help them strike a balance between their aspirations and the comfort of users who would potentially use the buildings designed. It is difficult to determine which aspect comes first, whether creativity or functional perfection. For this reason, tutors must strive and stress the importance of both these aspects in the design studio. Additionally, it is up to design tutors to bridge the gap in opinions between their students and themselves, thus allowing students a better architectural understanding. This is particularly important in issues such as assessment criteria, where misconception is often the missing link that transforms the high-beneficial process of assessment into a confusing and frustrating



Figure 3: The Traditional Assessment 'Jury' Conducted at the end of each Architectural Design Studio Module. (Source: Authors).

It may be important to note, however, that many members of staff disagree on weighting of functional perfection and form. Some tutors prefer to assign up to 60-70% of the final grade on functional solutions, while others place

experience.

Finally, it is imperative, particularly in the case of an architectural department such as that of the AAST, that students' understanding of the grading system is made highly understandable, possibly through well-formulated feedback forms and regular interim crits. These would allow students to propose their own assessment criteria related to assigned projects, and meanwhile reduce feelings of frustration and nervousness they may experience during the final jury.

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References

- Casakin, H. P. (2007). Factors of Metaphors in Design Problem-Solving: Implications for Design Creativity. *International Journal of Design*. Vol. 1(2), pp.21- 33.
- Chafee, R. (1997). The Teaching of Architecture at the Ecole Des Beaux-Arts. In A. Drexler (ed.); *The Architecture of the Ecole Des Beaux-Arts. The Museum of Modern Art, New York, USA*.
- Cleford, T. and Hopkins, A. (2006). Moderation Without Tears. *Transactions, CEBE- Centre for Education in the Built Environment, Cardiff, UK*, Vol. 3(1), pp.84 - 94 .
- Csikszentmihalyi, M. (1997). *Creativity-Flow and Its Psychology of Discovery and Invention*, Harper Perennial, New York, USA.
- Eikongraphia (2008), Dubai 8; Dubai Towers [Web Page]. Accessed 2008 Jun. Available at: <http://www.eikongraphia.com/?p=1962>.
- Elseragy, A and Elnokaly, A. (2007), The Influence of Self Appraisal and International Boards Validation Processes upon the Architectural Education in the Arab Region; 24th Engineering Conference, Engineering Education in Arab World, Amman, Jordan, 14-17 May 2007.
- Fisher, T. (2004). Architects Behaving Badly: Ignoring Environmental Behavior Research, *Harvard Design Magazine*. 21, http://www.gsd.harvard.edu/research/publications/hdm/back/21_fisher.pdf; accessed December 2007.
- Goldschmit, G. and Tatsa, D. (2005). How Good Are Good Ideas? Correlates of Design Creativity, *Design Studies*, Vol. 26, pp. 593- 611.
- Haddad, E. A. (2006). Theoretical Speculations and the Design Studio, *Proceedings of the Changing Trends in Architectural Design Education, CSAAR 2006*. Rabat, Morocco.
- Hadjri, K. (2003). Bridging the Gap Between Physical and Digital Models in Architectural Design Studios. *International Archives of Photogrammetry, Remote Sensing and Spatial Information Sciences*. XXXIV-5/ W10 (Tarasp, Switzerland., 24-28 Feb).
- Heap, J. (1989). *The Management of Innovation and Design*, Cassell, London, United Kingdom.
- Lizor, B. D. (2006). Balancing Jury Critique in Design Reviews, *Transactions, CEBE- Centre for Education in the Built Environment, Cardiff, UK*, Vol. 3(2), pp. 52 - 79.
- Morrow, R., Parnell, R. and Torrington, J. (2004). Reality versus Creativity? *Transactions, CEBE- Centre for Education in the Built Environment, Cardiff, UK*, Vol. 1(2), pp. 91- 99.
- Robinson, S. (2007). Peer Assisted Learning Within Architecture: the Methods and Benefits. *Transactions, CEBE- Centre for Education in the Built Environment*,

Cardiff, UK, Vol. 4(2), pp. 45-53.

Salama, A. (1995). *New Trends in Architectural Education: Designing the Design Studio*, Tailored Text and Unlimited Potential Publishing, Raleigh, North Carolina, USA.

Salama, A. (2005). "A Process Oriented Design Pedagogy: KFUPM Sophomore Studio," *Transactions, CEBE- Centre for Education in the Built Environment*, Cardiff, UK, Vol. 2(2), pp.16 - 31.

Salama, A. (2008), *A Theory for Integrating Knowledge in Architectural Design Education*. Archnet-IJAR, *International Journal of Architectural Research*. 2008 Mar; Vol. 2 (1), pp: 100-128.

Schon, D. A. (1985). *The Design Studio: An Exploration of Its Traditions and Potentials*, RIBA Publications, London,, United Kingdom.

Shih, C. (2004). *Between Concept and Form: Learning From Case Studies*. *Journal of Asian Architecture and Building Engineering*, Vol. 3(1), pp. 217 - 221.

Smartdeez (2008) *Amazing Dubai's Projects* [Web Page], 2008; Accessed 2008 Apr. Available at: <http://www.smartdeez.com/2008/07/amazing-dubais-projects>.

Szalapaj, P. J. and Chang, D. C. (1999). *Computer Architectural Presentation: From Physical Models in Space to Virtual Models in Cyberspace*, *International Journal of Design Sciences and Technology*, Vol. 7(1), pp 41- 54.

Tietz, J. (1999). *The Story of Architecture of the 20th Century*, Germany, Konemann Verlagsgellschaft mbH.

Weisberg, W. R. (1993). *Creativity Beyond the Myth of Genius*, Freeman, London, United Kingdom.

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