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Architectural Education:
What Really Goes On and What Ought to be Done?
"The Learner: The Other Side of the Coin"

Paper:

Embedding Systems Thinking Approach Within Introductory Curricula Teaching & Learning

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Paper Abstract:
Studies in the field of architectural education reveal that curricula design and implementation are partitioned, linear and fragmented. Meanwhile, the idea of practicality and inter-disciplinarity of knowledge is based on the acts of connection and linkage. In this essence, architectural education is regarded as a manifestation of upholding or supporting, such aspect decrees a development of integrative, practical and interdisciplinary knowledge, as key concepts that reflect tremendous changes on the mechanism of design education.

Through this paper, we call for an educational methodology that is built on establishing a relationship of various disciplines through a practical knowledge base, projects and scales of work in an interpretation that is essential for the production of comprehensive design works. Also anticipated to serve as a prototype for learning by doing, crossing boundaries between courses, as well as addressing whole-systems thinking, that is to teach each student how to independently learn as a life long process. A question evokes itself: ***how and in what stage of learning can we introduce such approach?***

The aim of this paper is to propose an answer for this question. It is based on determining key learning approaches regarded as efficient for architectural education, and, are expected to address the holistic way of thinking of students. Then a showcase of one of the courses that adopts whole-systems thinking in perception as well as in application will take place. Bringing together the findings, an approach towards offering an educational methodology that targets the development of a higher quality of mind of students, can then be generalized, preparing students to carry on their roles in creating sustainable futures.

Key words:
Systemic Thinking – Practical and Interdisciplinary Knowledge

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> *"...Why am I studying those useless courses? I'm supposed to graduate as an architect, and they waste our time by too much information that we definitely won't remember once we're done with the courses..."*
>
> *Mohamed Hamada freshman student of architecture, MIU, Fall 2007*

Introduction: The Dilemma of Individuality

A feature of individuality and egoism reigns over a fragmentation of knowledge bodies as well as a separation of studied issues sometimes in the same course. Not to mention isolation of courses as discrete islands along the academic years vertically and horizontally.

In our universities, as well as in our culture, there are seemingly self-evident assumptions that thinking is one thing and feeling is something else, that theory and practice are separate, and that clarity is always closer to truth then ambiguity. These assumptions and the institutions that embody them are argued to deprive students of confidence in their ability to comprehend rightly their own minds, bodies and the world around them. This aspect results in students' slow loss of intellect at the same time losing their mentality (ElNachar & Safey Eldeen, 2003).

Literature on the subject at hand determines some characteristics associated with a-so called- shallow teaching approach. Including a heavy workload, relatively high class contact hours, an excessive amount of course material, a lack of opportunity to pursue subject in depth, a lack of choice over subjects and a lack of choice over method of study, a threatening and anxiety provoking assessment system.

A good designer would "inquire deeply into the purposes and consequences of things to know what's worth doing and what should not be at all" (Orr, 1992). This draws on establishing a relationship between various disciplines through a practical knowledge base, and between projects and scales of work that cross disciplinary lines.

To promote a holistic-thinking in learning, instructors need to understand the importance of connecting prior knowledge to new concepts, creating effective organizing schemes for information to assimilate contextual understanding, using multiple representations to reinforce key concepts, and promoting active engagement in learning. Giving students the responsibility for their own learning is difficult, who likened the students' responses to this empowerment as going through the steps associated with trauma. Students often lack skills such as self-monitoring, time management, and effective listening. Note taking is a good example of this problem; students write what they are seeing, but do not process what they are hearing, thus missing the concept being explained. Information can be forgotten at every step of the learning process; in order to acquire the knowledge, students must do something with it and organize it for future retrieval. Unfortunately, prior knowledge, which is very important for continued learning, is often missing or incomplete because students do not know how to retrieve it. Thus, students are unable to apply new ideas in practical situations (reference).

1. In order to develop competence, students need frequent practice and timely and constructive feedback, whether through homework, in-class activities, or discussion. Learning by doing refers to learning in which the learner is directly in touch with the realities being studied. The skills become almost a habit, you are able to be successful without concentration and your conscious mind is free to take on other things (Bibliography of Experiential Learning, 2002). Maslow's 'Stages of Learning' (practice-trial and error- learning from mistakes) has been agreed upon as successful application for acquiring skills, but it was disputed as a method for the acquisition of knowledge. Experiential Learning was then featured as means of assimilation of knowledge together with skills. The concept is perceived from the view point that learning is a change in attitude achieved according to multiple intelligence (Safey Eldeeen, 2004).

Several visions contributed to the development of the experiential learning approach. Piaget, suggested that knowledge should be provided while the learner is applying his/her own in a particular situation, and that knowledge should be matched with the ability to assimilate it (Piaget, 1972). Meanwhile Kolb affirmed that this learning approach is a cycle within which the learner tests new concepts and modifies them as a result of reflection and conceptualization (Kolb, 2001).

The role of experiential learning is also envisioned as paramount for students' exploration issues, abstraction, conceptualization and generalization from disconnected bodies of knowledge. Fostering sensitivity to listen, notice, observe, differentiate, analyze and consider. Experimentation in the field has also proved that experiential learning helps verification of hands-on existing dynamics and variables within their natural contexts and settings, creating a discourse of know-how and confrontations through the close examination of the imperatives, restrictions and consequences of design process (Keeton, M.T., & Tate, P.J., 1978).

Systemic Thinking: A Model of the World:

The world is not we think of but what we live through. Thus, it is evident that it is hardy that students be able to understand and to think about things which nevertheless they are able to do. This reflects that, in educational institutions, the truth of modern science can be demonstrated only in high technical and mathematical formulations that do land themselves to expression in normal life thought and situations. Such supposition has proved itself wrong, with the introduction of the "systemic learning" that can be applied to any learning discipline or educational formulation (Systemic Thinking in Teaching and Learning, 2005).

On the other hand, ***systemic thinking*** involves the use of various techniques to study "systems" of many kinds. It means studying things in a holistic way, rather than through purely reductionist techniques. It aims to gain insights into the whole by understanding the linkages and interactions between elements that comprise the whole "system" (Systemic Thinking in Teaching and Learning, 2005).

The systemic thinking approach is regarded as an operational perspective of the universe. It is an approach that is different from that of the traditional forms of analysis. Traditional analysis focuses on the separating the individual piece of what is being studied; in fact, the word "analysis" actually comes from the root meaning to break into constituent parts. Systemic thinking in contrast, focuses on how the thing being studied interacts with the other constituents the system – a set of elements that interact to produce behavior – of which it is a part. This means that instead of isolating smaller and smaller parts of the system being studied, systemic thinking work by expanding its view to take into account larger and larger numbers of interactions as an issues being studied. This results in sometimes strikingly different conclusions than those generated by traditional forms of analysis, especially when that is being studied is dynamically complex or has a great deal of feedback from other sources, internal or external (Safey Eldeen, 2005).

Based on the preceding, the characters of systemic thinking are extremely effective for the manifestation of holistic-thinking in design education. On the most difficult types of problems to solve; those involving complex issues; those that depend a great deal on the past or on the actions of others; and those stemming from ineffective coordination among those involved. This broader perspective creates the understanding necessary for better long term solutions by seeing the whole picture, students then are able to think if new possibilities that they had not come up with previously, in spite of their best efforts.

Design Thinking Implies Demonstration of Systemic Thinking

It is argued that we need to address the significance links between educational methods and tools that provide systemic learning experiences in order to promote skills and attitudes required by design thinking. The essence of design education would then be centered on upholding and supporting as core of its thinking process, would then be based on the acts of connection and linkage. Hence, the systemic thinking approach in teaching and learning implies an interdisciplinary and practical knowledge should be the pivot of our introductory curricula, in which we respond to each of:

- *The need to* develop educational systems to establish an "international democracy of knowledge", moving toward a sustainable future without losing regional identities and cultural diversity.
- *The need to* development an interdisciplinary approach highlighting the interrelationships between disciplines allowing for study and research across the traditional disciplinary lines.
- *The need for* partnership with respect to the concerns, and sharing of knowledge, across disciplinary boundaries.

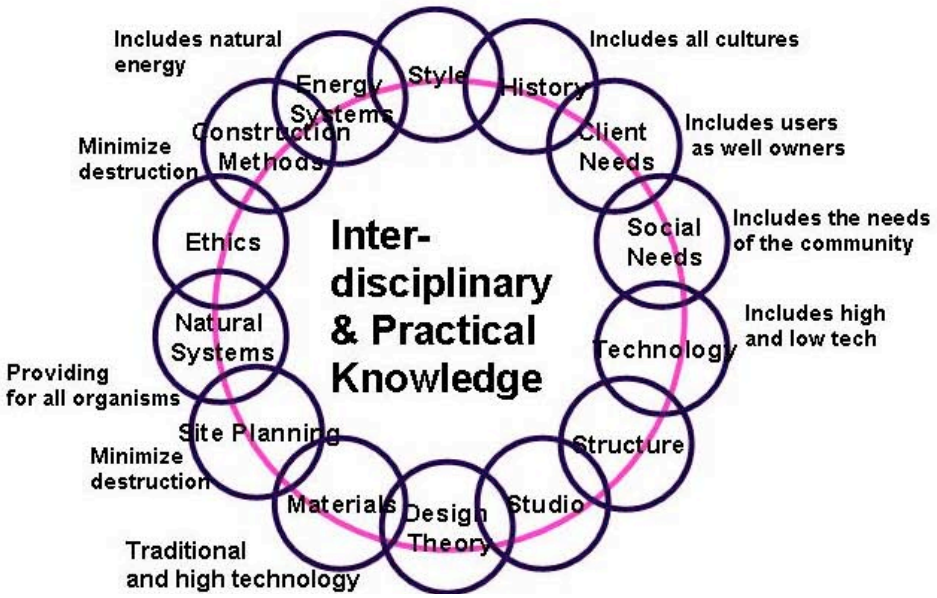


Figure #1: proposed components of interdisciplinary knowledge for design education

Bearing in mind all the above, and in an attempt to the test hypothesis, a "modeling and architectural workshops" course, offered to freshman students in their second semester was put to trial*. Aspects Considered when designing the course included three main pivots. ***First;*** learning new ideas or skills occurs when as a result of problem solving, not in advance of it which argues rather forcibly against the introduction of bodies of knowledge in advance of practical application. This was demonstrated in destroying the boundaries and the distinction between lectures, studios and off-campus learning. ***Second;*** the practical problems which students face, should strike a balance between too much familiarity and too

much novelty, for which the already existing body of knowledge offers possible, but not accurate or sufficient answers. This was implemented by strengthening the research-base, with a maximum contact with the community to foster real world learning. In addition to allowing opportunity to expand analysis and evaluation phases. Also, real world design was a base for the course. ***Third;*** when dealing with generalizations (concepts) and specifics (experiences), we should continually work back and forth, with periods of experimentations in between, in which we might seek new concepts, generate variation on existing themes, and query our previous experiences and so on. This was achieved through letting students solve -a design problem perhaps- with their existing concepts, help them see the probable inadequacies of their solutions, and then help them evolve their exiting ideas, as then they are highly motivated and are receptive to new ideas and/or more sophisticated concepts and more extensive bodies of knowledge.

The following table shows how the course assignments were a reflection of the preceding considerations and how they were deliberately linked to other courses and/or topics from other courses. It is worth mentioning that instructors of associated linked topics were scheduled as part-time lecturers along the course, and were involved in the regular pinups to assess the unification of the product with what has been lectured.

Exercises	**Work level & Linkage with other courses or other courses topics**	**Description**	**Outcome**
5 weeks Evaluation *Free scale*	Colors and Materials Design Fundamentals & Visual Training Architectural Drawing	1. Folding/gluing (ready made models) 2. Theme composition (different size cubes)	Simulation Concept Formation
Mid Term Evaluation *Scale 1:20 – 1:5*	Style/material/proportion Function/ Properties of Material Human Factors in Design Human Needs/Scale/Ergonomics/ Standards	3. Façade design (2-d) 4. 3-d Element design (door, window, staircase)	Analysis Synthesis
Final Evaluation *Scale 1:5 – 1:1* Jury	Structure/Properties of Material Building Technology/ Theories/Renown Architects Works Putting it altogether	5. Construction f different planes (dome, vault, truss) 6. Large Scale Model Or: Design and Build	Experimenting & Reflecting Evaluation & Criticism

Table #1: modeling course linkage with other topics in both lectures and assignments.

The course was then applied, and based on students' work outcome, the following points were highlighted:

- Simulations, with its domain of demonstrations, pre-designed experiments, exercises, illustrations, …etc., were considered as closed controlled environments designed to screen out distractions and unplanned influences so that the students' attention can be focused on the learning at hand.
- As the subjects of their studies became more "real" – that is, as students began to work with more complex and unanswered questions- the learning situations in which they pursue them also become more open to the "real time conditions" of a lifelong learning. Students spent more and more of their time off-campus organized for learning.
- Likewise, the campus became for them a place to which they resorted for reflective analysis of their ongoing involvements in the world outside and from which they venture forth to seek further experience.

Students' Side of the Coin:

Two students' evaluations of course were conducted throughout the semester; right after the mid term and after the finals. The evaluation was based on two questionnaires; the first was composed of three main sections examining each of 1. course organization-assessment and grading methods. 2. teaching materials and resources. 3. instructor/student interaction- student outcomes. Students' responses to the course evaluation in the mid-term revealed some hesitation about the nature of course, with several instructors, several sources, and work load. Their quotations included; "heavy work load, little time allowed with respect to the assigned tasks, ambiguity of grading criteria, interesting but tiring course", etc.

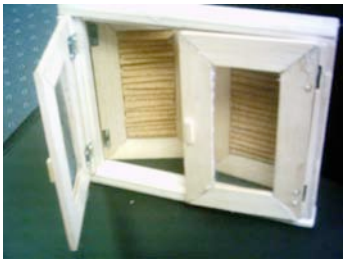
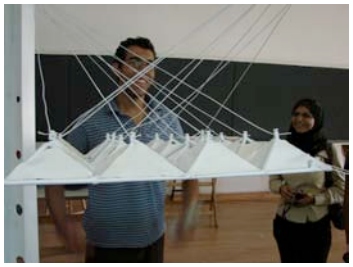
As for the end of tem evaluation of course, they typical university evaluation format was analyzed. This questionnaire is structured of four basic parts. First part was about course intended learning outcomes, content, resources, facilities and tools, assessment and grading,. Second part was about instructor personal and professional qualities, teaching methods and techniques. Third part was about teaching assistants. And, finally fourth part was open ended entries where students where assigned to state the major strengths and weaknesses of the course. The responses to this part of questionnaire were base for our qualitative content analysis.

Students' responses accentuated that implementing such methodology has provided them with a better understanding of some of the diverse considerations in the built environment. It made them more able to identify emerging problems and needs, and more flexible to conceptualize ways for dealing with those previously specified problems with respect to their overall contexts. This was perceived as useful as guidance for the future, and thus enhancing students' judging, thinking and creative abilities. From students' quotations were: "the most thing I liked in this course was the class democracy", "course is very useful. We learnt a lot of things like learning in groups, going to several places", "acquiring self confidence; ideas generation; acquiring skills", developing our creativity trying to define a problem and solve it on our own", etc.

Analyzing Students' Responses at the end of the course revealed that this educational method has built on their own theoretical understanding of some the complex issues pertaining to the built environment and its cultural, social and physical attributes, built on their systemic thinking and its underlying objectiveness, as well as endorsed on their creativity with respect to problem solving. At least three patterns of development are conceived, these are; students' shifting from particular skills through integrated effectiveness, from closed to open learning, and from other-directed to self-directed learning. Such attributes are expected to reinforce holistic-thinking within students' mind from the onset. And it is left for future research to investigate the relevance of this methodology in their upcoming academic years.


Theme composition from different sized cubes


Facades of independent buildings to urban level

Three dimensional elements design


Lectures from other courses, and in true settings



Design and build

Reflections and Conclusion:

This paper revolved around the idea of embedding a holistic-thinking approach in teaching introductory courses. A review of the imperatives behind this urge were reviewed, some learning approached were identified, based on which systemic thinking approach was elected and defined. Key aspects of systemic thinking were then adapted to devising a course introduced to first year students of architecture. An experiment on embedding basic systemic thinking was then applied, and discussed. Results of which affirm on the possibility of its generalization.

Finally, we regard this paper as a preliminary exploration; we urge our colleagues to join effort and to continue exploring what really goes on versus what should be done about architectural education. We aim at a collaborative work on track, developing and assuring the quality of our Egyptian undergraduate programs, while maintaining schools uniqueness and distinctiveness.

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End Notes:

*: Modeling and Architectural Workshops, spring semester 2008, Misr International University, coordinated and taught by M. S. ElSawy, together with a number of guest lecturers.