

ARCHITECTURAL EDUCATION INTEGRATED FRAMEWORK: LINKING DESIGN AND IT

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ABSTRACT

The coming generations of graduates who can guide the national work should have special characteristics to satisfy the requirements of various human activities sectors. As one possible way towards preparing these skillful graduates, education plays a significant role. Hence, the cultural transformation from store and retrieve to create and criticize way of learning has aroused significantly, which needs constructing an integrated framework for under-graduate architectural education that considers different dimensions of the surrounding community, particularly in the information technology (IT) age. The framework contents can integrate, internally, with each other and, externally, with the other preceding and/or following educational phases. This research work may propose a vision of architectural design curriculum in light of an integrated framework of an under-graduate architectural education and the possible interaction with other parts of the framework. Special consideration is given to computing and IT courses and their potential impact on architectural students. These courses include: Modeling, analysis, and presentation; CAD; 3D modeling and visualization; The connected architect and IT; Multimedia, E-collaboration; and Virtual design studios.

KEYWORDS:

Architectural education; Architectural design; Information technology; and E-Learning.

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1. INTRODUCTION

The coming generations of graduates who can guide the national work should have special characteristics. These graduates should also be able to follow the social, environmental and political progress, to ideally use the material and human resources, to try to improve the level of living and the social, economical and cultural level in all society sectors, and to increase the individual's quality in making decisions suitable for solving the international, national and regional cases. In addition, they should also offer the suitable solutions for the social problems along with increasing the individual's abilities in making effective free decisions. They should also affect positively in the personal and social life, which will –in turn- make individuals able to control their life and adjust their way in an effective and productive manner in spite of the changes that occur around them (Ammar, 1996; Abd El-Mawgood, 1988; Darwish, 1999; Sakran, 2001a). As of Shehab [1999], education can be one way towards developing these highly qualified graduates to be able to satisfy the needs of human activities sectors.

Consequently, it emerges the importance of insuring the philosophy of changing from the culture of memorizing, recalling, and storing into the culture of criticizing innovating education, which in turn needs the establishing of an integrated approach for the university education that takes into consideration all the social perspectives that surrounds the educational process (whether local or international) (Inas, 1999; Mina, 1986; Mahmoud, 1999; Mostafa, 1991).

Therefore, the need for an integrated approach of architectural education during the university stage can be of great importance. This approach should have interdisciplinary parts and components that form a balanced framework in one perspective and integrates with other educational levels in another perspective. In

addition, according to Anis [1999], Bedard [1999], and Sakran [2001b], it integrates with the different circumstances and conditions that surrounds it so that it does its role in building the free person who affects positively in his surroundings and completes his role in the society.

The present research work may propose a vision of architectural design curriculum in light of an integrated framework of an under-graduate architectural education and the possible interaction with other parts of the framework. Special consideration is given to computing and IT courses and their potential impact on architectural students. These courses include: Modeling, analysis, and presentation; CAD; 3D modeling and visualization; The connected architect and IT; Multimedia, E-collaboration; and Virtual design studios.

2. AN INTEGRAL APPROACH TOWARDS ARCHITECTURAL EDUCATION

During the last decades of the 20th century and the beginning of the 21st century there was an increase in the spread of the international aims at establishing compact and united enterprises that depend on the integration and interaction between parts and components away from specialization and spreading. These enterprises are the only ones capable of continuation among the increasing international challenges.

As of Ezaki et al [1996], Gould [1999], and Smith [1999], and in the light of the technological ever-increasing progress in the new century, the designers should search for new ways and means through which they can deal with the progress that should be reflected on the ideas for improving the educational process that aims at preparing those architects (Appleman, 1997; Fruchter, 1999; Wright, 1999).

In the light of these perspectives appears the importance of completing the educational process generally (and the architectural educational process particularly) through an

integral approach in which all components and parts serve the general aims of this approach. This comprehensive approach branches into a smaller number of smaller approaches that are highly specified. For example, the architectural education approach.

On making a representation of the features of the suggested approach of architectural design framework, we will find that it depends on a group of components and parts that complement among each others in two main axes. The first axis is the vertical axis that depends on the consecutive architectural design curriculums in the successive learning stages in an integral approach (or as a compound subsequent build). The second axis is the horizontal axis that depends on the interaction and integration of the architectural design curriculum with the different educational curriculums from which the framework is formed in order to serve each others.

3. THE VERTICAL AXIS OF THE ARCHITECTURAL EDUCATION FRAMEWORK

On the vertical approach we find that the architectural design curriculum must serve a group of aims that can be achieved through these subsequent curriculums that are taught in each educational phase/year.

Every curriculum should achieve a group of aims that take the form of a compound subsequent built, taking into account that these groups of aims may vary according to the type, size and directions of the educational institute through which the approach is applied. What we are concerned to emphasize here is the importance of the presence of such system even if the components and parts differ. We may address here a suggested group of aims related to the different successive educational phases, each consists of two semesters:

3.1.First phase (1 and 2)

Through which the knowledge of the general basics and concepts of design, and architectural representation tools are accomplished.

3.2.Second phase (3 and 4)

Through which a method of scientific logical way of thinking, criticism, and creativity is accomplished, along with forming the independent architectural personality.

3.3.Third phase (5 and 6)

Through which dealing with compound multidimensional projects and the keen observation of the architectural details take place.

3.4.Fourth phase (7 and 8)

Through which the ability of interaction and positive reaction with the society and the surrounding environment is established.

4. THE HORIZONTAL AXIS OF THE ARCHITECTURAL DESIGN FRAMEWORK

On the horizontal approach it was found that the curriculum of architectural design must integrate with the group of subjects and different curriculums taught through the framework. This is done by the coordination of the faculty members who teach these subjects. For example, when educational buildings are concerned in a design project, it is possible to coordinate with other subjects as architectural theories curriculums through which the general basics of designing educational buildings and its important

developing stages are explained. It could be useful to benefit from the sciences of the scientific methodology curriculum and human sciences when considering projects that deal with society and local environment and so on. The possibilities of the interaction and integration between architectural design curriculum and different educational curriculums through the teaching phases in the under-graduate level are shown in the form of the following matrix, as in Table (1):

Table (1): Matrix of Curriculums Interaction

	First phase	Second phase	Third phase	Fourth phase
History and Theories of Architecture	•	•	⊕	⊕
Human Science	O	⊕	•	•
Scientific Methodology	•	•	⊕	O
Environmental Control	O	•	•	⊕
Building Construction and Executive Documents	•	•	•	•
Sciagraphy and Perspective	•	•	⊕	⊕
Visual Studies	⊕	•	⊕	⊕
Urban Design and Planning	O	⊕	•	•
Interior Design	O	⊕	•	•
Architectural Criticism	O	⊕	•	•
Computer and IT	⊕	⊕	•	•

The above table shows the possibilities of interaction and integration between different teaching curriculums and architectural design curriculum contained in the integrated architectural education framework through the different successive teaching phases/years. The symbol (●) shows a strong interaction possibility, the symbol (⊕) shows a medium interaction possibility, while the symbol (○) shows a weak interaction between architectural design curriculum and the mentioned curriculum. For example, the effects of the human science curriculum on the architectural design appears in the second phase. These effects are strongly shown in the third and fourth phases. However, the scientific methodology has strong interactions in the first phase, these interactions start to weaken in the following phases, and so on for the rest of the different curriculums.

The following section pays special consideration to computing and IT courses and their potential impact on architectural students.

5. COMPUTING, IT, AND E-LEARNING IN ARCHITECTURAL EDUCATION

Computing and IT including the use of E-Learning technology can help, significantly, in preparing students with the needed skills in order to be productive in today's job market in the IT and globalization age. Towards achieving this aim, the following proposed courses and their distribution over 5 phases/years -one preparatory and four specialized architectural education (SAE)- each with two semesters, are shown in Table (2).

Table (2): Proposed Computing and IT Courses

Phases/Year	Course
Preparatory 1st semester	Modeling, Analysis and Presentation (1)
Preparatory 2nd semester	CAD
First SAE, 1st semester	3D Modeling and Visualization
First SAE, 2nd semester	Multimedia
Second SAE, 1st semester	Modeling, Analysis and Presentation (2)
Second SAE, 2nd semester	The Connected Architect and IT
Third SAE, 1st semester	E-Collaboration
Third SAE, 2nd semester	
Fourth SAE, 1st semester	Virtual Design Studio and Projects
Fourth SAE, 2nd semester	

Courses brief description, in addition to, their potential output and impact on architectural education are shown in tables 3 and 4, as follows:

Table (3): Computing and IT Courses' Description and Impact (Preparatory and First Specialized Architectural Education - SAE)

Course	Description	Output and impact
Modeling, Analysis, and Presentation (1)	A course for entry level and intermediate students. A task-based course with visual features, step-by-step instructions, and plenty of screen shots to guide students	Preferred in the preparatory phase/year, as student has no architectural background, to help

Course	Description	Output and impact
	<p>through the most important tasks.</p> <p>Course content includes:</p> <ul style="list-style-type: none"> -Introduction to operating systems -Introduction to internet browsing -Report making with word processing software -Modeling and analysis with spread sheets and data processing software -Managing data with databases software. -Presenting with data presentation software 	<p>student with tools of modeling, analysis, and presentation of data in the coming undergraduate courses.</p>
CAD	<p>Explains commands and applications, and contains a variety of features that enable students to create real-world documents and drawings, effectively, using computer-aided drafting/design software. It includes: basic drafting techniques, drawing display commands, layer management, dimensioning, creating elements, editing and modifying, layout and plotting, conceptual design, space boundaries, and working with areas</p>	<p>-Enhances and strengthens students' drafting skills.</p> <p>-Aids students through different phases of construction document creation (from early stages of conceptual design, through design development, and finally to the finished set of drawings).</p>
3D Modeling and	Explains commands and	Complement CAD

Course	Description	Output and impact
Visualization	applications, and contains a variety of features that enable students to create 3D architectural elements and applications, effectively, using 3D modeling and visualization software. It includes: creating 3D elements, editing and modifying, and architectural applications	course and serve design needs from the early stages of conceptual design, passing by design development, and finally to the finished presentable project
Multimedia	Explains commands and applications, and contains a variety of features that enable students to render 2D and 3D drawings and present them, effectively, using various software. Software for 2D and 3D rendering, image processing, walk-through animation, sound integration, and other multimedia programs	Helps students in manipulating the output of 2D and 3D drawings. Enhance students' capabilities of architectural design presentation with multi-format.

Some examples for the results of using computing in the architectural field, from Cairo University, Architectural Department, students' works are shown in the following Figures (1, 2 and 3):

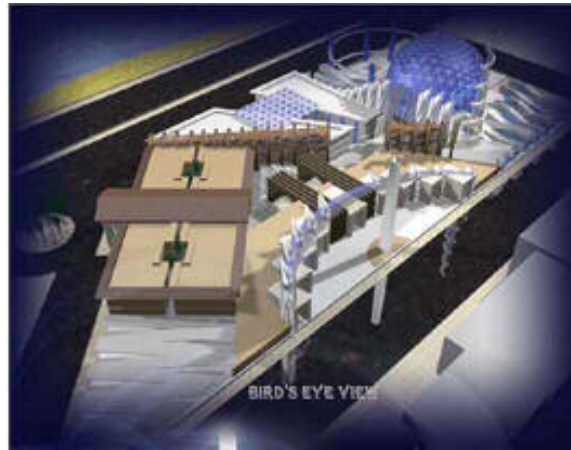


Fig. (1): A Possible Product of A 3D Modeling and Visualization Course

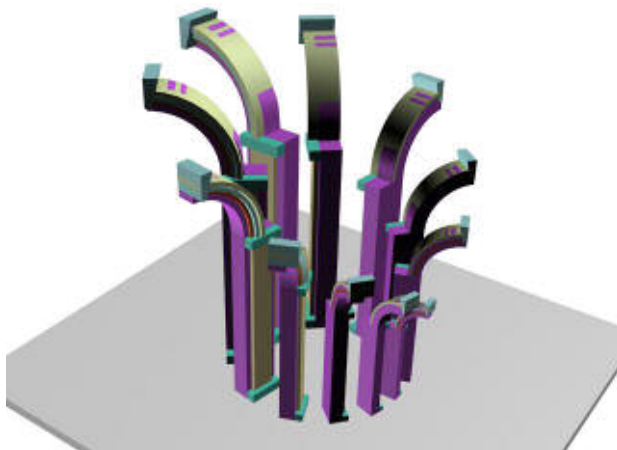


Fig. (2): A Possible Impact on Creative Design



Fig. (3): A Possible Product of A Multimedia Course

Table (4): Computing and IT Courses' Description and Impact (Second, Third and Fourth Specialized Architectural Education - SAE)

Course	Description	Output and Impact
Modeling, Analysis, and Presentation (2)	A course for entry advanced students. A task-based course with visual step-by-step instructions to guide students through important tasks. It includes: Advanced report making (and data integration, collaboration, customization, and distribution on the world wide web) with word processing software; Designing complex workbooks, analyzing data, integrating data, collaborating with others using spread sheets and data processing software; Design, maintaining and customizing databases using data processing software; Broadcasting presentations; Using net	<ul style="list-style-type: none"> -Enhance students capabilities to model, analyze and present data, effectively. -Prepare students for the connected architect and IT course applications. -Help in urban planning and architectural design analysis of programs and feasibility studies.

Course	Description	Output and Impact
	show, Using net meeting, and integrated project.	
The Connected Architect and IT	It builds upon the previous course: Modeling, Analysis, and Presentation (2). The course includes: Introduction to the new revolution of IT; Networking (local and wide area networks); Internet topology, types of connections, protocols, and software; Architectural applications through the internet such as collaboration via whiteboards and new features of CAD, virtual design studies, and serving drawings and maps.	Aids students to: -Understand the impact of networks wiring. -Build his/her own network. -Understand and use, effectively, the internet. -Publish his/her work.
E-collaboration	This is a one phase/year (two semesters) course. It consists of several projects for collaboration with the web using: -Word processing, data	-Allows collaboration between colleagues through electronic media and communication means in order to work as an integrated team, internally, in the department of architecture, or externally, with

Course	Description	Output and Impact
	<p>processing and databases, and presentation software, including net meeting (downloading, placing a call, hosting a meeting, sharing remote desktops, receiving and sending video, and using the whiteboard).</p> <p>-CAD software including virtual conference technology usage.</p>	<p>other departments' colleagues.</p> <p>-Allows coordination and cooperation with other courses work (exercises, projects, etc.).</p> <p>-Helps in advanced stages of design development where the interaction between various disciplines takes place.</p>
Virtual Design Studios and Projects	<p>This is a one phase/year (two semesters) course. It includes learning and practicing Virtual Reality (VR) techniques. The course is a guided project based one, where the student participates in design, with foreign students and faculty members. It can serve as a graduation project, as well. Foreign speakers and jury can be invited in the</p>	<p>-In principle, an individual designer might initiate a project, develop a design, and fabricate a product without the intervention of anyone else. However, in practice, all but the simplest of design and construction tasks are carried out by teams in which there is a division of labor among members. So, designers tend to spend large proportions of time communicating with each other. To minimize communication costs and difficulties, which increase with</p>

Course	Description	Output and Impact
	course, making use of video conferences, and other advanced technology.	<p>distances, teams' members cluster themselves closely in offices, studios, etc... together with specialized resources such as drawing archives, technical reference libraries, and print facilities for easy access. But, computer-aided design and virtual reality technology can be combined with digital telecommunications to reduce or eliminate the need for co-location, thus members of geographically distributed design teams can work together in virtual design studios.</p> <p>-The expertise gained in the previous phases/years can be put into practice and polished in this course.</p>

6. CONCLUSION

The present research work proposes an architectural design curriculum approach, in light of an integrated architectural education framework, with the possible interaction with other components of the framework. Special consideration is given to computing

and IT courses, including the use of E-Learning technology, and their potential impact on architectural students.

The philosophy of changing from the culture of memorizing and recalling into the culture of criticizing innovating education emerges, significantly, particularly in the Information Technology (IT) age. This, in turn, needs establishing an integrated educational framework taking into account the surrounding environments.

At last, we want to stress on a group of points that must be mentioned here. The group of goals and work axes mentioned in the above research are nothing but a group of thoughts from the researchers through their work in teaching architectural design curriculum. These thoughts can be discussed and developed after testing them for longer periods. They may vary with the size, type, goals, and directions of each educational school.

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إطار متكامل للتعليم المعماري: ربط التصميم بتكنولوجيا المعلومات

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ملخص

يحتاج تسير قيادة العمل مستقبلياً إلى أجيال من الخريجين ذوي مهارات عالية قادرة على تلبية احتياجات قطاعات النشاط البشري المختلفة. وكأحد السبل لتأهيل هؤلاء الخريجين، يلعب التعليم دوراً مميزاً. ومن ثم، تبرز أهمية التأكيد على فلسفة التحول من ثقافة التلقين والحفظ والتخزين والاسترجاع إلى ثقافة التعليم الابتكاري الناقد، وهو ما يتطلب بناء منظومة متكاملة للتعليم المعماري لمرحلة التعليم الجامعي (البكالوريوس) تراعي الأبعاد والجوانب المجتمعية المحيطة وخاصة في عصر تكنولوجيا المعلومات. وتتكامل الأجزاء والمكونات المختلفة لهذه المنظومة داخلياً فيما بينها وخارجياً مع المراحل التعليمية الأخرى، سواء السابقة أو التالية لها. وي طرح هذا العمل البحثي رؤية لمنهج التصميم المعماري في إطار منظومة متكاملة للتعليم المعماري في المرحلة الجامعية (البكالوريوس) وإمكانية التفاعل بين منهج التصميم وأجزاء المنظومة الأخرى. هذا مع اعتبار خاص لمنهج الحاسب الآلي وتكنولوجيا المعلومات وإمكانية تأثيرها على الطالب المعماري. وتضم هذه المناهج: النمذجة، والتحليل والتمثيل، مساعدة الحاسب في التصميم والرسم، النمذجة والرؤية ثلاثية الأبعاد، المعماري المتصل وتكنولوجيا المعلومات، الوسائط المتعددة، المشاركة الإلكترونية، واستوديوهات التصميم الافتراضي.

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