



Architecture Education Methodology Comparison between KTH-Sweden and PUA-Egypt

Shahira Sharaf Eldin, Johan Martelius

(Assist. Prof., Architectural Department, Pharos University in Alexandria, Alexandria, Egypt, shahira.sharafeldin@pua.edu.eg)

(Professor of History of Architecture, School of Architecture and the built Environment, KTH Royal Institute of Technology, johan.martelius@arch.kth.se)

1 ABSTRACT

The increasing global emphasis on sustainable approaches demands new approaches to architecture education. In order to raise the level of architecture education; analyses of different education programs, finding comparable experiences and problems across borders and the creation of a network worldwide for the exchange of information are recognized methods of achieving and maintaining comparable national and global standards. With the aim of improving education and research activities, Faculty of Engineering at Pharos University in Alexandria, Egypt; PUA (Private developing world university) and the Royal Institute of Technology; KTH (International technical university in Stockholm, Sweden) agreed on long term cooperation in 2009.

This cooperation aim is to introduce the “Swedish” experience in teaching and education at PUA in order to provide graduates with the professional, intellectual and technological skills which enable them to compete in global job markets and cope with modernity. As a part of the cooperation agreement between PUA and KTH; a team work from KTH conducted a follow up and evaluation of Architecture program at PUA.

The present paper focuses on the Architecture Curriculum followed in PUA as compared to the already adapted in Sweden. This comparison is undertaken in various directions covering methodologies used in both universities; besides in depth analysis of that methodology outcome, in the form of the final product quality (the graduate students) will be exposed. This comparative analysis gives us as academics a basis to strengthen our programs, to enhance our role in shaping undergraduate education, and to improve the quality of education.

2 INTRODUCTION AND BACKGROUND

Architectural education, as one of the distinctive branches of education, requires the development of creative capabilities. The primary concern of architects is to produce three dimensional space and form to accommodate related human activities. Like other types of education, architectural education conveys, conserves, and transmits the values of the profession and society at large. Since humane environments are created in a field of tension between reason, emotion and intuition, architectural pedagogy should be viewed as training toward the manifestation of the ability to conceptualize, coordinate, and execute the idea of building rooted in humane tradition. This mandates a comprehensive understanding of two different but related types of pedagogies in architecture: skill-based and knowledge-based.⁽¹⁾

Debates on higher education assert that a university mission should foster a campus environment that nurtures exploration, enlightenment and critical thinking among all students. Inquiry, investigation, and discovery are now viewed as activities central to undergraduate programs worldwide.

2.1 Foundation of Architecture department at Pharos University in Alexandria (PUA)

Pharos University in Alexandria (PUA) was established as nongovernmental university on July 2006 according to Presidential decrees No. 252/2006 and 202/2009. Since then PUA, with its eleven faculties, became a member in the Egyptian Council of Private and National Universities. The Engineering Faculty, as one of the major PUA faculties encompasses six departments; Mechanical Engineering, Electrical Engineering, Computer Engineering, Petrochemical Engineering, Architecture Engineering, and Civil Engineering.⁽²⁾

2.2 The School of Architecture and the Built Environment at KTH Sweden

The School of Architecture and the Built Environment, (Skolan för Arkitektur och samhällsbyggnad) is one of eleven schools at the Royal Institute of Technology (KTH). The School of Architecture is unique among KTH's schools in that we work with both the natural sciences and technology and with the social sciences and the humanities. The School of Architecture is also noted for its excellent contacts within research, business and the public sector, a strong tradition of contract education, and continual and well-organized contacts with professional organizations about the content and development of educational programs. The School of Architecture is comprised of seven departments and four centers for advanced research. ⁽³⁾

2.3 KTH - PUA cooperation history

The cooperation between Pharos University in Alexandria (PUA) and KTH has started in early 2006 for collaboration in education and research activities, Faculty of Engineering at PUA and KTH. The scope of such long term cooperation is to introduce a "Swedish" quality education and training at PUA that provide its graduates with the professional, analytical, and technological skills which enable them to compete in global job markets. This will further enable the growing Swedish investment in the Middle East region capitalizing on developing human resources and offering jobs for PUA students. The cooperation will also increase the awareness of KTH and PUA students and staff of the mutual potential benefit of culture, scientific, economical and socio- culture interests. A Memorandum of Understanding (MOU) was signed by PUA and KTH in May 2007. After initial delay a joint team from KTH and Uppsala University (UU) visited PUA and agreed in September 2008 to start the first phase of the cooperation by evaluating and bench marking the Engineering curricula at PUA with respect to KTH programs. ⁽⁴⁾

The cooperation agreement between Faculty of Engineering, Pharos University in Alexandria (PUA), and the Royal Institute of Technology (KTH), involves only five programs. KTH team has reviewed the Architecture engineering program. The KTH report was presented to PUA in May 2009. An overall review of the different program were undertaken, in depth analysis of the content of the different courses have been made, compared with the corresponding programs at KTH, and finally some recommendations were provided. Accordingly, PUA started to work on the suggested modifications as specified in the report.

The cooperation in education between KTH and PUA is an important way of developing human resources and also constructing lifelong education system. Through cooperation, the university development direction can be accurately mapped out, teacher's practical ability is improved, the education quality can be enhanced and its personnel training capability is strengthened. ⁽⁵⁾

The current work presents an experience of collaboration between two universities (KTH and PUA) presenting new opportunities for academics to strengthen programs, to enhance their role in shaping undergraduate education, and to improve the quality of education. . The most significant plan is to promote mobility of staff and students and to introduce joint a successful experience of joint degree program which offer PUA students' chances to compete in the global market.

3 EVALUATION OF THE ARCHITECTURE CURRICULA IN PUA AND KTH

The evaluation of the Architecture Curricula in PUA and KTH are evaluated according to UNESCO/UIA Charter for Architecture Education. The charter involves the acquisition of the following capabilities: Design, Knowledge and Skills. Knowledge contains the following studies: culture and artistic studies, social studies, environmental studies, technical studies, design/theories studies and professional studies. The comparison between PUA and KTH architecture curricula was initiated on the previous basis (UNESCO/UIA Charter), besides, an in-depth analysis of the different courses at PUA were evaluated and compared to corresponding courses at KTH. The comparison was carried out through three main aspects; graduation requirements, courses content, and teaching methodology and presented in the following sections. ⁽⁶⁾

3.1 Graduation requirements

The requirements for a Bachelor Degree in Engineering at PUA are different from the requirements for a similar degree in Sweden (KTH). The Egyptian regulations require that the students spend at least 5 years in Engineering Schools before they are allowed to be graduated, while the Swedish system normally requires 3 years, without minimum requirement for the study period. Fig. 1 illustrates the make-up of the engineering programs at PUA and KTH. It was therefore necessary to observe these requirements when modifying PUA

curricula in order to maintain a high quality education and training of the students meanwhile fulfilling the requirements of both PUA and KTH for a B.Sc. degree in Engineering. ⁽⁴⁾

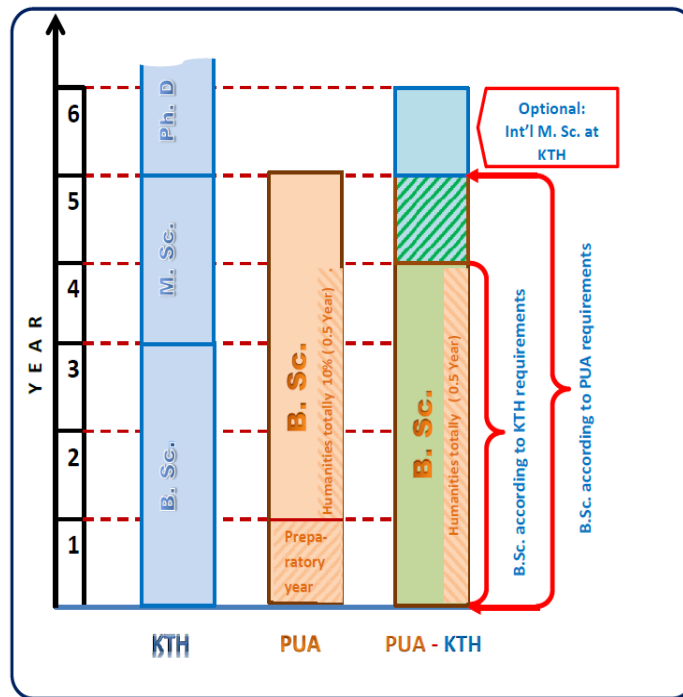


Fig. 1: illustrates the make-up of the engineering programs at PUA and KTH.

The first year of the PUA architecture program is a preparatory year, which is common requirement to all programs at the Egyptian Faculties of Engineering. Besides, regulations also require that at least 10% of the curricula courses are humanities and languages, which is equivalent to approximately one semester. In order to complete the requirements for the B.Sc. degree in architecture, the students must pass successfully, a total of at least 177 credit hours(Cr-hr), through the 5 Academic Years (10 Semesters). A summer training of 60 days over 3 years is a degree requirement in Architecture Department.

At KTH, Master of Architecture is awarded after the student has completed the courses required to gain 300 Cr-hr. The program is divided into three foundational years at the undergraduate level (Years 1-3) and two advanced years at the graduate level (Years 4-5). After completing the five years and the required 300 academic Cr-hr, students are awarded the Master of Architecture degree (Arkitektexamen).

The academic year at PUA is divided into two semesters. Each semester is about 18-19 weeks. The credit hour system is applied by PUA and the total semester load is about 18 or 20 Cr-hr. The courses are given throughout the semester and the final exams are given at the end of the semester. The number of credit-hour per course is based on the number of contact hours for each course including lecture hours, tutorial hour, and practical (laboratory) hours.

In comparison, the academic year at KTH is divided into two semesters with an average load of 30 Cr-hr (hp according to the ECTS system). Thus it can be fairly established that the 1 Cr-hr system used by PUA is equivalent to 1.5 Cr-hr (hp) according to ECTS-KTH system. This is illustrated by the following example given in Table 1.

	Weekly load Contact hours	Total load Contact hours	Credit hour PUA	Equivalent KTH	Equivalent KTH hp - Credit
Lecture	3	45	4	22.5	6
Tutorial	2	30		10 (3h each)	
Practical/lab	1	15		5 (3h each)	

Table 1: Equivalency of credit hours between KTH and PUA.

Thus, upon the successful completion of the PUA courses in the first four years, the students will have an average number of 160 Cr-hr (according to PUA system) which is corresponding to 240 hp (credits: according to ECTS system used by KTH). This fulfills the formal requirements of KTH system for a B.Sc. in Architecture Engineering. ⁽⁴⁾

3.2 Content and extent of courses

3.2.1 Courses content

Tables 2-5 summarize similar courses and different aspects between the two curricula's courses through different level. The major differences between KTH and PUA programs in architecture were the following:

Studio work versus knowledge: First, whereas KTH has a structure based on design studios where the aim is to integrate and synthesize various skills and fields of knowledge, PUA has distinct subdivisions into specialized courses. At KTH only architectural technology and the history and theories of architecture are forming separate courses, to be followed through all years. Also, studio description does not indicate whether knowledge delivered in a lecture format is integrated into design assignments in the studio.

Real theme versus hypothetical theme: KTH has no specialization on B.Sc level, whereas PUA is introducing now only one specialization (Architectural Engineering). Urban Design and Interior Design are compulsory courses in the PUA Architecture curricula. At KTH urban design forms the major theme of studies during the last year of B.Sc level, although this also includes one large scale project in architectural design. Interior design, while addressed variously in different studio projects, has no specific place in the curriculum of KTH, nor any specified teaching position. Even on master level, architecture or architectural design remains the major framework of the studios at KTH. While interior design, although often produced by architects, also forms a separate profession in Sweden and Europe, urban design is a required part of the architectural curriculum. The EU directive on architecture states urban design as compulsory on B.Sc. level education in architecture, being a requirement for student exchange between European schools.

Theoretical courses versus Practical courses: According to KTH assessment, the PUA curriculum covers an impressive scope of theoretical and practical aspects of the architectural field. This includes for instance, the History and Theories of Architecture and related issues of architectural conservation. Conservation is covered at PUA in one elective course and through design application course. KTH at present is covering issues of restoration or conservation mainly in studios on master level, but the dialogue between the two universities will hopefully cover also the role of conservation and designing in existing fabric. Issues of physical context and environment also affect the place of landscape design. Like interior design, this also forms a separate profession in Sweden, but being closely related to issues of context and exterior architectural space, the integration of landscape design in the curriculum is always relevant and forming aspects in studio work.

Artistic versus technical paradigms: When it comes to more technical aspects, whether concerning building construction or design instruments, PUA, has detailed courses distributed through the curriculum. Basically at KTH, the first year is focusing on traditional or analogical methods of drawing and presentations, whereas later year focus on the digital process. Courses in architectural technology mainly proceed from conventional methods to experimental approaches mainly in second year.

Unity versus multidisciplinary criticism: The place of art, or artistic design also is less specified at KTH compared to PUA. Teachers who are educated and practicing as artists, however, are involved in design studios on B.Sc level, supplying instructions on perspective construction, the role of colors etc. In KTH B.Sc level, Studio teaching takes place in groups of 20-25 students led by two architects, a civil or environmental engineer and an artist. The presence of multidisciplinary group in the studio adds and develops the students' skills. ⁽¹⁾

Bachelor level versus master level: Finally, the status of the B.Sc level in architecture need to be revised. KTH has the B.Sc degree, as a preparatory stage for the Masters degree. Nowadays, the B.Sc degree is considered to be of no real significance or professionally relevant. The PUA B.Sc level based on five years of education, four of which are specializing in architecture, should be considered as a preparation for Master level studies in other schools of architecture, including KTH. On the other hand, since the professional education in architecture is generally and internationally considered to form an integral unit, it seems that PUA should aim towards extending as soon as possible its education into becoming a full program, to be accepted as the professional level degree in architecture.

ARCHITECTURE DEPARTMENT

2009 /2010

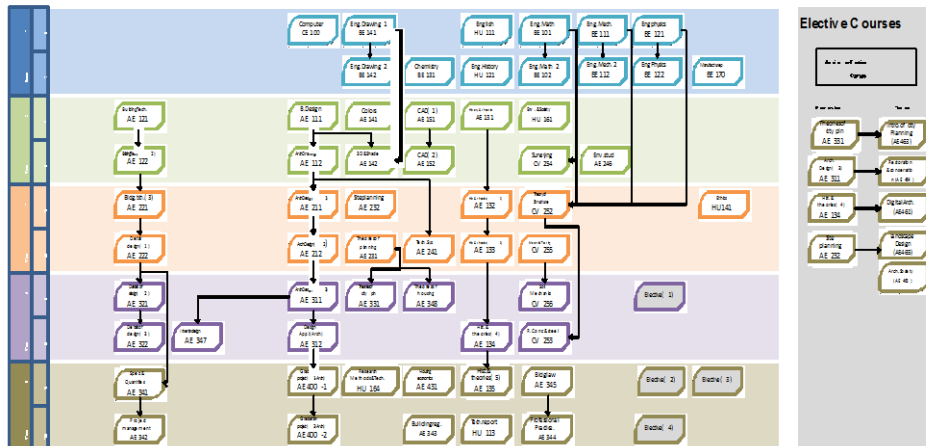


Fig. 2: PUA ; Old Architecture program.

Courses	PUA/2nd level	KTH/1st year (Experiments)
Design	(AE210) Basic Design / Architecture Design 0(AE112) The first course begin by teaching drafting skills gradually. By the end of this level	A11P1B Architecture Project 1:1 composition, geometry, scale. A11P2B Architecture Project 1:2 Landscape, structure, movement . A11P3B Architecture Project 1:3 Housing, employment, climate .
Building Technology	Building technology begin also in the second level of architecture through two courses (AE 121	A11TEB Architectural Technology 1 7.5 hp
Artistic studies	(AE141) (colors in built environment course) which introduces them to the basic principles of colors. (AE142) 3D and Shadow course introduce the students with the aid of studio exercises the behavior of shadows with the different forms and surfaces. Then students begin drawing 3D perspectives in freehand sketches or using manual drawing tools of one	A11KOB Artistic methods and tools. A11REA Representation 1: technical drawing and descriptive geometry
Cultural and Historical studies	History and theory 1 (AE131) introduce the students to the history architecture of the Ancient Civilizations; i.e. Egyptian, Greek ,Roman. In theories they begin to learn about the basics and principles of architecture form, orders and space design.	A11HIB Architecture History and Theory 1 course which give students a basic understanding of architecture's historical and theoretical development in a European context, from antiquity to the late 1900's. The course provides a basic introduction to architecture, architecture theory and urban planning history.
Social Studies		A11IAA Introduction to Architecture The goal of course is that, from a design perspective, develop knowledge of how the architecture works as part of a series of spatial, cultural, technological, economic, political, social and ecological processes, and problematize architect matter based issues of power, aesthetic value systems, culture and gender .
Environmental Studies	AE 246 course Environmental studies in Architecture. This course concern with all about the basics of the environment; methods and techniques of human comfort indoor , studying the passive techniques of solar design, ventilation and wind effect on the built environment. Also this course shows how environmental factors may be utilized, controlled and modified as an integral part of architectural design.	Integrated through design project A11P3B Architecture Project 1:3 Housing, employment, climate .
Computer Studies	Students in the second level through CAD1 course gain a working knowledge of the drawing methods and techniques using CAD programs in 2D and 3D.then in the 4th semester they complete CAD2 course to learn about graphics programs such as Photoshop, Rivet and 3D Max. These courses enable students to accomplish their design and working drawings using the computer in the next academic years.	A11REA Representation 1: technical drawing and descriptive geometry Tools: Adobe package, Rhino, AutoCAD, laser cutting - can vary from year to year)
Technical Studies	Surveying course (CV254) students in this course learn to identify mapping systems and building surveying.	Integrated through design project A11P2B Architecture Project 1:2 Landscape, structure, movement .
Professional Studies		A11IYA Introduction to the Architectural profession course which is an introduction to the architectural profession and its identity.

Table 2: Similarity and different aspects between PUA/2nd level and KTH/1st year.

Courses	PUA/3rd level	KTH/2nd year (Articulation)
Design	(AE211) Architecture Design 1 / Architecture Design 2(AE212) courses teach students a simplified definition of architectural Design to improve their sense of relationship between the human scale and the architectural space, the module, zoning diagrams and the relationship between the different stories of a building. By the end of this level, students are introduced to design and recognition of vertical circulations, functional relations and use of spaces whether in a multistory building or single universal space, and present all needed drawings.	A21P1C Architecture Project 2:1 structure, location, activity A21P2B Architecture Project 2:2 - Tectonics, Ornaments, Transformation A21P3C Architecture Project 2:3 material, space, detail
Building Technology	Building technology 3 (AE221) is about detailed working design, focusing on the various finishing materials; for floors, ceilings, and walls. Design Detail (1) (AE 222) explain how to present complete portfolio of the basic working drawings of a building (designed in Design courses), with the layout design and the building implementation.	A21TEB Architectural Technology 2
Artistic studies		A21KOB Artistic methods and techniques
Cultural and Historical studies	Architecture and theory 2 and 3 (AE132, AE133) are about history of architecture beginning from Christianity till gothic architecture for the first then Islamic till ottoman architecture in second course. As for theories at the first part they continue to learn about architecture physical and functional components to end in the second part with design principals of cultural buildings in addition to hospitals and health-centers.	A21HIC Architecture History and Theory 2: Architecture and Modernity This course provides a deeper study of architecture and architectural theory development with an emphasis in the 1900s, but with flashbacks to 1700 - and 1800's. The modern architectural historiography studied the course and reflect on how we can broaden the perspective of history and analysis models
Social Studies	In the third level, (AE231,). course entitled theories of planning begins to review the history and theories of the growth of the cities due to both natural and human factors.	
Environmental Studies	AE232 Site planning this course revise environmental, physical, visual and social, aspects of site planning.	Integrated through design project A21P3C Architecture Project 2:3 material, space, detail A21REA Representation 2: Fabrication and descriptive geometry Module 1: building climate, construction and energy
Computer Studies		A21REA Representation 2: Fabrication and descriptive geometry Part 2: The architecture technology, and digital modeling Part 3: design, detail, file
Technical Studies	Two courses (CV252, CV 255) are offered. First course entitled theory of structures discuss different structures types and analysis. The second course entitled Materials testing describe properties, behavior and fabrication of building materials. Technical Systems in buildings(AE241) course give an overall look to the building technical systems, and their relation to the internal design elements.	Integrated through design project A21P1C Architecture Project 2:1 structure, location, activity. A21P2B Architecture Project 2:2 - Tectonics, Ornaments, Transformation.
Professional		A21AYA Architecture Substance and Architect profession

Studies		
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Table 3: Similarity and different aspects between PUA/3rd level and KTH/2nd year.

Courses	PUA/4th level	KTH/3rd year (Practitioners, credentials, professional) B.Sc.
Design	<i>Design courses (AE 311, AE312)</i> aims at teaching the student the architectural and structural grids and the relation between them taking in consideration architectural environmental strategies. In AE 312, Students are taught to respect existing urban fabric through designing new buildings in a historical area and be able to protect the heritage and to comply with the new trends and spirit of the age.	A31KAX Degree in Architecture at the basic level, "Candidate Projects" A31P1A Project studio 3:1, Urban design. A31P2D Project 3:2 Urban spaces and landscape. A31P3A Architecture complex Project
Building Technology	<i>The Design detail (2) course (AE 321)</i> develop the students' ability to comprehend basic building components and construction details leading to the practical execution drawings of previous designed public-use architectural project, whereby students are required to present a complete set of construction documents. During this level, in the eight semester, students focus through Design detail 3 (AE322) on integrating the design concept and functional aspects of the building with the various systems and technical installations that govern its operation.	A31T1A Architectural Technology 3:1 building, city, process A31T2A Architectural Technology 3:2: building, city, process
Artistic studies	Interior design course (AE347) in which they are taught the interior design process and the relationship between the different internal planes of an architectural space including materials, lights and new technologies affecting the internal space design. Aspects involved in the execution of interior design are also incorporated in practical exercises.	
Cultural and Historical studies	Architecture and theory 4 (AE134) teach the students at first to trace the evolution of architectural theories through the modernism and the post-modernism till the age of cyberspaces and the digital architecture discussing technology and its effect on architecture. In the same course, in the history part students revise architecture of the Renaissance and post Renaissance.	A31H1A Architecture History and Theory 3:1 World Architecture: The course involves an expansion and deepening of the previous year's content by focusing on architecture, urbanism and traditional construction cultures outside Europe. Historically, the course spans from ancient times to contemporary globalization. A31H2A Architecture History and Theory 3:2 Essay on the basic level
Social Studies	(AE231)The course entitled theories of city planning begins to review the history and theories of the growth of the cities due to both natural and human factors. Also urban planning is introduced through different exercises. AE 348 Theories of housing gives the fundamentals of housing.	A31P1A Architecture Project 3:1, City Planning. A31SFA Urban form and theory.
Environmental Studies	Elective course: Landscape design	A31P2D Architecture Project 3:2 City Space and Landscape.
Computer Studies		A31REA Representation 3: Information management and presentation.
Technical Studies	(CV256) entitled Soil mechanics introduces the students to the types of buildings foundation, different types of soil, soil tests, measurements, and capacities. Second course entitled Reinforced concrete and steel structure (CV253) give students the basic of design of reinforced	

	concrete and steel structures.	
Professional Studies	--	--

Table 4: Similarity and different aspects between PUA/4th level and KTH/3rd year.

Courses	PUA/5th level (B.Sc.)	KTH/4th year (10 studios) (M.Sc.)
Design	Design graduation courses (AE400-1, AE400-2). At first, there is an introductory course for the graduation project, where the student with the help of his/her teacher should choose the type, name and site of his/her graduation project. By the end of this course the student should complete a written research about the chosen project, with a complete finalized program, site analysis, and some of the latest examples of similar projects. In the second part of the graduation course (AE400-2), the student should apply most of what was learned in the previous years of architectural studies as the graduation project should reflect deep studies of the effect of architecture on society, culture, technology.	Design Process Studio,
Building Technology		Performative Design Studio,
Artistic studies		Basic Design Studio,
Cultural and Historical studies	History and architecture 5 (AE135) with routes, influences and evolution of contemporary architectural movements and their philosophy.	Critical Studies Design Studio.
Social Studies	AE431 Housing economics AE462 Architecture and society AE 464 Architecture conservation (elective course) AE 461 Digital Architecture (elective course)	Contextual Space Studio, Urban Studio,
Environmental Studies		Landscape Design Studio. Sustainable Design Studio
Computer Studies		Advanced Design Studio,
Technical Studies		
Professional Studies	AE345 course (building laws regulations and codes) contains Architectural legislations (building laws, urban organization and planning acts) AE344 Course entitled Professional practice, students gain a working knowledge of the ethics and rules of professional architectural practice to promote their knowledge.. (AE341) specifications and quantities course deals with methods of measurement and quantities evaluation for construction works. Also capability to specify materials and preparing of bids are also given. (AE342) Project management is about understanding all about the	Practice Based Research Studio,

fundamental of construction management.	
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Table 5: Similarity and different aspects between PUA/5th level and KTH/4th year.

3.2.2 Courses extent

Studies groups are evaluated between PUA and KTH curricula according to their percentage comparing with the total level (year) credit hours. Comparison results are presented in table 6 and illustrated in Fig. 2-5.

The three figures confirm the previous discussion about the dominance of the design studio in KTH while all other courses are integrated into it. The amount of theoretical courses offered in PUA are more than KTH but joining the courses is important to add and develop students informations. Artistic studies are cumulative studies and therefore must take more concern along all levels in PUA to match with KTH.

Studies groups	PUA/2 nd level	KTH/1 st year	PUA/3 rd level	KTH/2 nd year	PUA/4 th level	KTH/3 rd year
Design	23.5%	55.0%	32.0%	55.0%	33.0%	64.0%
Building technology	23.5%	12.0%	21.5%	15.0%	22.0%	12.0%
Artistic studies	17.0%	10.0%	--	10.0%	9.0%	4.0%
Cultural and historical studies	6.0%	12.0%	11%	15.0%	6.0%	12.0%
Env. Studies	6.0%	11.0%	6.0%	10.0%	6.0%	8.0%
Others	24.0%	--	29.5%	--	24.0%	--

Table 6: Comparison between studies groups in KTH and PUA.

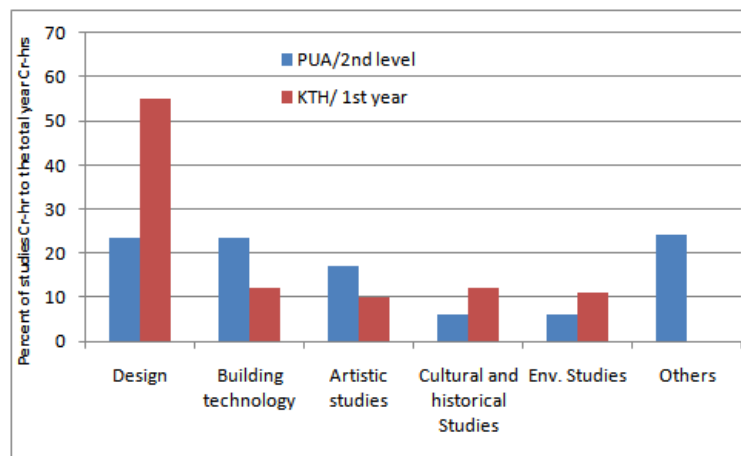


Fig. 3: Percent of studies Cr-hr to the total year Cr-hrs between PUA/2nd level and KTH/1st year.

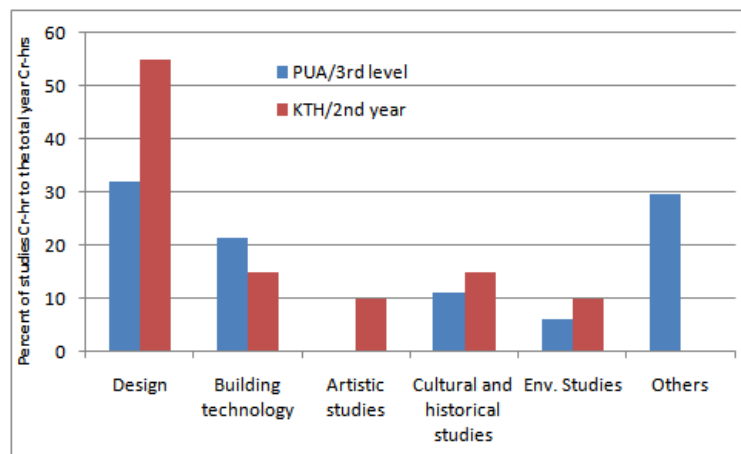


Fig. 4: Percent of studies Cr-hr to the total year Cr-hrs between PUA/3rd level and KTH/2nd year.

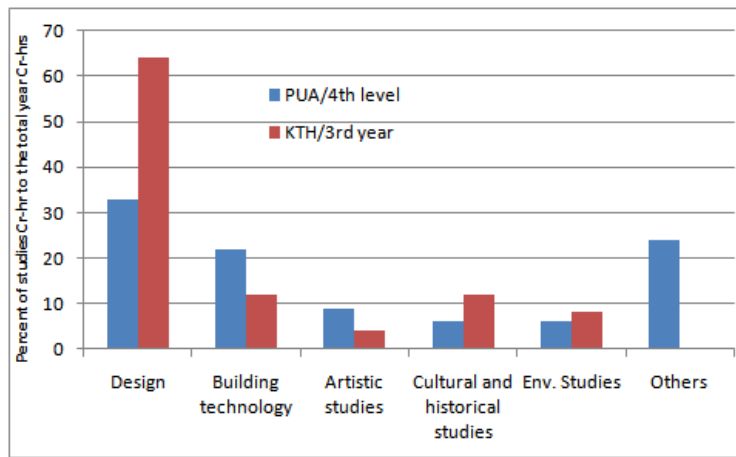


Fig. 5: Percent of studies Cr-hr to the total year Cr-hrs between PUA/4th level and KTH/3rd year.

3.3 Teaching and assessment methodology

Teaching and assessment methodology is discussed through courses' teaching methods, grading system, and Training in the next part.

Courses' teaching methods in PUA: are divided in two groups: theoretical courses and practical courses which need studio work.

Theoretical courses: Knowledge is usually presented to students through traditional teaching methods such as lectures and exercises. Non- traditional methods such as interactive learning, simulation in lab, site visits, mini projects, .etc are sometimes applied. The final evaluation is divided into two parts; the first part (50%) is on the assignments, mid-term exam and semester work and the other 50% is on the final exam. History and theories, professional and elective courses group are theoretical. Also environmental studies are considered to be among the theoretical ones. Elective courses are also considered theoretical courses.

Practical courses: The architecture design studio- the backbone of architecture education- is the main component of the teaching pedagogy. The two components which governed the studio work are: the design process in the studio and teaching style adopted by the instructor or studio director which can always differ according to the route taken in the studio. ⁽¹⁾All design and its complementary courses, building technology and computer courses have studio and practical exercises as main component. Civil courses, urban and environmental courses are also considered practical courses except for environmental studies as mentioned earlier. As for the practical courses the grade is distributed in two parts: the first part which is 60% is allocated for semester work (research, students' projects progress report, Mid-Term exam) and the other 40 % is on all students' projects presentations and the assessment of a jury committee (composed of internal and external examiner).

Grading system in PUA: Courses are graded on a scale from A to F. A-D are passing grades, A is the highest grade. (F) which is fail sign is used for courses grades less than 50%.

Training in PUA: A summer training of 60 days over 3 years is a degree requirement in Architecture Department. Training has to be undertaken in companies or establishments approved by the faculty. Student's performance is evaluated at the end of the training period by the company where training is undergone and by the department and the faculty coordination.

Courses' teaching methods in KTH: The program in KTH is course-based. The program curriculum is organized in a series of courses arranged in a list on-line. The course list also describes several elective courses. In the undergraduate program (Years 1-3), all courses are compulsory. The overall objective for Year 1 is to give students basic knowledge in the discipline of architecture, Fig. 6. Articulations are introduced in Year 2 as a deeper exploration of the discipline of architecture. The design projects increase in complexity, encompassing construction techniques, sustainability, and the building's interface with its users and the surrounding world. shown in Fig.7. In the third year of study, the focus is on how students confront the profession and understand the context of their work. They are introduced to and begin in-depth studies in the field of urban planning, Fig.8.



Fig. 6: KTH year 1:Experiments



Fig. 7: KTH year 2:Articulations



Fig. 8: KTH year 3:Experiments Practices, Precedents and profession

The curriculum conforms to the so-called European Architect Directive (2005/36/EG, formerly 85/384/EEG) and the course list specifies the course offerings for each academic year. Students who repeat a year of study or return to their studies after taking time off normally must follow the current course plan which is divided in 3 years of undergraduate studies and 2 years of Post graduate studies to complete the master level as shown in Fig.9.

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Fig. 9: KTH Architecture program.

Grading system: Courses in the first and the second cycle are graded on a scale from A to F. A-E are passing grades, A is the highest grade. The grades pass (P) and fail (F) are used for courses under certain circumstances. Academic courses and design studio projects in the architecture program are normally graded as either pass (P) or fail (F). Thesis projects are graded according to a particular decision of the school president.

Training of architects: That training, which must be of university level, and of which architecture is the principal component, must maintain a balance between theoretical and practical aspects of architectural training and guarantee the acquisition of the required knowledge and skills. During my visit to Architecture department at KTH, the author noticed that a part of the school is rented to an architecture firm. This can be a chance for students to interact with real clients and real users. ⁽³⁾

4 ADAPTIVE CHANGES IN PUA CURRICULA

Adaptive changes were applied to the PUA curricula, as shown in Fig. 10, to cope with the KTH curricula. In the following sections major and minor changes in PUA courses are presented. ⁽⁷⁻⁸⁾

4.1 Major changes

First Level/First Semester

HU121* History of Vernacular Architecture: The course is changed in contents for architecture students. Architecture students will study a wide introduction to Vernacular architecture having the same no. of credits (i.e. 2credits).

First Level/Second Semester

BE142* Engineering Drawing and Descriptive Geometry (2): The course is changed to include a wide introduction to architectural drawings in addition to 2D and 3D projections. The course became (3 credits.)

Second Level/third Semester

AE111 Basic design course: This course content is modified to give the student knowledge on contextual approaches ,i.e. Designing a sculpture to be exposed in a real square Drawing an architecture pioneers' famous project with all surrounded landscape ,etc.

Second Level/Fourth Semester

AE112 Architectural Drawings course: This course is changed to AE210 Architectural Design (0).

AE210 Architectural Design (0) and AE122 Building Technology level 2

Integrated Design and Building studio starts the 4th semester and the building systems studied in the AE121 Building Technology level 1 and AE122 Building Technology level 2 are applied on the design project worked in AE210 Architectural Design (0). Thus a closer integration of technological and structural aspects within the design studio will take place.

Third Level/fifth Semester

AE231 Theories of city planning: This course will be offered in 3rd level /5th sem.(lecture +Exercise).

Third Level/six Semester

AE232 Urban design: This course will be offered in 3rd level /6th sem.(lecture +Exercise). Also, in all design courses in this level, urban context has been introduced to develop students' ability to explore issues associated with the relationship between culture and the built environment.

4.2 Minor changes

Second Level/ Third Semester

AE151 Computer Aided Drafting 1: This course introduces the student to the CAD conception in the 2D architectural drawings. In addition the course introduces the three dimensional design, using programs like CAD as an important means in architectural presentation which enable students to present advanced designs by adding materials. The course helps the student to monitor the building systems, and details, also manage the integration of CAD programs and the design process.

Second Level/Fourth Semester

AE152 Computer Aided Drafting 2: Architecture students are introduced to courses of graphics such as Photoshop, Rivet and 3D Max.

Third Level /Fifth Semester

AE211 Architectural Design level 1 & AE221 Building Technology level 3: An integrated design studio concept is adopted in full starting the 5th semester by adding the actual hours spent in studio in relation to each of the AE211 Architectural Design level 1 & AE221 Building Technology level 3.

Third Level /Sixth Semester

AE212 Architectural Design level 2 & AE222 Details Design 1: An integrated design studio concept is adopted by adding the actual hours spent in studio in relation to each of the AE212 Architectural Design level 2 & AE222 Details Design 1.

Fourth Level/Seventh Semester

AE311 Architectural Design (3) & AE321 Details of Design 2: Urban Design is introduced in the form of a studio project work. Selected contents of the AE233 Theories of Urban Design will be incorporated in the

lectures of Architectural Design (3) having a code AE311 to give students the needed knowledge of urban design and an urban design project is introduced in the same course. In addition the integrated design studio concept is adopted by adding the actual hours spent in studio in relation to each of the AE311 Architectural Design level 3 & AE321 Details of Design 2.

Fourth Level/Eighth Semester

AE312 Design Applications & AE322 Details of Design 3: The integrated design studio concept is adopted by adding the actual hours spent in studio in relation to each of the AE312 Architectural Design level 3 & AE322 Details of Design 3. This course dealing with heritage conservation and addition to historic context must be an introduction for the graduation project. In this way the scales from the one family house to urbanism and different buildings typology will have been covered by the studio projects before the graduation project.

Fifth Level/Ninth and Tenth Semester

AE400-1 and AE400-2 Graduation project: The integrated design studio concept is adopted starting fall 2010/2011 through including the study and presentation of architectural and structural details into the graduation project.

Graduation project 400-2: The KTH remark was that The final project should consist of a major public structure, to include all aspects and scales, from details of construction to urban context. In Graduation project's second part, the course is now modified to be divided in three parts with their entire studio work needed (urban planning, design paradigm and Construction details).

All Levels/ Semesters

History and theory, 1 – 5 (3rd, 5th, 6th, 8th, 9th semester): History and Theories of Architecture courses adopted methods of analytical examples display, critical and comparative analyses. Seminars and other forums are applied for more discussion. This is also must be applied in exams.

The relationship between historical and theoretical components of the courses are made clearer. Architecture theory as developed in history, from ancient to modern, is integrated with history courses in AE134.

A more global outlook is strived for throughout the periods, to include not least the Islamic and early Christian cultures outside of Egypt.

Modern textbooks (such as “A Global History of Architecture”, 2006) replaced Banister Fletcher’s survey.

"Modern architecture: a critical history" book has been considered as a reference in History and Theories of Architecture 4 and 5.

5 CONCLUSIONS AND RECOMMENDATIONS

International cooperation between KTH and PUA as an integral part of the modern university education, together with all the advantages that result from the well organized department for inter-university cooperation and its influence on the academic process, can lead us to the following conclusions and recommendations:

- *Teaching methodology versus assessment methodology:* Since the core of architectural education is the studio work performed individually or in groups. PUA on-going projects as well completed candidate projects on display expressed certain quality. Serious level of requirements must be adapted in projects assessment and evaluation.
- *Knowledge and analysis versus Design tactic:* Curriculum policy must encourage the incorporation of knowledge in different learning settings. Approach used in decision making, combining of a design project with an analysis of a reference example, are very promising tools. Awareness of the complexity related to spatial, functional and structural aspects as well as to the selected site must be emphasized by both students and teachers.
- *Integration lectures and studio:* Courses of the Architecture Department curriculum in PUA fulfilled the KTH requirements. In fact, the new curricula must emphasize on integration of theoretical knowledge provided from lecture to be reflected on Design studio judgments and process.
- *Manual skills versus technical skills:* The students are working with free hand sketches, models with varying degrees of abstraction and of course computer drawings, obviously elaborating these tools all along the educational process. The on-going dialogue with the architecture department at KTH may now focus on enhancing these tools and methods and on values and ideals related to architecture, urbanism and design rather than on details of the curriculum.
- *Advances in technology leading to changes in learning pedagogy:* Architects all around the world are confronted with new technologies to learn it then to innovate in developing it. Architects are experiencing new methods for experimenting architecture design i.e. virtual reality lab, Architecture and media lab. PUA guided by KTH can strengthen educational program to compete internationally.
- *Participation of students in Architecture studios:* Tutor must enhance the participation of students in studio work evaluation, to address the interaction with social and culture issues, community groups and with real life situations.
- *Undergraduate program versus Master education:* On the other hand, since the professional education in architecture is generally and internationally considered to form an integral unit, it seems that PUA should aim towards extending as soon as possible its education into becoming a full program, to be accepted as the professional level degree in architecture. PUA has presented a proposal for the M.Sc to take the approval of the Supreme Council of Egyptian Universities towards extending its education to become a full program (undergraduate and post graduate studies) to accomplish the professional level degree in architecture. The Postgraduate program offered at Department of Architectural Engineering will lead to the award of Master and Master of Science (M.Sc.) degrees in the following fields: Architecture and Urban Design. The duration of study to receive a Master and Master of Science Degrees is 2 years minimum, and 5 years maximum from the date of registration. For Master degree, the first year consists of taught courses adding up to 30 credit hours (minimum 1 year and maximum 3 years) beside 10 credit hours for scientific report. But for Master of Science Degree, the first year consists of taught courses adding up to 18 credit hours from elective courses (minimum 1 year and maximum 3 years) beside 22 credit hours for thesis, as relevant to the chosen field of specialization.⁽⁹⁾ KTH connection can become the instrumental in this respect. KTH Professionals and specialists will collaborate to create a coherent Master Architecture education.

This comparative analysis gives us as academics a basis to strengthen our programs, to enhance our role in shaping undergraduate education, and to improve the quality of education.

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