Research Paper

A Comparison Study of Integrating Theoretical and Practical Components of the Architecture Education Curriculum in Iran and Australia

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Abstract

Integrating different parts of the curriculum is one of the important challenges in architecture education. Curriculum development has an important role in linking theoretical subjects into practical design studios. This study focuses on an analytical comparison of two architecture curricula in different contexts of Australia and Iran. The purpose is to find the limitations and benefits of each curriculum through educational systems, teaching time for theoretical and practical subjects, and the map of courses and subjects. This paper contributes to the literature of architecture education through analysis of integrating different subjects. This study implements a document analysis method and a comparative case study method. The comparison indicates that although the architecture curriculum in Iran benefits from an extensive education with more subjects, wider content, and triple teaching time, it provides less opportunity for integrating theoretical and practical subjects. Furthermore, course structures at Australian universities benefit from greater flexibility and choice for students to individualise their course through elective subjects. Architecture education is a problem-based and project-based learning, so the results of this research have a wide application in research on higher education. Also, the findings of this study can assist design schools to improve their curricula through linking theory to practice.

INTRODUCTION

Integrating theory and practice is a contemporary challenge for curriculum development in higher education generally and in design education specifically, whereby the Curriculum is the platform for linking theoretical knowledge into practical projects. Design pedagogy is supported by educational curriculum to reach this aim. There are different design pedagogies which universities follow based on their context and goals.

Curriculum design is an essential part of education delivery and reform. Curricula usually involves the whole experience provided to students in a school [1]. They form part of activities, recommendations and actions with the purpose of improving formal education [2]. Curricula development may have different purposes including developing a responsive curricula to 'unpredictable local, national and global challenges and opportunities' [3]. Integrating different parts of the curriculum is one of the

important challenges in architecture education around the world [4, 5]. Therefore, regular research on curriculum-including architecture education-is needed to respond to contemporary changes and challenges.

There are few studies comparing architecture education based on the curriculum. In one of them, sustainability in architecture education has been analyzed through comparing two different contexts; Iran and Australia [6]. In the other, the researcher has compared different architecture education curricula to find the most appropriate one for Kuwait [7]. The study shows that "there are no specific criteria for setting the architecture curriculum".

Architecture education has a number of divergent demands that include the need for more flexible and integrated curriculum to meet real world problems [8]. Architectural curricula needs to be modified according to current professional interests and accreditation board validation [9], and it also requires to find a balance between individual and collaborative learning, future and history, and creativity and sustainability [10]. Furthermore, architecture curricula are goal directed means for social equality and saving environment [11]. Architecture

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curriculum and course content need to reform for balancing and harmonizing subjects as well as integrating the knowledge gained to design studio projects [9].

Traditional approaches to content analysis help to identify the content components to be learned and classified in the curricula. Following the mechanistic paradigm, the educational process of architecture is reduced to a large number of disconnected components [12]. However, through a constructivist view, knowledge components are not separated in the real world [13].

Traditional forms of architecture education engage with and involve many aspects of experiential learning and integrated curriculum based on creative activities of problem solving. Relevance of the content across the course and opportunity to apply skills and knowledge to new situations, supports the development of new ways of understanding [14].

Architecture students were not able to provide practical and meaningful links between ancillary subjects and design projects. Therefore, it seems that each subject is independent and unlinked to others [15]. While the studio is not the only setting for architecture teaching and learning activities, the traditional pedagogy tries to centralize it and integrate it with other subjects. In modern architecture pedagogy, the subjects which support the design studio are taught in the way that the content is usually delivered in lectures, and tutorial sessions are offered to support development and critical thinking, and also students are expected to explore and discuss issues related to lectures [14].

1. MATERIALS AND METHODS

The research has utilized an illustrative form of case study to expose alternative approaches to curriculum structuring. Two cases have been analyzed to show the existing situations in document analysis method in which documents are interpreted by the researchers to provide meanings around an assessment topic [16]. Document analysis has been used to compare and contrast the two cases; commonalities and differences are uncovered and discussed. It has also used a comparative case study method [17]. While the two cases set the limitations of the study, they also present possibilities for curriculum development that may be applicable two different contexts. This study implements an outside of these cases, in similar contexts.

The study focuses on an analytical comparison between two different curricula, being at the School of Architecture at the Faculty of Fine Arts at University of Tehran (UT) which represents a conventional public university in a developing country, and at the School of Design in the Creative Industries Faculty at Queensland University of Technology (QUT) which represents a conventional state university in a developed country.

The scope of this study is primarily focused on introducing and analyzing the curriculum of architecture education at two selected universities through different factors such as teaching time for theoretical and practical subjects, the distribution of the subjects, and the map of courses and subjects. But there is also a comparison of the

two educational systems in terms of mode of teaching delivery, size of student groups, and various types of learning environments.

In this paper, theory refers to the knowledge, while practice refers to the application. In addition, theoretical subjects refer to the subjects rather than Design category, while practical subjects refer to the subjects which are taught in Design Studios. Moreover, theoretical teaching time refers to the teaching time which are delivered as lecture, while practical teaching time refer to the teaching time which deliver as tutorial sessions; no matter if they are related to Design studio subjects or other categories.

1.1. Case 1: Iran

University of Tehran (UT) is the largest and the first modern university in Iran which was established in 1934 [18]. The first department of architecture in Iran was established in 1940 as part of the Fine Arts Faculty. The architecture education was closely modelled on the French École des Beaux-Arts based on the traditional atelier system which was a design studio led by a master and his colleagues. Each atelier had been combined of students from different entries. So, students in this learning environment had opportunity to benefit from peer-learning [19].

The architecture curriculum in Iran has periodically changed in 1959, 1968, 1982, 1998, and 2014. The latest version was directly designed by UT in 2014 and approved by 'Council of Educational Planning' at 'Ministry of Science, Research, and Technology' in 2017. Since then, individual universities which have their own 'Board of Trustees' were authorized to devise their own curriculum for approval by the 'Council of educational Planning', which can be used by other universities. Before that, the 'Council of Art', which was formed by selective professors from different universities, were responsible for designing and reviewing architecture curriculum under the supervision of the 'Council of educational Planning' at the 'Ministry of Higher Education'.

The course redefine partially occurred in 1968 and then overall in 1982 (after the Cultural Revolution in Iran) [19]. As the first major change, the course redefined to re-orient toward Iranian Architecture and cover more technical subjects forming an architecture engineering degree. The next major shift in course design occurred nationally when a Continuous Master Degree of Architecture changed to Bachelor and discontinuous Master Degree in Architecture in 1998. Until 1998, students who were selected in the national university entrance exam, as well as especial exam for choosing architecture course, entered the Master of Architecture which lasted 6-7 years. Although this change occurred 20 years ago, some academics still believe that the previous curriculum was better for training architects [20]. It seems that most of these opinions did not consider parallel changes in the culture of universities, a sharp rise in the number of architecture schools, and other contextual confounding variables.

The continuous 6-7 years Master program was divided into a 4-4.5 years Bachelor and a 2-2.5-year master's

degree to provide more flexibility, offering various fields for Masters. But the Bachelor Degree of Architecture remained with no other alternatives [21]. From 2002, the School of Architecture at UT offers one undergraduate program and eight postgraduate programs which incorporates a PhD program and seven Master degree courses including Architecture, Landscape, Interior Design, Architecture Energy, and Architecture Technology [18]. The curricula in Iran have defined a bachelor's degree for four years which is between the comparative duration for a Bachelor of architecture in the US (5 years) and Europe (3 years).

1.2. Case 2: Australia

Queensland University of Technology (QUT) is a large size public university which initially was established in 1882. Architecture is one of the seven design courses at the School of Design, which moved from the Faculty of Built Environment and Engineering to the Creative industries Faculty in 2012. QUT and its predecessor institutions have offered continuous professional education in architecture since 1919. The latest version of the architecture Course received professional accreditation in 2016, in which a five year program of architectural education is structured as a four year undergraduate Bachelors (Honors) degree and a one year postgraduate Masters [22]. The course at QUT represents the conventional architecture curriculum within Australian universities regarding the category of subjects and their outlines. However, the structure is unique within Australia (where all other architecture programs are structured as three years plus two years for Bachelor and master's degrees respectively).

In particular the longer undergraduate course allows greater flexibility and choice for students to individualize their course by enrolling in 'second majors' that extend and specialize their skill set; the integration of the undergraduate degree with study options in five other design disciplines (Landscape Architecture, Interior Design, Graphic Design, Industrial Design, and Fashion) as well as broader built environment related study areas, such as; Urban and Regional Planning, Construction Management, and Property Economics. These diverse learning opportunities provide a rich and diverse environment appropriate for 21st Century graduates. The one year Masters focuses on transition to practice. The combination of six design disciplines has also provided opportunities for collaboration and transdisciplinary activity [22].

The course structure benefits from opportunities for integrated transdisciplinary study (within course subjects, through minor/major programs, through addable degrees). According to Crowther and Savage [23], 'The value of such student choice in not limited to transformative learning and professional alignment. Students who make their own choices are also more likely to use a 'deep approach' to learning due to higher levels of motivation and feelings of ownership'. Electives are normally structured as Minors (4 subjects) and Second Majors

(8 subjects) to ensure that students engage with a structured amount of relevant knowledge, rather than too many random single electives. Students may choose to do a Minor in Work Integrated Learning (workplace learning) in which they analyze and report on their professional practice experience [22].

Various knowledge domains contribute to the ability of practitioners to implement this curriculum. These knowledge domains exist at the intersection of understandings of society, technology, art, culture, history, professionalism, law and business. They are also appropriated and synthesized in architectural practice and, through this process, distinctive architectural knowledge emerges. Developing this ability to integrate divergent fields of knowledge is a significant aim of the courses. The School of Design at QUT seeks to embed design activities into all of their subjects, allowing students to practice and implement their developing design skills across a range of architectural content areas [22].

2. RESULTS

There is a close relationship between educational curriculum and educational systems. In traditional systems of design studio teaching (UT as other Iranian universities), each academic member (lecturer) is responsible for a group of students and there is not a structured relationship between different groups of each entry (year) for architecture studios. But in modern systems of architecture studio teaching (QUT as other Australian Universities), each lecturer is coordinator of an architecture studio (or other subjects) that consists of multiple groups of up to 20 students. In this system each coordinator plans the outline and provides theoretical materials which is delivered in an hour lecture per week to all the students, this is followed by tutorial sessions for studio teaching in different groups for three hours.

In Master Studios, the coordinators' duties are limited to administration works and the tutor of each group who is usually a permanent academic staff, designs and defines the project outline and so on. Also, there is no lecture for Master studio and tutorial sessions run 7 hours per week. Moreover, in 'Architecture design 8' of bachelor's degree there is 1-hour lecture, but 6 hours tutorial p/w. Tutors generally will be selected from practitioners or PhD students. Tutorial sessions of design studio follow a 'Problem Based Learning' approach for application of knowledge through different learning activities.

The number of students at lectures usually range between 60-80 at UT and 100-200 at QUT, the proportion for practical subjects (average size of tutorial groups) are similar in both universities (around 18 students for bachelor design studio tutorial). Moreover, at UT each lecturer is responsible for teaching 4-6 subjects per year, while at QUT the number is 2-3.

Furthermore, there are different types of learning environments in architecture education including lecture room, studio space, tutorial room, computer lab, fabrication lab, and online learning environment. The different types of learning environments support different

pedagogies which leads to deeper engagement of students with problem-based learning. QUT benefits from the aforementioned six types including online learning environments, tutorial room, and simulated practice office, but UT does not have the two latest.

2.1. UT and QUT curriculum comparison

Educational curricula can be compared through different aspects. This section focuses on the aspects that are related to integrating theoretical and practical parts of the curriculum. In the document of Architectural Engineering curriculum for the Bachelor degree at UT [15], the subjects of non-design studios have been introduced to serve for design, criticism, and research of architecture works. The curriculum states that the graduate of the bachelor's degree should be able to apply the necessary knowledge for a contextual design. However, this aim is not supported by an effective pedagogy, as the curriculum/unit outline does not include any section such as learning approaches/teaching methods.

Different categories of subjects for UT and QUT curricula have been presented based on the Bachelor and Master of Architecture course structure including: number of subjects in each category, Theoretical (T.) teaching hours and Practical (P.) teaching hours for each category, and the percentage of teaching time in each category to the whole teaching time (Table 1 and Table 2).

In the bachelor curriculum of UT [15], the subjects were classified to:

o Basic subjects; at the first three semesters to prepare students for architectural design projects with necessary knowledge, skills and experiences.

o Essential subjects; different architectural subjects including theoretical, practical and combination of two.

o Elective subjects; to select from different fields such as technology, landscape, interior architecture, and internship.

o Public subjects; including 5 public subjects (two for Persian and English languages, two physical practice, and one Society studies) and 6 religious public subjects (students choose 6 from 17 subjects) which are compulsory for all bachelor's degrees.

And in the Master of architecture curriculum at UT [24], the subjects are classified to:

o Essential subjects; in three groups of design studios, theoretical knowledge, and professional practice.

o Elective subjects; based on the student's interest or related field of Master thesis.

o Master Thesis; also, is an important part of the curriculum which does not contain any formal classes since it is based on one-to-one interaction between student and his/her supervisor/s. The Master Thesis is an individual project which includes confirming a proposal, working with the supervisory team, and submitting a report on theoretical aspects and a design project.

o Prerequisite subjects; for the students who graduate from courses rather than architecture and enter the Master of architecture, to be familiar with a few essential subjects of the Bachelor curriculum.

Table 1. UT subjects' categories in Bachelor (B.) and Master of Architecture (M.A.) based on [15, 24]

	Category of subjects	NO. of subjects	T. Teaching hours	P. Teaching hours	% to whole
Bachelor	Basic	10	48	768	24
	Essential	31	688	1408	61
	Elective (from 11 choices)	4	96	64	4
	Public (and religious)	11	320	-	11
Total for bachelor's degree		56	1152	2240	100
Master	Essential	9	160	448	73
	Elective (from 5 choices)	1	32	-	4
	Master Thesis	1	-	192	23
Total for master's degree		11	192	640	100
Total for Both Degrees		67	1344	2880	

Although the classification of the subjects in the curricula at UT and QUT are different, the following results can be concluded (Table 1 and Table 2):

o Classification of subjects at UT is very basic while at QUT it is more specific and similar to the standard approach in international schools of architecture.

o Number of subjects at UT is more than twice compare to QUT.

o Teaching hours for both Theoretical and Practical subjects at UT is about three times compared to QUT.

o The ratio of teaching time in Design category to the whole in Bachelor and Master at UT are 47% and 69% at UT compared to 37% and 54% at QUT which shows more emphasize on design projects at UT.

o The ratio of Elective subjects to the whole at UT is 4% compared to 24% at QUT. This proportion results in more flexible program for students at QUT for bachelor's degree.

o The ratio of public subjects at UT is 11% without any link to design studio or practical subjects.

A summary of data presented in Table 1 and Table 2 has been provided at Table 3. This Table compares different aspects, including the number of subjects/number of Years, lecture and practical teaching hours, time of practical teaching hours relative to the whole, number of weeks per semester, and teaching amount (hour per week).

Furthermore, 'Practical teaching time to the whole' which means percentage of practical teaching hours (the time which students are taught at studio/tutorial room) to all the teaching hours has been compared. This ratio is similar in the bachelor's degree (67% and 65% at QUT and UT respectively), but different in the Master (83% and 77% at QUT and UT respectively). The QUT Master's Degree has 83% practical time for the purpose of preparing graduates for practice, while UT is more concerned about theoretical subjects that enhance the knowledge of graduates.

Table 2. QUT subjects' categories, based on [22]

	Category of subjects	NO. of subjects	T. Teaching hours	P. Teaching hours	% to whole
Bachelor	Design	9	117	377	37
	Technology/Documentation	3	39	78	9
	Environment	1	13	26	3
	History & Theory	6	117	117	18
	Communication	3	39	78	9
	Elective in QUT	8	104	208	24
Total for bachelor's degree		30	429	884	100
Master	Design	2	_	182	54
	Technology/Documentation	1	13	26	12
	History & Theory	1	19.5	19.5	11
	Project Delivery & Practice Management	2	26	52	23
Total for master's degree		6	58.5	279.5	100
Total for Both Degrees		36	487.5	1163.5	

Table 3. Comparison analysis of architecture curricula at UT and QUT

Different factors	QUT		UT	
	Bachelor	Master	Bachelor	Master
Number of subjects/ Number of Years	30/ 4.5	6/ 1	56/ 4.5	11/ 2
Lecture hours	429	58.5	1152	192
Practical hours	884	279.5	2240	640
Practical teaching time to the whole	67%	83%	65%	77%
Total of teaching hours	1313	338	3392	832
Number of weeks per Semester	13	13	16	16
Teaching amount (hour Per week)	13	13	18-24	12-14

Finally, the higher number of subjects at UT represents a higher quantity of content compared to QUT. Even if the headlines of the comparable subjects are assumed similar, the curriculum at QUT is very compressed. This means that at QUT, students are required to study and learn independently (for example 3 hours for each subject per week which means 13 hours for teaching and 12 hours for self-directed learning per week) which is achievable in this curriculum. Students at QUT rely more on self-learning which decreases the necessity for teaching contact time. this approach leads to reduced cost for the educational organization. On the other hand, UT has many theoretical subjects, but there is not enough time to apply this knowledge in/out of class time. This is because of average 18-24 hours of teaching time per week that does not leave enough time for applying each subject during the semester.

The course map at UT and QUT have been illustrated respectively (Table 4 and Table 5). Since UT has not provided any course map for its curriculum, the authors drew this map based on the category of subjects and related colors at QUT map to make it more convenient for comparison. The course maps have been required according to the following arrangements:

o Communication row moved to locate under Design row (row 2) to present more integration with design subjects at UT map (Table 4).

o Technology-related subjects form the fourth row from the combination of three subjects which are related to Technology and two subjects which are related to 'Project Delivery & Project Management' (Table 4).

o Still there are a few subjects that cannot be classified under a specific group at UT map, so they have been titled as 'Sundry' (row 5). These subjects have been classified as essential in the UT curriculum.

o Urban and Rural Studies and Environmental Studies formed a new row (row 6) to separate this category from other subjects.

o There are also two rows named Public and Religious subjects (row 9 & 10) that do not exist at conventional architecture map in other countries including Australia.

Comparing the map of courses and subjects in both universities, reveals the following similarities and differences:

o Average number of subjects per semester at the Bachelor level for UT is 7 while the relevant number at QUT is 3.75, so students at UT are faced with various and different subjects each semester, which may result in unnecessary complexity that can make it harder to bridge between theoretical subjects and design studios. Furthermore, assuming Design Studio as core of the curriculum, when students are faced with a higher density of subjects per semester (at UT), results in considering the other subjects as secondary, so students may put less time during the semester. Also, the assessment criteria for most theoretical subjects are based on final exams. However, at the Master level the density is 2.75 for UT and 3 at QUT. This condition provides more concentration for students and enough space to think about the interrelation of different areas at both universities.

o Basic subjects at UT are almost equivalent to basic subjects of first year at QUT but are delivered in three semesters.

o Technology at UT curriculum consist of 7 subjects plus 4 related ones which involves the Bachelor students during their whole study. But most of these subjects are delivered as lectures and theoretical contents (excluding Building Technical Design and Construction Procedure) without any application in architecture design projects. At QUT there are just 4 Technology subjects which benefit from tutorial sessions for problem-based learning with some connections to apply their knowledge into the design studios.

o There is minimum link between categories of Sundry, Theory, Elective, Public and Religious subjects with architecture Design studios in UT curriculum. Most of these subjects are delivered as theory and lecture-based approaches with the rare opportunity for students to apply their knowledge in project-based learning.

o Both Bachelor curricula of UT and QUT offer different areas of elective subjects to the students who can choose several subjects at their own pace. Students at UT must select 4 random subjects from 11 elective ones at their Bachelor and 1 subject from 5 elective subjects at their master's degree. At UT there is not any classification for four selected subjects as specialization on a specific area. While at QUT there is a structural relationship for each package which fosters a focused specialization within the Bachelor course, i.e. two 4 subject minors or a single 8 subject major.

Table 4. Map of Courses and Subjects retrieved from [15, 24]

Row	Subjects' Category	Bachelor Year 1		Year 2		Year 3		Year 4 & 4.5		Master Year 5		Year 6	
1	Design	Intro. to Ar. D. 1	Intro. to Ar. D. 2	Intro. to Ar. D. 3	Ar. D. 4	Ar. D. 5	Ar. D. 6	Ar. D. 7	Ar. D. 8	Ar. D. 9	Ar. D. 10	Ar. D. 11	Master Thesis
2	Communication	Ar. C. 1	Ar. C. 2	Ar. C. 3	Sketch 1	Sketch 2			Final Project (9th sem.)				
3	Technology	Statics	Steel Structure	Concrete Building	Building Structure	Building Construction 1	Building Construction 2	Technical Design					
4	Technology related subjects	Building Materials					Electrical Acoustics	Mechanic Services	Project Management			Construction Procedure	
5	Sundry		Nature & Ar.	Computer Aided Ar.	Design Process		Surveying	Estimating	Conservation	Ar. Programming	Environ. Psychology		
6	Environmental Studies				Environm-ental Control	Urban Planning	Urban Design	Rural Design					
7	History and Theory		World Ar.	Islamic Ar. 1	Islamic Ar. 2	Contemporary Ar. 1	Contemporary Ar. 2			Ar. Research	Ar. Philosophy in Iran	Ar. Rights & Regulation	
8	Elective (4+1 of 11+5)	Mathematics & Ar.	Computer Design & Fabrication	English for Ar.	Interior Design	Construction Technology	Internship	Landscape Ar.	Re-use of Ar.	Modern Structure	Site Analysis	Ar. & Development	Ar. Theory
9	Public	English Language	Persian Literature	Physical Practice	Physical Practice			Family & Society					
10	Religious (6 of 13)	Religious 1	Religious 2	Religious 3	Religious 4	Religious 5	Religious 6						

Table 5. Map of Courses and Subjects retrieved from [25]

Subjects' Category	Bachelor Year 1		Year 2		Year 3		Year 4		Master Year 5	
Design	Ar. D. 1 Small project / Introducing Design	Ar. D. 2 Small project	Ar. D. 3 Residential houses	Ar. D. 4 Commercial Ar.	Ar. D. 5 Sustainable Ar.	Ar. D. 6 Mixed use Ar.	Ar. D. 7 Industrial Ar.	Ar. D. 8 1. Complex Building Design 2. Complex Building Documentation	Ar. D. 9 1. Urban Design 2. Complex Building	Ar. D. 10 1. Urban Design 2. Complex Building
Technology/ Documentation				Ar. Tech. 1 Small-scale Building Construction	Integrated Technologies 2 (Structures)	Ar. Tech. 2 (Building Services)				Project Management
Environment				Integrated Tech. 1 (Environment-al Principles)						
History and Theory	Intro. Design Sustainability	Intro. Design History / Ar., Culture and Place	Ar. in the 20th Century		Ar. and the City		Research Methods		Contemporary Ar. Culture	
Project Delivery & Project Management									Professional Practice	Contract Administration
Communication	Ar. Visualization 1	Ar. Visualization 2	Ar. Visualization 3							
Electives			Minor	Minor	Minor	Minor	Minor	Minor		
						Minor	Minor			

3. DISCUSSION

The aim of architecture education in each country is affected by historical, cultural, geographical, and economical characteristics which effects the curriculum [26]. While political and ethical focused curricula-which is popular in eastern countries- tends to be objective, focusing on rational acquisition of knowledge, the phenomenological approach- a common approach in western countries- tends to be subjective, focusing on intuitive acquisition of practical experience based on constructivist epistemology. Therefore, instead of dividing knowledge in a rational mode of curriculum, phenomenology 'encourages students to discover and construct knowledge that has personal meanings and values for themselves'[11].

Each university should redefine their institution's mission, vision, values, and strategic guidelines [27]. Architecture education in Iran presents a neutral program (without vision) with no specific attention to the challenges of place and time and no emphasize on human responsibilities about the social and ecological environment [15]. The architecture curriculum is inflexible and similar for all students in Bachelor degree, but there are a few different curricula in Master program responding to various professional needs as their main missions. In comparison, architecture education in Australia and New Zealand is aimed for responding to the physical and ethical challenges and future needs of the real world such as sustainable environment [25].

In the Bachelor curriculum at UT [15], it is implied that undergraduate students are responsible for bridging their knowledge in design projects. Dividing a discipline into different subjects may lead to breaking a big problem into small ones, but it is not the most appropriate approach, since it will result in independent components which are not properly integrated. Teaching unrelated components of a syllabus and content of a curriculum, while expecting students to apply them in design studio, is likely to give students multiple pieces of a puzzle without giving them the whole picture and still expect them to build the whole image in their mind.

The main reasons for problematic architecture schools can be attributed to an inefficient organizational system, non-active learners, lack of an appropriate curriculum, and not enough harmony between content and aims of course in the curriculum [28]. Providing integrated subjects begins with connecting different parts of the outline through appropriate aim, content, approaches, and assessment. Outlining elements of each subject including teaching time, content, and assessment should support learning aims. In the same way, program elements should support course goals.

In Iran, the Council of Educational Planning does not consider 'learning outcomes', 'teaching-learning approaches', and 'overall assessment' as necessary parts of course outline for evaluating and confirming the proposed curriculum. The new curriculum of UT did not provide a 'Map of Courses and Subjects' which presents data for enough course analysis, including: the distribution of subject in different semesters, timetable management, and subjects' relationships analysis. The analysis of subjects' outlines at QUT indicates that a few practical subjects have been linked to the theoretical ones, but there is a lack in assessment of knowledge gained from theoretical subjects in design projects. Moreover, the way of linking the two (how) has not been outlined.

For the purpose of reviewing and improving architecture curriculum, UT established a committee to provide an overview of its architecture education, its aims and challenges in 2011. This committee ran a survey among academic members, graduates and students to investigate the limitations and changes [29]. Some of the comments are as follow:

o Providing various educational programs

o Redefining various fields of architecture education based on international approach

o Increasing selective subjects based on students' needs and preferences

o Linking design studio to technology or theoretical subjects

The committee emphasized on the need for continuous revision (e.g. every five years) and response to social, cultural, local, national and international needs [29]. They also provided two recommendations which were not actioned;

o Decreasing public subjects and orient the remained ones toward specific educational needs of each course.

o Allowing each university to define 30% of their subjects based on their local needs, aims, and academic abilities.

Architectural education in Iran needs to change to be responsive to contextual condition. Since curriculum should be planned based on specific contexts yet these contexts are different around the country, one option would be local planning through authorizing universities for planning their own curricula relating to local conditions.

The proposed Map of Courses and Subjects has been presented for UT, to maximize integration of the related subjects based on previous findings (Table 6). This map has been designed for the course of Architecture Engineering. In the Master, the course should focus on an expertise area through choosing related subjects in both theoretical and elective categories. Moreover, one of the Ar. D.[1] studios has been deleted to finish the course in 4 years appropriately.

In each column, the subjects of Rows 3 & 4 (Table 6) can be integrated to Design studio project of the same, last, or next semester through:

o Linking knowledge gained from previous semester/s (theory subjects) with design studio of the next semester (such as the first and the third arrows). In semester 8, the key subjects of previous semesters can be linked to apply the whole theoretical subjects as well as design principles through analytical, critical and creative thinking in a coherent design process and building documentation.

o Integrating theoretical subjects to practical ones (design projects) at the same semester (such as the second arrow).

o Investigating for a meaningful understanding of knowledge through testing a Design Project in the Theoretical subjects of the next semester (such as the third arrow).

Elective subjects have been packaged into two minors or one major area (including 4 subjects) in Bachelor and one minor for master's degree. These packages should be provided by each school based on their local needs and abilities.

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[1] In this paper, the abbreviations are as follow:

Ar.: Architecture

C.: Communication

D.: Design

Intro.: Introduction

Sem.: Semester

There are also some other initial changes in the name, order, position or combination of the subjects through redefining various fields of architecture education based on a review of international approaches and architecture curricula. For instance, Ar. Programming and Conversation exchanged their position in bachelor's and master's programs. In addition, the sequential subjects such as Contemporary Ar. 1 & 2 in the previous map (which has been changed to Modern Ar. in the new map) have been combined with each other which help to decrease the number of subjects. This also increases the opportunities for knowledge application through problem-based learning by increasing the teaching hours from two to three. Furthermore, the name of some subjects such as World Ar., Contemporary Ar., and Islamic Ar. have been changed to better represent their field of knowledge or their focus of geographical area.

In addition, the architecture profession has changed over the past few decades, but in some institutes the curriculum has not kept up with this change (the curriculum is still based on an outdated mode of practice).

Many architects, and practices, have become more specialized, but the curriculum is still very generic. The curriculum at QUT has been approved and endorsed by the 'Architects Accreditation Council of Australia' (AACA) which made it more responsive for application in professional environment [25]. The AACA sets the competency standards and conducts the accreditation process. This process typically involves reviewing of curriculum documents, a five-year visit interval to the university for assessment of the students' works, the staff, and the facilities. In Iran, industry and authorized organizations could also be involved for evaluating the curriculum based on their needs.

According to curriculum guidelines [22], the purpose of Bachelor of Architecture course is to gain knowledge and develop the ability to produce an architectural design, conduction of research and critical analysis of architectural works. Based on the introduction of these curricula, architectural design is the core of the course which needs to be integrated to the theoretical subjects [30].

Table 6. The proposed Map of Courses and Subjects for UT to maximize the integration of different subjects

Subjects' Category	Year 1			Year 2		Year 3		Year 4		Year 5		Year 6	
Design	Intro. to Ar. D. 1	Intro. to Ar. D. 2	Ar. D. 3	Ar. D. 4		Ar. D. 5	Ar. D. 6	Ar. D. 7	Final Project	Ar. D. 9	Ar. D. 10	Master Thesis	
Communication	Ar. C. 1: Form	Ar. C. 2: Material	Ar. C. 3: Sketch										
Technology & Project Management	Building Materials	Building Structure	Building Services			Building Construction	Technical Design	Project Management				Construction Procedure	
Environmental Studies				Environ-mental Studies		Rural Design	Urban Planning	Urban Design					
History and Theory	Art, Design, and Ar.	Computer Aided Ar.	History of Ar.	Iranian Ar.		Modern Ar.	Place and Society	Ar. Programming	Ar. Rights and Regulation	Ar. Research	Conservation	Environmental Psychology	
Elective (4+2 of 12+6)	English for Ar.	Computer Design and Fabrication	Internship	Construction Technology		Sustainable Ar.	Interior Design	Landscape Ar.	Re-use of Ar.	Site Analysis	Ar. & Development		

Bachelor | Master

4. CONCLUSION

Overall, the comparison indicates that although architecture curriculum at UT benefits from more subjects (twice), wider content, and teaching time (triple), it provides less opportunity for integrating theoretical and practical subjects. The curriculum is also very compartmentalized, and it needs to better integrate the subjects; this is the modern approach to curriculum development – integrating theory and practice, and 'authentic learning experiences.

It is also reasonable to critique the programs against each other and suggest that the depth of knowledge in the Iranian program highlights that the Australian program may not be covering the full content field, and that may leave graduates with a limited knowledge base. Conversely the Iranian program does not offer students much opportunity to apply their knowledge through project-based learning, and thus leaves graduates unable

to fully use knowledge to make design decisions. Neither is perfect or perhaps even optimal, though both offer ideas that might be applied in similar contexts.

The main weakness in the course mapping for both universities is the lack of horizontal (serial) as well as vertical (parallel) connections between subjects in terms of integrating knowledge to practice and vice versa. The paper demonstrates the importance of course maps for effective analysis through vertical and horizontal relationships between subjects and their distribution, the absence of curriculum matrices can lead to a lack of awareness of critical pedagogical relationships.

An integrated curriculum should be supported by effective educational systems and learning environments. Moreover, an integrated curriculum should coordinate subjects' elements and program's elements in harmony with each other to support the course goals. In addition, flexible architecture programs should be responsive to local contexts and international global needs.

This paper contributes to the recent debate of bridging

different subjects in architecture curriculum focusing on teaching time and the map of course. This research was limited to document analysis and did not involve in pedagogy and empirical studies. Therefore, examination of how much the curriculum is really being taught in each school, can be in the focus for further studies.

Architectural education is based on problem based and project-based learning, the result of this research has a wider application in the research on higher education. Also, the results of this study can help related schools to enhance their curricula through integrating different subjects.

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