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Original Research Article

A Comparative Analysis & Assessment of the Architecture Master Programs in the United States Universities*

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Abstract

Problem statement: Prominent works of architecture indicate the emergence of individuals with adequate awareness, competence, and consequently, architecture knowledge. Achieving such a level of proficiency in architecture would surely require appropriate theoretical education alongside practical experience. As the aim of architecture is to build places for humans to reside, it is necessary to apply efficient tools in responding to such needs. Many countries deliver architecture educational programs, but few architects graduate from the schools. Hence, one would have to admit that educational programs and goals play an essential part in training students.

Research objective: The duty of universities in this midst is to provide the right context for talents to actualize and provide the grounds for students to enlighten and think critically. The present study seeks to examine the performance of top architecture universities (in the USA) in terms of the curriculum and the goals they pursue in training architecture students as efficient individuals in the architecture industry.

Research method: The present study adopts an analytical approach, investigating the curriculums of 20 prominent universities in the USA given the significance of the higher education system in training architects. Master's programs were investigated as important intermediate programs given the various goals and plans adopted in different programs.

Conclusion: Our results indicated that each of the studied universities had defined educational goals and plans, designed respective educational programs, and provided educational labs to enhance skill learning and creativity in the students.

Keywords: *Education, Architecture, USA, Master Program.*

Introduction

Education is among the fundamental needs to preserve awareness and enhance knowledge in the academic

community, playing a central role in training human resources and accomplishing the goals concerned with knowledge, arts, and industry (Sultanzadeh & Armstrong, 2000, 29). Meanwhile, higher education is among the most essential pillars of the community as the highest level of the education system, leaving direct impacts on economic, political, and social behaviors

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and norms (Mirriahi, 2012, 108). A university's mission is to provide the right context for talents to actualize and provide the grounds for students to enlighten and think critically. Research and exploration are currently considered the central activity of educational programs, seeking to give individuals chances to improve themselves and their role in education so that the quality of education is enhanced as well. Architecture training in Iran has been faced with numerous challenges from the get-go, until a unified program was developed for all architecture faculties, and architecture education found its way into public and private universities and higher education centers across the country. However, this flood of new training centers gave rise to many opportunities and –of course- threats to architecture, to the point that many of the newly-emerged problems in contemporary architecture can be traced back to education in this field (Tabibzadeh & Parva, 2021, 1). Architecture education depends on developing innovative abilities. Creating space to withhold human activities is the primary concern of architects. This education is also generally concerned with the preservation and transmission of the conventional teachings between the community and profession and requires the use of more effective methods in responding to the new needs emerging from economic and social developments (United Nations, 1993).

Architecture training requires an appropriate and agreed-upon definition of "Architecture." Traditional teachings in schools such as Beaux-Arts and Bauhaus schools are examples of schools providing a specific approach to architecture and teaching it. However, contemporary architecture schools focus on training an individual to develop skills and insight rather than delivering specific educational materials. Given the importance of the subject, the present study performs a comparative study on the architecture education curriculum in the current educational system of prominent universities in the world and focuses on the master's program as an important intermediate program given the various goals and plans adopted in different programs. The study seeks to address the question of how a better architecture education program can be developed at a global scale

based on the analysis and comparison of curriculums in the top 20 American universities (which are among the 200 top universities of the world) and compares them to the universities' educational goals and approach. For this purpose, 20 prominent schools of architecture were selected despite the multitude of schools in the studied country, and their architecture education programs and goals were examined.

Research Method

Compilation of an appropriate methodology framework in research to achieve the desired result is among the necessities that must resonate with the realities of the research subject. Conscious and purposeful effort for such consistency is at the top of all research efforts and is considered their executive logic (Sameh, 2018, 32). The present study adopts a qualitative method with an analytical approach mainly based on the comparison tool. As Groat and Wang suggests in her book "Research Method in Architecture," describing and explaining real positions leads to solutions such as logical analogy, classification, and finally comparative analysis rather than similarities or dissimilarities between architectural theories or phenomena (Groat & Wang, 2007). Data used in the present study were derived from the online portal of the studied faculties that provided access to their majors and courses as discussed in the text and analytic diagrams. Furthermore, correspondence was made with the respective professors (see references) as discussed in the text and analytic diagrams provided. The comparison and analysis were thus made based on the data demonstrated in the tables, diagrams, interviews, correspondence, and curriculums found on the online portal of the studied schools.

Theoretical and Practical Training in the Master Program

Architecture requires creativity and architecture training is thus creative and quite complex, as a result of which it cannot be confined to specific and pre-determined frameworks. A bit of pondering into architecture and its education over the past several decades indicates that the method of training applied in architecture

schools has suffered a profound failure in its ideals. Under such circumstances, maintaining the minimum necessities in architecture training through the revision of teaching methods and contents appears to be crucial and unavoidable (Rostami Najafabadi & Aghahosseini Dehghani, 2015, 101). Professional skills developed through the educational process raise concerns regarding the incoherence and lack of effective connection between various theoretical and practical training resulting in a substantial gap between architecture classes and studios. The different educational methods applied in classes lead to different results, but the most conventional methods adopted nowadays are the ones based on classification. On the other hand, previous research suggests that there are gaps throughout the architecture training process that step from relying on mere theoretical concepts and not paying sufficient attention to the practice of learning. As the science of human settlements, architecture requires a serious transformation in terms of educational programs and a transformation in terms of student admission policies, lessons, and teaching methods. Today, the issue of teaching and learning patterns and group learning and activities has piqued the interest of experts in the field of higher education. Experts have recently become particularly concerned with how to achieve teaching and learning patterns. The increasing growth and vast changes in training methods over the recent years have put the study of adapting the learning context to all aspects of the learner's needs at the focus of education experts (Azemati, Mozafar, Saleh Sadekpour & Hosseini, 2018, 3).

John Habraken argues: "We need to learn how the knowledge of human-environment structures, what can be learned from contemporary and historical documents, how different patterns can be compared, and how their methods over the years can be identified. Teaching architectural design without teaching about the quality of human environment performance would be like teaching medicine with no regard for how the human body works" (Habraken, 2006).

A large portion of the architectural training (apprenticeship) is delivered through practice and interaction in architectural design ateliers. The

significance of design studios in architecture training has been accentuated by various scientists in the fields of architecture and arts (Rezaei & Mahdinjad, 2019, 5). Architecture should not be experienced in a social vacuum. The presence of actors such as legislators and users challenges the design to a great extent. Architecture should thus be considered a vessel for a wide range of skills enabling the designer to interact seeking to achieve collective consensus or steer the way, which would raise challenges. Hence, one of the present challenges in architecture training in Iran is the insufficient connection between theoretical and practical lessons and the aforementioned. The presence of both theoretical and practical courses on the curriculum was thus considered an essential index in the definition and analysis of the studied universities' programs. Ultimately, professional needs can be well responded to through the analysis of the architecture schools and students and using the resulting knowledge to improve the quality of higher education and establish dynamic connections between education and assessment methods.

Introduction of the Architecture Majors in the US

Educational content provides students with planned opportunities to learn through interaction. The most central objective of an education plan is to train individuals for their professional and personal lives in the community (Sedaghati & Hojjat, 2019, 4). Architecture training is a field of education aimed at training individuals capable of performing the act of architecture, which is concerned with creating works of architecture. Contemplating the educational methods would thus not only improve the quality of the profession, but also leave a more prolonged and comprehensive impact on the consistency between the profession and education (Mozaffar & Khosravi, 2019, 60). A total of 20 architecture schools in the US were thus selected to analyze their architecture programs, 11 of which were among the top 50 schools of architecture in the world, and the rest were reported by Kakarli Simmonds as the top 20. The following Table 1 demonstrates the architecture programs in 20 architecture schools in the US on the three bachelor's, master's, and Ph.D. levels.

The [Table 1](#) above demonstrates the architecture majors of each studied university in three bachelor's, master's, and Ph.D. Levels. Some universities offer courses in a variety of departments including architecture, urban planning, technology, etc. The time it takes to graduate from each program varies depending on the major and the capabilities and background of the students. Many universities offer courses to gain the necessary knowledge and skills and discover one's area of interest, and the courses taken in these programs depend on the academic skills of the students. Some universities such as Georgia offer several majors called double degree courses, where architecture courses are combined with urban planning and management courses that graduates with a bachelor's degree from either of these courses can apply for at the master's level. As the diagram demonstrates, the number and diversity of the majors vary across the universities as all schools are situated in the US but their curricula vary from one another, and those making decisions regarding the courses and curricula of each university base their decisions on each school's goals and approach. The following is concerned with the architecture schools' goals and approaches in terms of teaching architecture and the duration of programs.

The American Architecture Program Goals & Approaches at the Master Level

Various factors are involved in the formation of educational goals in each field, among which the objective and tangible needs of society are prominent actors. One could argue that many of the academic disciplines in the contemporary world emerged and developed based on present or future needs ([Sameh, 2018, 15](#)). Comparing the goals, structure, program duration, and courses can help discover the overall methods and principles adopted in architecture education at this level. A considerable body of research has been carried out on how architecture is taught, the quality assessment of various architecture education programs, and the role of practical and theoretical courses in the curriculum. Such pieces of research have all investigated the historical trend of architecture education and the

position of courses in the curriculum, the results of which suggest the accentuation of architecture education content when it comes to quality assessment ([Sedaghati & Hojjat, 2019, 6](#)). As the curriculum can vary across program level and discipline, the present study remained focused on architecture education goals at the master's level as an intermediate between bachelor and Ph.D. levels. [Table 2](#) indicates the goals of each studied school based on the overview available of the schools' online portal (see references) as their vision and goals behind training students in architecture. Another aspect explored in the present section is how the number of courses and duration of study varies for architecture and non-architecture graduates. This hints at a point that may be further explored in the Iranian higher education system where all architecture and non-architecture graduates are offered the same courses at the master's level. The following table demonstrates architecture education programs and goals and the duration of completing a master's in architecture (for architecture and non-architecture students) in the studied universities.

The educational approach and goals of each of the 20 universities demonstrate its schemes and the educational path it has taken to train future architects. A study of the goals suggests the closest relationship between architecture and urban design courses in top Schools of the world. Urban design and planning and urban management have thus made a close connection with architecture. Students with a professional bachelor's degree in architecture and those without such a degree vary in terms of the duration of the study and may land anywhere between a year and a half and five years. The flexibility of the time it takes to get a master's degree in architecture for students with and without an undergraduate background in architecture is noteworthy. The following discusses the courses and their content in master's programs of architecture in the studied universities which have been accessed through the online portal of the universities and correspondence with the respective professors. Results suggest that the courses and their credits can be classified into three theoretical and practical dimensions including design studios,

Table 1. Architecture Programs in 20 Architecture Schools in the US on the Three Bachelor, Master, & Ph.D. Levels. Source: Authors.

University	Programs		
	Bachelor	Master	Ph.D.
Austin, Texas	Three Majors of Interior Architecture, Architecture, & Architecture Studies (History of Architecture), Incorporating a Combination of Architecture, Engineering, & Arts	Architecture, Landscape Architecture, History of Architecture, Architectural Studies, Historical Preservation, Latin America Architecture, Sustainable Architecture, Interdisciplinary Studies	Architecture History, Preservation History, Sustainability
Berkeley	Architecture, Landscape Architecture	Architecture, Landscape Architecture	Architecture & Respective Fields
Carnegie Mellon	Architecture, History, Technology, Construction Science, Architectural & Graphical Presentation	Architecture, Advanced Design, Sustainable Design, Computational Design, Construction Management, Architectural Engineering, Building Performance Recognition	Construction Management, Architecture Engineering, Computational Design
Columbia	---	Architecture, Advanced Architectural Design, Critical & Conceptual Methods, Historical Preservation, Architecture & Research in US Development, Urban Architecture	Architecture
Cornell	Architecture	Architecture, Professional Design, Advanced Architecture, Computer Graphics, Material Design Computations, Landscape Architecture, Real Estate, & Properties	Architecture History & Urban Development
Georgia	Architecture, Building Construction	Architecture, Construction, Facilities Management, Sustainable Energies & Environmental Management, Real Estate Development	Architecture
Harvard	Engineering Design, Design Studies, Landscape Architecture, Architecture	Architecture, Design Engineering, Landscape Architecture, Environmental Planning, & Urban Planning	Design Engineering, Design Studies, Landscape Architecture, Architecture
Illinois	Architecture	Architecture, Landscape Architecture, Architectural Sciences	Architecture
Virginia	Architecture, Architecture History, Environmental Planning, & Urban Planning	Architecture, Landscape Architecture, Urban Planning, Architecture History, Environmental Planning, & Urban Planning	Placemaking Philosophy, Art Philosophy, History of Arts
Michigan	Architecture	Architecture, Architecture Research, & Design	Architecture
Milwaukee	Architecture	Architecture, Ecological Design, Architecture, & Urban Planning Integration, Historical Preservation Studies, Real Estate Development	Environmental Design, Technology, & Resource Sustainability
MIT	Architecture, Architecture Studies	Architecture, Architectural Studies, Building Technology, Architecture Criticism, & Theory	Construction Technology, Computation & Design, Architecture Theory & History
Pennsylvania	Architecture, Landscape, Fine Arts, Historical Architecture Preservation	Architecture	Architecture
Rice	Architecture, Architecture Studies	Architecture	---
South California	Architecture, Architecture Studies	Professional Architecture, Advanced Construction Architecture Studies, Heritage Preservation, Landscape Architecture	Architecture Technology, Function & Leisure, Teaching & Design Theory
Syracuse	Architecture	Architecture	Architecture
A&M Texas	Architecture, Environmental Design, Architecture Studies	Architecture, Architecture Knowledge, Landscape Architecture, Construction Management	Architecture
UCL	Architecture	Professional Architecture, Architecture	Architecture
Washington	Architecture, Architectural Design, Architecture & Construction Management, Architectural Studies	Architecture, Landscape Architecture, Design Computations, Architecture Theory, & History	Architecture
Yale	Architecture	Professional Architecture, Architecture & Management, Environmental Design, Environmental Management	Architecture

Table 2. Architecture Program Duration and Goals at the Master Level in 20 American Universities. Source: Authors.

University	Goals	Master's Program
Austin, Texas	Architecture is a spatial practice whose meaning is understood concerning aesthetics, society, & cultural & technical contexts	Pre-professional architecture: 3.5 years for students with no previous training in architecture, 2.5 years for students with previous training in architecture
Berkeley	Pre-professional & liberal training	40 credits in a year for students with an architecture degree (professional five-year program), three years of professional program, & 84 credits for students with no bachelor's degree
Carnegie Mellon	A response to the growing professional trend, globalization, & technological advancements based on growth & research	An advanced two-year program including four semesters & 144 credits for those with a five-year bachelor's degree, a professional master's program for those with a four-year non-professional bachelor's degree
Columbia	The use of knowledge & insight to better respond to the environment and interpret the relationship between form, material, space, and media or human life & thought through architecture	Master in advanced architectural design including a three-semester program over summer, fall, & spring
Cornell	Per the policies of the Ministry of Architecture	Following the basic principles of architectural education & rapid development of thinking & design in developing environments
Georgia	Focused on architecture & history theory, sustainable building technologies (structure, construction, environmental systems, media, & modeling) + professional architecture education	Two types of curricula: one two-year & one three-year program depending on the student's background: 3-5-year master's in architecture, 102 credits Two-year master's in architecture for architecture graduates, 60 credits
Harvard	An architecture program including a design studio, visual studies, theory, technology, history, & professional practice	A professional program for architecture graduates or similar
Illinois	A program based on the five principles of design, technology, history, theory, & practice	Master's degree (with no bachelor's in architecture): three years (six semesters), a sum of 102 mandatory & optional credits Master's degree or dissertation: a year-and-a-half program (three semesters) or 32 credits
Virginia	The architecture department trains leaders who creatively engage & shape the built environment complexities in all cultures & at all scales.	2.5 years for students with a bachelor's in architecture (82 credits) & three years for graduates without a master's degree in architecture (102 credits)
Michigan	An incentive to learn science alongside architecture & urban planning (interdisciplinary)	A two-year program (four semesters) including 60 credits for architecture graduates & master's students from other disciplines A three-year (seven semesters) program including 150 credits for no-architecture students, 84 credits of dual urban planning program in three years
Milwaukee	An exploration of planning & construction opportunities	Two years for students trained in architecture (60 credits) & three years for other students (90 credits)
MIT	Centralized and professional study & design of construction requirements	2.5-3.5 years and 164 credits The program offers courses from the architecture & urban planning departments: Urban planning, arts, culture, construction technology & computation, theory, history, & criticism
Pennsylvania	Development of knowledge, skills, & research methods in architecture & the field of science & arts The curriculum consists of two main parts: design studios & architecture history & seminars	A total of 31 credits including 14 credits in the studio, six credits in technology, three credits in history & theory, 1.5 credits in visual studies, & 1.5 credits in professional practice for students with no bachelor of architecture degree A three-year program containing a total of 29 credits including 12 credits in the studio, six credits in technology, three credits in history & theory, 1.5 credits in visual studies, & 1.5 credits in professional practice for students with a bachelor of architecture degree
Rice	Innovation in the knowledge & practice of architecture, development, & improvement of community knowledge on the aspects of design & construction	A 130-132 credit program over 3.5 years (seven semesters)
South California	A combination of social & environmental issues in design	A 102-credit program over three years for those with an irrelevant undergraduate background A 64-credit program over two years for those with a relevant undergraduate background

Rest of Table 2.

University	Goals	Master's Program
A&M Texas	Advanced studies in internal & virtual environments, committed to training, studio method (project-based learning to foster professional behavior)	A 52-credit program over two years for those with a relevant undergraduate background A three-year program for those with an irrelevant undergraduate background
UCL	Architecture and urban planning programs are offered through training, design, technology, & criticism studios	A 122-credit program over three years for students with a bachelor's degree in architecture or other A 56-credit one-year program for students with a bachelor's degree in architecture
Washington	From aviation to urban design, beyond the status quo	2-3 years including architecture & landscape architecture: culture-based place-making, historical preservation, integrated design, urban design, & context, & sustainable green design 137 credits over three years for students with a relevant bachelor's degree 92 credits over two years for students with no relevant bachelor's degree
Yale	Architecture is indirectly connected to other forms of art as a discipline and the most conventional form of art	144 credits for students with a bachelor's in architecture 72 credits for students with a degree in architecture

technical studies, and technology as further explained in the following (Table 3).

As Table 3 demonstrates, all courses are approved by the National Architecture Qualification Board in the United States and fall into either of the three mentioned general areas. The fact that the contents of the courses and number of credits vary across the schools although all the studied universities are in the same country indicates that each school offers courses based on its distinct vision and goal behind teaching architecture. Table 3 also suggests that the schools are essentially focused on new construction system technologies and accentuate climate-specific and environmental designs. For instance, the homepage of Austin School of Architecture reads: "Designing the future; a school of architecture with a brilliant past in training leaders and design and planning. Our impact on the construction of sustainable, beautiful, and meaningful environments across the world has been tangible. As a student, you would be offered an innovative curriculum, unparalleled resources, well-equipped studios, and an invested community of faculty, alumni, and friends." The vision of the school indicates that architecture gets its meaning concerning the community, aesthetics, and cultural and technical contexts, which have been incorporated into the content of courses offered in this school. To elaborate on its master's courses, Virginia University's school and architecture explains that this

program is focused on fostering innovative architecture in a global urban context and argues that the breadth and depth of their faculty's expertise teach students to push beyond experimental boundaries while building strong connections with the community, practice, and technology (Virginia University School of Architecture website). The following diagrams compare the number of courses in the fields of design and practice in studios, theory and history, technology and construction, optional courses, and conferences and dissertations (Fig. 1).

Design in studios is a professional aspect of training and a traditional method in architecture schools through which students carry out a design project under the supervision of a design professor. The studio is an environment containing 12-20 students with their design desks, books, and design models. The students engage in conversations while building their designs individually (Schön, 1998,184). In this design process, all the elements of architecture and design limitations and opportunities come together for the design to be carried out. A studio is a place where the practical and intellectual process of design takes place and learning revolves around "practice." Studio training (in its modern sense) has been around for approximately 30 years and was first introduced by Dr. Donald Schon, an urban planning professor, in 1972 (Broadfoot & Bennett, 2003, 13-15).

Today, design studios are held online given the

Table 3. The number of courses in Architecture Programs at the Master Level in 20 American Universities. Source: Authors.

University		History & Theory	Elective		
The University of Texas at Austin	M.A.1 111 (3.5 Years)	<ul style="list-style-type: none"> - Vertical Studio I (6) - Vertical Studio II (6) - Vertical Studio III (6) - Vertical Studio IV (6) - Architectural Drawing (3) - Digital Drawing & Fabrication (3) - Technical Communications (3) - Professional Practice (3) <ul style="list-style-type: none"> - Site Design (3) - Advanced Studio I(6) - Advanced Studio II [Integrative Studio] (6) - Advanced Studio III (6) 	<ul style="list-style-type: none"> - World Architecture: Origins to 1750 (3) - World Architecture: Industrial Rev. to the Present(3) - Theory of Architecture I (3) - Theory of Architecture II (3) 	<ul style="list-style-type: none"> - Environmental Controls (3) - Environmental Controls II (3) - Construction I (3) - Construction II (3) - Construction III (3) - Construction IV (3) 	<ul style="list-style-type: none"> - Advanced History (3) - Advanced History (3) - Advanced Theory (3) - Advanced Theory (3) - Advanced Visual Communication (4) - CRP or LAR (5) - Open Elective or MDS Preparation (3) - Open Elective (3) - Open Elective (3)
		<ul style="list-style-type: none"> - Introduction to Architecture Studio 1 (5) -Representational Practices in Architectural Design (3) - Introduction to Architecture Studio 2 (5) - Architecture & Urbanism Studio (5) - Graduate Option Studio (5) - Integrated Design Studio (5) - Final Thesis Studio (5) 	<ul style="list-style-type: none"> - History of Modern Architecture (3) - Advanced Architectural Design Theory & Criticism (3) - Advanced Study of Energy & Environment (3) - Architectural Research Colloquium (1) - The Cultures of Practice (3) 	<ul style="list-style-type: none"> - Introduction to Structures (4) - Introduction to Construction (Graduate Level) (3) 	<ul style="list-style-type: none"> - CED Lectures Colloquium (1) - Final Thesis Seminar (3) -Professional Practice Colloquium (1) - 6 Electives (12)
Carnegie Mellon University	M.A 192 Unites (3 Years)	<ul style="list-style-type: none"> - Integration Studio I: Environment, Form & Feedback (18) - Integration II: Advanced Construction (18) - Advanced Synthesis Option Studio (18) - Advanced Synthesis Option Studio or M.Arch Thesis Studio (18) - Digital Skills Workshops (3) 	<ul style="list-style-type: none"> - Architectural Theory (9) 	<ul style="list-style-type: none"> - Materials & Assembly (9) - Environmental Science 1: Climate & Energy (9) - Statics/Structures (9) - Ethics & Practice (12) - Environmental Science 2: Building Systems Integration (9) - Real Estate Design & Development 2 (9) - Computational Design Selective 3(9) 	<ul style="list-style-type: none"> - M.Arch Pre-Thesis (3) - M.Arch Thesis Seminar (9) - Electives (33)
		<ul style="list-style-type: none"> - Core Studio I (9) - Core Studio II (9) - Core Studio III (9) - Advanced Studio IV (9) - Advanced Studio V (9) - Advanced Studio VI(9) - Visual Studies I: Architectural Drawing & Rep I (3) - Visual Studies II: Architectural Drawing & Rep II (3) 	<ul style="list-style-type: none"> - Questions in Architectural History I (3) - Questions in Architectural History II (3) - Distribution 1 (3) - Distribution 2 (3) - Distribution 3 (3) - Distribution 4 (3) 	<ul style="list-style-type: none"> - Architectural Technology I (3) - Architectural Technology II (3) - Architectural Technology III (3) - Architectural Technology IV (3) -Architectural Technology V (3) -Architectural Technology VI (3) 	<ul style="list-style-type: none"> - 4 Electives (12)

Rest of Table 3.

Universtity		History & Theory	Elective		
Cornell University	M.A 114 Unites (3 Years)	<ul style="list-style-type: none"> - Core Design Studio I (6) - Core Design Studio II (6) - Core Design Studio III (6) - Core Design Studios IV: Integrative Design Practices (6) - Core Design Studios V: Expanded Practices (6) - Vertical Design Studio (6) - Professional Practice (3) 	<ul style="list-style-type: none"> - Theories & Analyses of Architecture I (3) - History of Architecture I (3) - Theories & Analyses of Architecture II (3) - History of Architecture II (3) - Architecture, Culture, & Society (3) - Pre-Seminar in Design Research (3) 	<ul style="list-style-type: none"> - Constructed Drawing I (3) - Environmental Systems I: Site & Sustainability (3) - Constructed Drawing II (3) - Structural Concepts (3) - Structural Systems (3) - Building Technology I: Materials & Methods (3) - Building Technology II: Construction Elements (3) - Environmental Systems II: Building Dynamics (3) 	<ul style="list-style-type: none"> - History Elective or Theory Elective (3) - Visual Representation Elective (3) - Open Elective (3) - Visual Representation Elective (3) - History or Theory or Visual Representation Elective (3) - Open Elective (3) - History or Theory or Visual Representation Elective (3) - Open Elective (3)
				<ul style="list-style-type: none"> - Independent Design Thesis (9) 	
Georgia Institute of Technology	M.A 102 Unites (3.5 Years)	<ul style="list-style-type: none"> - Architecture Core I Studio (5) - Architecture Core II Studio - Architecture Core III Studio(5) - Advanced Architectural Design I (6) - Advanced Architectural Design II (6) - Architecture Design & Research Studio I (6) - Architectural Design & Research Studio II (6) 	<ul style="list-style-type: none"> - Architectural History I - Antiquity Through the 18th Century (3) - Architectural History II - 19th & 20th Century (3) - History of Urban Form (3) - Theory of Architecture I (3) - Theory of Architecture 2 (3) - Practice of Architecture I (3) 	<ul style="list-style-type: none"> - Architecture Modeling & Media I (3) - Architecture Modeling & Media II (3) - Architecture Modeling & Media III (3) - Construction Technology & Design Integration I (3) - Environmental Systems I (3) - Environmental Systems II (3) - Construction Technology & Design Integration II (3) - Building Structures II (3) - Building Structures I (3) 	<ul style="list-style-type: none"> - Practice Elective (3) - Professional Electives (20)
Harvard University	M.A 74 Unites (5 Years)	<ul style="list-style-type: none"> - First semester Architecture Core: Project (8) - Second semester Architecture Core: Situate (8) - Third Semester Architecture Core: Integrate (8) - Fourth Semester Architecture Core: Relate (8) - Collaborative Design Engineering Studio I (6) 	<ul style="list-style-type: none"> - Deployable Surfaces: Dynamic Performance Through Multi-Material Architectures (4) - Nano Micro Macro: Adaptive Material Laboratory (4) 	<ul style="list-style-type: none"> - Lecture (4) - Seminar(4) - Lecture/ Workshop (4) - Seminar/ Workshop (4) - Research Seminar (12) 	

Rest of Table 3.

Universtity		History & Theory		Elective		
Illinois Institute of Technology	M.A 102 Unites (3 Years)	<ul style="list-style-type: none"> - Architecture Studio 1; Elements (6) - Architecture Studio 2; House (6) - Architecture Studio3; Local (6) - Architecture Studio 4; Facilities (6) - Architecture Studio 5; Metropolis (6) - Architecture Studio 6; Metropolis (6) 	<ul style="list-style-type: none"> - Global modernism (3) - Contemporary Architecture (3) - Advanced History / Theory (3) 	<ul style="list-style-type: none"> - Design Communication 1 (3) - Structures 1: Structural-System Analysis (3) - Design Communication 2 (3) - Structures 2: Building Design (3) - Mechanical & Electrical Building Systems for Architects (3) - The Urban Environment (3) - Digital Design Communication 3 (3) - An Introduction to Urbanism (3) - Professional Practice (6) - Mechanical & Electrical Building Systems for Architects 2 (3) 	- 8 Electives (24)	
University of Michigan	M.A 105 Unites (3 Years)	<ul style="list-style-type: none"> - Architectural Design 1-6 (36) - Design Fundamental (1) 		<ul style="list-style-type: none"> - Representation (3) - Fabrication (3) - Structure I (3) - Structure II (3) - Professional Practice 1-2 (6) - Construction(3) - Environmental Systems (3) - Sustainable Systems (3) - Integrative Systems (3) 	- 3 Electives (9)	<ul style="list-style-type: none"> - Thesis Seminar (6) - Thesis (6)
University of Wisconsin, Milwaukee	M.A 90 Unites (3 Years)	<ul style="list-style-type: none"> - Architectural Design 1 (6) - Architectural Design II (6) - Studio (6) - Studio (6) - Comprehensive Design Studio (6) 	<ul style="list-style-type: none"> - Architectural History & Theory (3) - Architecture & Human Behavior (3) - Law & Professional Practice (3) - Topics in Architectural Theory (3) 	<ul style="list-style-type: none"> - Architecture Systems 1 (3) - Visualization 1 (3) - Architecture Systems 2 (3) - Structural Analysis & Design (3) - Environmental Systems (3) - Building Construction (3) 	<ul style="list-style-type: none"> - Elective (Practice) (3) - Elective (Architecture) (3) - Elective (Theory) (3) - Elective (Architecture) (3) - Elective (Graduate) (3) - Elective (Graduate) (3) 	<ul style="list-style-type: none"> -Pre-Thesis (6) -Thesis or Studio (6)
Massachusetts Institute of Technology	M.A 327 Unites per 30 minutes (3 Years)	<ul style="list-style-type: none"> - Core Studio 1 (21) - Core Studio 2 (21) - Core Studio 3 (21) - Option Studio (21) - Option Studio (21) - Option Studio (21) - Professional Practice (18) 	<ul style="list-style-type: none"> - Geometric Disciplines (9) - Architecture Assemblies (9) - Thesis Prep (9) - Precedents (9) - Arch From1750 to Present (9) 	<ul style="list-style-type: none"> - Environmental Tech in Buildings (9) - Structural Systems 1 (9) - Structural Systems 2 (9) 	<ul style="list-style-type: none"> - Urbanism Elective (9) - Computation Elective (9) - Technology Elective (9) -5 Electives (45) 	- M.Arch Thesis (24)

Rest of Table 3.

University		History & Theory	Elective			
University of Pennsylvania	M.A(29 Unites (3 Years)	<ul style="list-style-type: none"> - Design Studio I (2) - Design Studio II (2) - Design Studio III (2) - Design Studio IV (2) - Design Studio V (2) - Advanced Design: Research Studio (2) - Professional Practice I (0.5) - Professional Practice II (1) 	<ul style="list-style-type: none"> - History & Theory I (1) - Visual Studies I (0.5) - History & Theory II (1) - Visual Studies II (0.5) - History & Theory III (1) - Visual Studies III (0.5) 	<ul style="list-style-type: none"> - Structures I (0.5) - Construction I (0.5) - Structures II (0.5) - Construction II (0.5) - Technology Case Studies (1) - Environmental Systems I (0.5) - Environmental Systems II (0.5) - Material Formations (1) 	<ul style="list-style-type: none"> - Elective I (1) - Elective II (1) - Elective III (1) - Technology Designated Elective (1) - Elective IV (1) - Elective V (1) 	
University of Rice	M.A 130 Unites (3 Years)	<ul style="list-style-type: none"> - Design Studio 1-6 (60) 		<ul style="list-style-type: none"> - Free Electives (27) 	<ul style="list-style-type: none"> - Curriculum (43) 	
University of Southern California	M.A 102 Unites (3 Years)	<ul style="list-style-type: none"> - Design foundation (2) - Graduate Architecture Design I (6) - Graduate Architecture Design I – Site (6) - Professional Practice: Pre-Design, Project & Office Administration (3) - Graduate Architecture Design II - Integration (6) - Graduate Architecture Design II - Comprehensive (6) - Advanced Graduate Architecture Design-Topics (6) 	<ul style="list-style-type: none"> - Global History of Architecture (3) - Urbanism Themes & Case Studies (2) - Architecture Themes & Case Studies (2) - Global History of Architecture (3) - Contemporary Architectural Theory (2) - Descriptive & Computational Architectural Geometry (2) - Professional Practice: Legal & Economic Context, Project Documentation (3) 	<ul style="list-style-type: none"> - Structural Design & Analysis (3) - Computer Transformation (2) - Building Systems: Materials & Construction (4) - Structural Design & Analysis (3) - Systems: the Thermal Environment (3) - Systems: Luminous & Auditory Phenomena In Architecture (3) - Advanced Building Systems Integration (4) 	<ul style="list-style-type: none"> - Electives (3) - Electives (6) - Electives (11) 	<ul style="list-style-type: none"> - Thesis Option I (6) - Thesis Option II (2)
Syracuse University	M.A 119 Unites (3 Years)	<ul style="list-style-type: none"> - Architectural Design 1-7 (42) - Media 1 (3) - Media 2 (3) - Professional Practice (3) 	<ul style="list-style-type: none"> - Architectural Research (5) - Studies in Arch. Histories (6) - Architectural History Principle (6) - Intro to Arch. Discourse (3) - Theory & Design Research (3) 	<ul style="list-style-type: none"> - Building Systems Design 1 (5) - Building Systems Design 2 (5) - Advanced Building Systems (5) - Structures 1 (3) - Structures 2 (3) 	<ul style="list-style-type: none"> - 9 Electives (18) 	<ul style="list-style-type: none"> - Thesis (Directed Research) (6)
Texas A&M University	M.A 85 Unites (3 Years)	<ul style="list-style-type: none"> - Design Foundations I (6) - Design Foundations II (6) - Design Foundations III (6) - Architectural Design I (6) - Architectural Design II (6) - Professional Practice (3) - Architectural Design III (Required) (6) 	<ul style="list-style-type: none"> - History of modern Architecture (3) - Survey of Architectural History I (3) - Survey of Architectural History III (3) - An Approved Architectural Theory Course (6) - Final Study Proposal (Required) (1) - Final Study (Required) (6) 	<ul style="list-style-type: none"> - Visual Communications (3) - Structural & Environmental Technology Concepts (3) - Elements of Architectural Structures (3) - Elements of Environmental Control Systems (3) - Structural Systems (3) - Environmental Control Systems (3) 	<ul style="list-style-type: none"> - Electives (12) 	

Rest of Table 3.

University	Program	History & Theory	Elective
University of California, Los Angeles	M.A 122 Unites (3 Years)	<ul style="list-style-type: none"> - Introductory Design Studio (6) - Building Design Studio (6) - Building Design with Landscape Studio(6) - Comprehensive Studio (6) - Major Building Design (6) - Research Studio (6) - Research Studio (2) - Advanced Topics Studio (6) - Research Studio (2) - Advanced Topics Studio (6) - Professional Practice (4) 	<ul style="list-style-type: none"> - Introduction to Computing (2) - Structure I (4) - Structures II (4) - Introduction to Building Construction (2) - Tech Core Studio (6) - Structures III (4) - Building Climatology (4) - Building Construction (4) - Environmental Controls (4) - Elective (24)
Washington University	M.A 137 Unites (3 Years)	<ul style="list-style-type: none"> - Foundation Studio I (6) - Foundation Studio II (6) - Integration Studio I (6) - Integration Studio II (6) - Integration Studio III (6) - Exploration Studio I (6) - Exploration Studio II (6) - Research Studio I (6) - Research Studio II (6) - Representation I (1) - Representation II (1) - Professional Practice (3) 	<ul style="list-style-type: none"> - History + Theory I (3) - History + Theory II (3) - Urban & Preservation Issues (3) - Contemporary Arch Theory (3) - Architecture & Landscape (3) - Research Methods (3) - Materials & Assemblies I (3) - Design Technology I (3) - Design Technology II (3) - Design Technology III (3) - Design Technology IV (4) - Design Technology V (4) - Design Development (3) - Electives (12) - Research Seminar I (3) - Research Seminar II (3) - Thesis Research Preparation (3) - Master Thesis (6)
Yale University	M.A 114 Unites (3 Years)	<ul style="list-style-type: none"> - Architectural Design (9) - Architectural Design (9) - Visualization & Computation (3) - Architectural Design (9) - Advanced Studio Design (9) - Advanced Studio Design (9) 	<ul style="list-style-type: none"> - Formal analysis (3) - Modern Architecture (3) - Architectural Theory (3) - Introduction to Urban Design (3) - Practice & Management (3) - Structures I (3) - Building Project I (3) - Structures II (3) - Building Project II (3) - Environmental Design (3) - Systems Integration (3) - Electives (24)

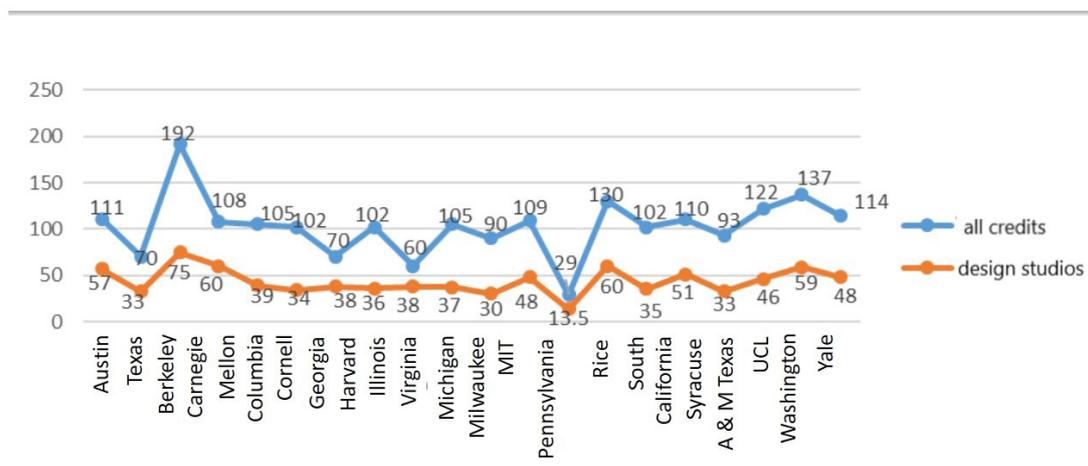


Fig. 1. A Comparison of the Number of Design Credits in Architecture Master programs. Source: Authors.

technological advancement and the widespread use of the internet. Virtual design studios have grown over the past decade resembling traditional ones, with the exception that students interact less in virtual studios. In this model, the students no longer have to get together in a physical space and debate over a specific topic. They rather model their work using a computer, email it to a professor in another country, and converse online (Laiserin, 2002, 142). The studios in the studied universities turned out to be quite advanced, providing a context for theoretical and practical education. To define its design studios, the UCLA School of Architecture states: “The studios are focused on researching and experimenting on form, exploring the correlation between architecture and urban design in response to contemporary architecture, and the relationship between form, construction technology, context, and environment. This department engages students with imagination and thought on the forms that are bound to be constructed in the community.” This definition suggests designing courses to be directly related to the needs of the community. The studios are also equipped with 3D printers, lasers, and robots in some cases so the students can model their designs in the studio environment on a larger scale. As Fig. 1 indicates, around half of the credits in master’s programs of architecture in top US universities are held in design studios. Fig. 2 compares the number of theory and history credits to the total credits in the studied Master of Architecture programs.

A closer look into theoretical courses indicates that these courses include academic content on the history and theory of architecture and urban planning and their discourse, suggesting the mutual relationship that architecture and urban planning have with the culture and policy of the community and accentuating the relationship between architecture as an interdisciplinary science with courses offered in arts, media, and urban planning departments. As the diagram above demonstrates, theoretical and history credits make up a smaller portion of the programs compared to studio credits.

Some schools require no theoretical courses to be taken as these courses are offered through optional credits. Fig. 3 three compares the number of technology and construction credits to the total credits in the 20 studied Master of Architecture programs.

Optional courses are courses that students take depending on their desired field of study every semester. For instance, some optional courses are in the field of technology and some are in the field of theory and history. Some universities such as UCLA allow students to take optional courses in other schools such as faculties of literature or cinema depending on their dissertation topic. Moreover, Dr. Carolyn Buchanan, professor of design at the University of Austin, stated regarding the absence of dissertation and optional courses in this school: “No dissertation in architectural design is required to complete the master program at the University of Austin, Texas. Students can take a design

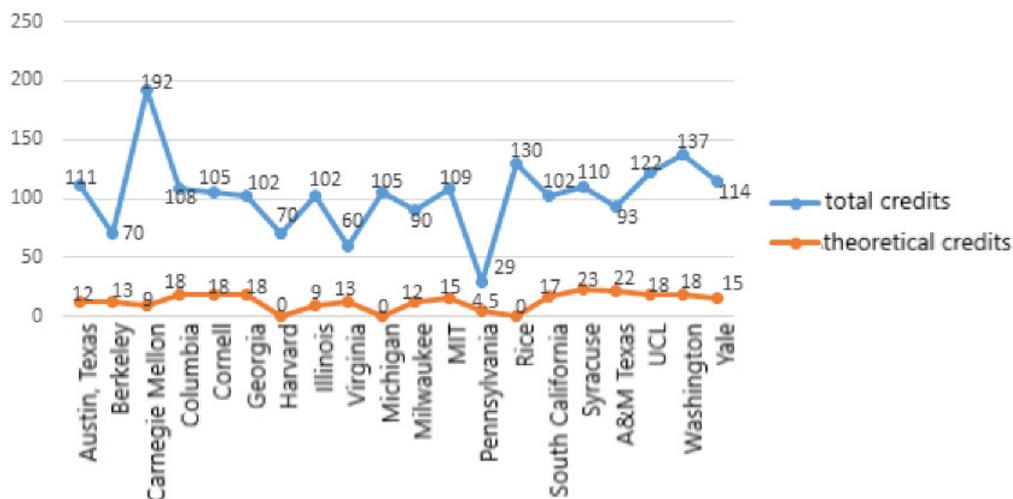


Fig. 2. Comparison of the Number of Theoretical & History Credits in Architecture Master Programs. Source: Authors.

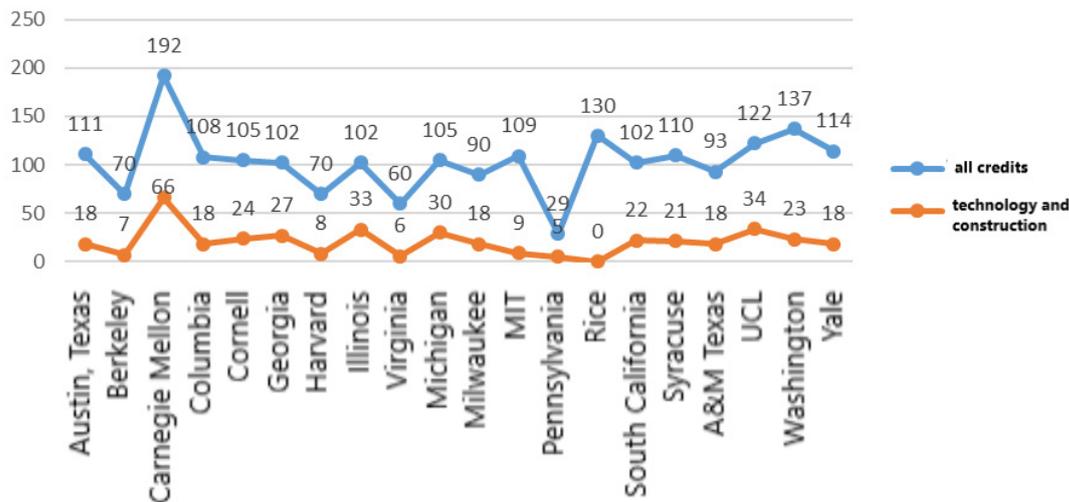


Fig. 3. Comparison of the Number of Technology & Construction Credits in Architecture Master Programs. Source: Authors.

studies course, but it is not required. The contents of the courses and their relation to the practical courses vary based on the professor and type of course. The students can tweak their program based on their interests and take the courses they are the most interested in.” Some schools offer courses to prepare for dissertation writing in the final two semesters (Table 3). Of course, not all schools require a dissertation. Fig. 4 compares the number of credits for dissertation and dissertation preparation to the total credits in the studied programs. The various types of courses were compared as mentioned above. Fig. 5 demonstrates a summary of the types of courses and credits offered in the studied programs in 20 architecture schools in the US in comparison to one another.

As Fig. 5 illustrates, design courses in studios make up a larger portion of the master’s programs in architecture at top American universities. This indicates that over one-third of the courses in all top 200 architecture schools of the world are focused on the practice field and are delivered in design studios, suggesting that today’s architecture training requires accentuated attention to practical courses and modern design studios equipped with digital design systems, printers, and modern construction devices so students can draw inspiration from their creativity and the needs of the community and world to design in a flexible and dynamic environment. It must be noted that what sets these schools apart is the flexibility in choosing courses, close attention to design courses for master’s students

of architecture, and the number of courses that require the student to spend four to five days a week in the university to take the required courses. Furthermore, it must be mentioned that universities have faced many challenges in teaching architecture over the past three years. Europe and the world are faced with immense challenges. Finding a balance between social, ecological, and financial concerns, digital transition, and major political development are among the primary driving forces of change in the recent decade. European and American universities are quite eager to overcome these challenges. They are old institutes that have been there for millennia, expanded the borders of knowledge, educated the citizens, and steered the community. However, overcoming the present challenges requires substantial change. The COVID-19 pandemic and the consequent social and economic crises the present decade has begun will continue to affect the years to come, but they also present opportunities for innovation in universities which future research needs to explore (Jørgensen & Claeys-Kulik, 2021, 2).

Conclusion

Results of the present study conducted on schools of architecture revealed that each school had defined goals and respective courses for each architecture program. The number of credits and the duration of study in the master’s program were revealed to depend on the student’s undergraduate background so the programs would be flexible and tailored to the skills of the individuals.

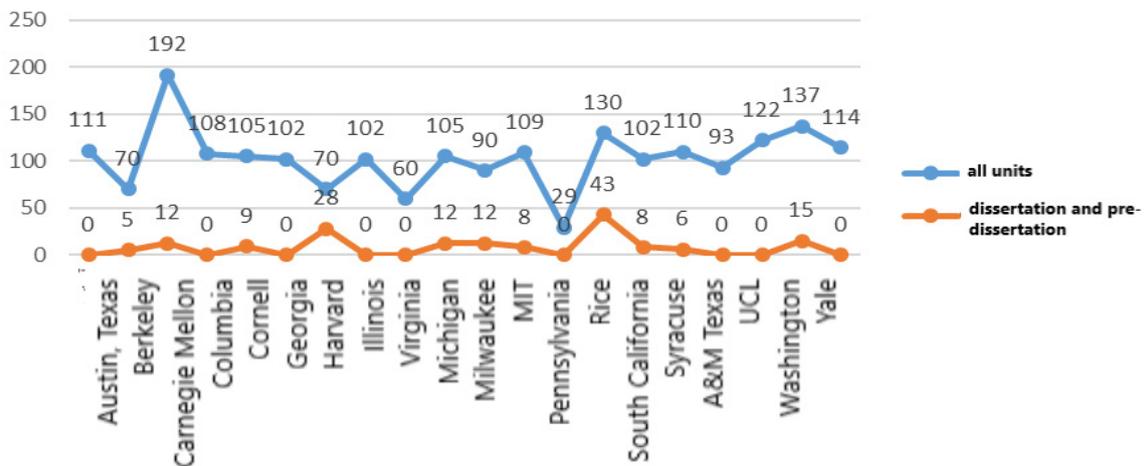


Fig. 4. Comparison of the Number of Credits on Dissertation & Dissertation Preparation in Architecture Master Programs. Source: Authors.

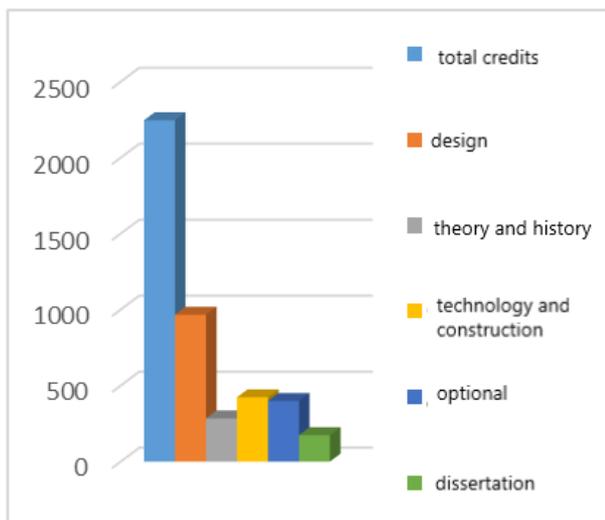


Fig. 5. A Comparison of the Total Credits in the 20 Schools in Terms of Fields of Study. Source: Authors.

The study and comparison of the programs and their structure in each school revealed common criteria such as attention to the specialization of the disciplines and their classification into various majors seeking a more specialized education and passing of prerequisite credits by students with irrelevant bachelor’s studies to enter the master’s program. The education offered in these universities accentuated independent thinking and pursued a balance between flexibility and fundamental knowledge and skills. On the other hand, diverse courses and programs were offered for various professional and academic goals, leadership in architecture, research, and other plans consistent with the educational goals, ensuring a persistent relationship between the students and alumni. Most of the studied universities particularly highlighted the philosophy of architecture among theoretical and design

courses. Some of the basic and conventional courses in Master of Architecture programs included design, structure and technology, history, theory and research, and management and execution practices that are thought to foster innovative thinking into practical technologies and construction, heritage preservation, cultural infrastructure, and the environment. Students in these programs are faced with a wide range of various environmental, political, and social aspects in architectural design and urban planning while considering the concepts in presenting their ideas and bridging design to other discourses such as social and human sciences, management, and skills in facing the issues of the day and overcoming them. The architecture curriculum offers design courses on all scales using manual design and digital architectural design technologies at the same time and takes advantage of past experiences to address real issues in the community and come up with context-specific answers to them. The relationship between historical and theoretical courses and design programs in studios was also quite evident. Such is an opportunity for the students to design and experiment with their ideas and creativity. Design courses in the studied schools encompassed all aspects of architecture from research to free-hand design and idea presentation in various forms. Research in the master’s program is a tool to increase awareness and understanding, examine contemporary issues, and practice contemplation into various approaches. On the other hand, master’s and Ph.D. students can take part in extracurricular programs or become teacher’s assistants in undergraduate classes

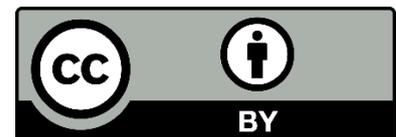
to gain experience in the field of teaching and ultimately graduate with master-level experience in architecture research or design. Hopefully, the educational process offered in these top schools of architecture in the world can inspire the future of architecture education at the global level so the master's program can grow into a theoretically and practically efficient program encouraging architecture enthusiasts to take part in such programs.

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