



THE IMPACT OF CAMPUS OPEN SPACE DESIGN ON USER'S NEEDS AND THE OPTIMUM USE OF OUTDOOR ENVIRONMENT

By

Nermine Ibrahim Nofal

A Thesis Submitted to the
Faculty of Engineering at Cairo University
in Partial Fulfillment of the
Requirements for the Degree of
MASTER OF SCIENCE
in
Architectural Engineering

FACULTY OF ENGINEERING, CAIRO UNIVERSITY
GIZA, EGYPT
2019

THE IMPACT OF CAMPUS OPEN SPACE DESIGN ON USER'S NEEDS AND THE OPTIMUM USE OF OUTDOOR ENVIRONMENT

By
Nermine Ibrahim Nofal

A Thesis Submitted to the
Faculty of Engineering at Cairo University
in Partial Fulfillment of the
Requirements for the Degree of
MASTER OF SCIENCE
in
Architectural Engineering

Under the Supervision of

Prof. Dr.
Ayman Hassan Ahmed Mahmoud

Professor of Landscape Architecture
Architecture Department
Faculty of Engineering, Cairo University

FACULTY OF ENGINEERING, CAIRO UNIVERSITY
GIZA, EGYPT
2019

THE IMPACT OF CAMPUS OPEN SPACE DESIGN ON USER'S NEEDS AND THE OPTIMUM USE OF OUTDOOR ENVIRONMENT

By
Nermine Ibrahim Nofal

A Thesis Submitted to the
Faculty of Engineering at Cairo University
in Partial Fulfillment of the
Requirements for the Degree of
MASTER OF SCIENCE
in
Architecture Department

Approved by the
Examining Committee

Prof. Dr. Ayma n Hassan Ahmed Mahmoud Thesis main advisor

Professor of Landscape Architecture, Architecture Department Faculty of Engineering,
Cairo University

Prof. Dr. Rowaida Mohamed Reda Youssef Internal Examiner
Professor of Architecture, Architecture Department Faculty of Engineering, Cairo
University

Associate Prof. Dr. Heba Abo el Fadl External Examiner
Associate professor in Fine Arts University, Architecture Department-Alexandria
University

FACULTY OF ENGINEERING, CAIRO UNIVERSITY
GIZA, EGYPT
2019

Engineer's Name: Nermine Ibrahim Nofal
Date of Birth: 17/11/1983
Nationality: Egyptian
E-mail: nermine_nofal@hotmail.com
Phone: 01155550712
Address: 22 October paradise ,6 October
Registration Date: 1/10 /2011
Awarding Date: 28/02/2019
Degree: Master of Science
Department: Architecture



Supervisors:
Prof. Ayman Hassan Ahmed Mahmoud

Examiners:
Prof. Dr. Ayman Hassan Ahmed Mahmoud
Thesis main advisor
Prof. Dr. Rowaida Mohamed Reda Youssef
Internal Examiner
Associate Prof. Dr. Heba Abo el Fadl
External Examiner

Title of Thesis:

THE IMPACT OF CAMPUS OPEN SPACE DESIGN ON USER'S NEEDS AND
THE OPTIMUM USE OF OUTDOOR ENVIRONMENT

Key Words:

Campus outdoor space; open space role ; educational landscape; physical elements;
user's behavior; users' needs.

Summary:

The research aims to study the campus open spaces, its physical settings and elements in relation with student's needs, behavior and activities. Its objective is to reach an applied framework and a set of comprehensive guidelines for best usage of university campuses open spaces that meet those needs. This research and its proposed methodology will help finding out how to enhance the existing campus open spaces design and provide design strategies and guidelines to new campus area design.

Disclaimer

I hereby declare that this thesis is my own original work and that no part of it has been submitted for a degree qualification at any other university or institute.

I further declare that I have appropriately acknowledged all sources used and have cited them in the references section.

Name: Nermine Ibrahim Nofal

Date:

Signature:

Table of Contents

ACKNOWLEDGMENTS.....	I
DEDICATION	II
TABLE OF CONTENTS	III
LIST OF TABLES.....	IV
LIST OF FIGURES.....	V
NOMENCLATURE	VI
ABSTRACT	VII
CHAPTER 1 : INTRODUCTION	1
1.1. INTRODUCTION	1
1.2. RESEARCH PROBLEM	2
1.3. RESEARH QUESTION	3
1.4. RESEARCH OBJECTIVES	3
1.5. THE CASE STUDY	3
1.6. RESEARH MYTHODOLOGY.....	4
1.7. RESEARCH TOOLS	4
1.8. RESEARCH SOURCES OF DATA.....	5
1.9. RESEARCH STRUCTURE	6
1.9.1. Research plan method relation.....	6
1.9.2. Research general structure.....	7
1.9.3. Research detailed structure	8
CHAPTER 2 :THE ROLE OF CAMPUS OPEN SPACE	9
2.1. OPEN SPACES AS A VITAL PART OF THE CAMPUS	9
2.1.1. What is Campus open space?.....	9
2.1.2. Campus open space.....	10
2.1.2.1. Campus open space role	10
2.1.2.2. Campus open space benefits	10
2.1.3. Campus landscape design	11
2.1.3.1. Landscape design	11
2.1.3.2. Campus landscape deisgn	11
2.2. EDUCATIONAL LANDSCAPE DESIGN/OPEN SPACE DESIGN	12
2.2.1. Learning spaces definition	13
2.2.2. Relationship between space design and Learning	13
2.2.3. Types of Learning Spaces	13
2.2.4. Informal learning across the campus	14
2.2.5. Design Factors for Outdoor Learning Spaces.....	15
2.3. SUMMARY	16
CHAPTER 3 : CAMPUS OPEN SPACE SPATIAL DESIGN –PHYSICAL CHARACTER	17
3.1. THE PHYSICAL ENVIRONMENT OF CAMPUS OPEN SPACE	17
3.1.1. The major elements of environmental quality	17
3.1.2. The physical environment definitions.....	17
3.2. PHYSICAL QUALITIES OF CAMPUS LANDSCAPE	18
3.2.1. Campus physical character (landscape)	19

3.2.1.1.	Accessibility	19
3.2.1.2.	Ease of movement.....	20
3.2.1.3.	Quality of public realm	22
3.2.1.4.	Sense of Identity	22
3.2.2.	Campus spaces.....	23
3.2.3.	Campus open spaces types.....	25
3.2.4.	Campus physical elements-Landscape elements	30
3.2.5.	Conclusion	36
3.2.5.1.	Physical qualities	36
3.2.5.2.	Physical aspects relations.....	36
3.3.	SUMMARY	38
CHAPTER 4 : STUDENTS NEEDS ,SOCIAL BEHAVIOUR AND ACTIVITIES IN CAMPUS OPEN SPACES		39
4.1.	NEEDS AS A SOCIAL QUALITY IN SUSTAINABLE CAMPUS OPEN SPACE	39
4.1.1.	Campus students' needs in relation with social development.....	39
4.1.2.	Students' needs effect on the use of campus outdoor spaces.....	39
4.1.3.	Students' Needs in relation with Social Development	40
4.1.3.1.	Friendship formation.....	40
4.1.3.2.	Group membership	40
4.1.3.3.	The climate, site conditions and campus size, natural factors, and the local community culture	40
4.1.3.4.	Territoriality.....	40
4.1.3.5.	Communication.....	41
4.1.3.6.	Different Social Distances	41
4.1.3.7.	Spatial separation due to social characteristics	41
4.1.3.8.	Gender differences affecting social quality.....	41
4.1.3.9.	Public participation and its impact.....	42
4.1.3.10.	Informal social spaces in campus.....	42
4.1.4.	Framework example combining previous reviewed elements	42
4.2.	BEHAVIOR AS A SOCIAL QUALITIES IN SUSTAINABLE CAMPUS OPEN SPACE	43
4.2.1.	Requirements and behavior of Students in outdoor campus spaces	43
4.2.2.	Surrounding environment effect on Students' behavior	44
4.3.	OUTDOOR SPACE ACTIVITIES	45
4.3.1.	Activities that Encourage the Socialization of Youth.....	45
4.3.2.	Activities that Encourage the Personal Development of Youth	45
4.3.3.	Framework table -descriptive chart	45
4.4.	SUMMARY	46
CHAPTER 5 : COMPARATIVE ANALYSIS FOR EXAMPLES.....		48
5.1.	FRAMEWORK AND ANALYSIS INDEX	48
5.1.1.	Framework literature review.....	48
5.1.2.	Proposed Framework	48
5.1.3.	Table shows Relation between campus outdoor design qualities and campus outdoor landscape design elements.....	49
5.1.4.	Table shows Relation between different types of campus outdoor spaces and students activities, behavior and needs	51
5.2.	CAMPUSES EXAMPLES ANALYSIS.....	52
5.2.1.	Introductiin	52
5.2.2.	Analysis process index.....	53
5.2.3.	WU campus in Vienna.....	54
5.2.4.	The University of New South Wales in Australia The University of New South Wales in Australia	79
5.2.5.	American University Campus Beirut, Lebanon.....	93
5.3.	COMPARATIVE RESULTS ANALYSIS	111

5.3.1.	Examples campus outdoor design qualities and campus outdoor landscape design elements comparison	111
5.3.2.	Examples types of spaces within the campus and students activities, behavior and needs comparison.....	112
5.4.	SUMMARY	113
CHAPTER 6 : STUDY CASES IN EGYPT.....		114
6.1.	INTRODUCTION.....	114
6.2.	ANALYSIS PROCESS INDEX	114
6.3.	CAMPUSES GENERAL INFORMATION.....	115
6.4.	OCTOBER UNIVERSITY OF MODERN SCIENCES AND ARTS (MSA UNIVERSITY) IN 6 TH OCTOBER	116
6.5.	THE AMERICAN UNIVERSITY IN CAIRO -AUC CAMPUS IN NEW CAIRO	139
6.6.	SUMMARY.....	167
CHAPTER 7: RESEARCH CONCLUSION AND FINDINGS.....		168
7.1.	COMPARATIVE TABLE BETWEEN MSA AND AUC RESULTS	168
7.1.1.	Comparative results Campus outdoor design qualities and campus outdoor landscape design elements	168
7.1.2.	Comparative results of spaces of spaces within the campus and students activities, behavior and need.....	171
7.2.	RESEARCH FINDINGS	172
7.3.	RESEARCH CONCLUSION	172
7.4.	RESEARCH RECOMMENDATIONS	173
7.4.	FURTURE RESEARCH	174
REFERENCES		175

List of Table

Table (1-1): structure showing phases and methods.....	6
Table (1-2): structure showing the theoretical and application parts	7
Table (1-3): structure showing chapter's detailed description.....	8
Table (2-1): Differences between formal and informal learning	14
Table (3-1): Sustainable landscape character for Iraqi university campuses Model.....	21
Table (3-2): landscape elements.....	31
Table(3-3):The relationship between campus design qualities and landscape elements	37
Table (3-4): Framework for healthy campus open space design.....	38
Table (4-1): symbol index	42
Table (4-2): Levels of evaluation in the case study.....	43
Table (4-3) Assessment for open spaces in the UNSW Main Campus	46
Table (5-1): Relation between campus outdoor design qualities and campus outdoor landscape design element.....	49
Table (5-2): Campus outdoor design standards detailed elements	50
Table (5-3): Relation between different types of campus outdoor spaces and students' activities, behavior and needs.....	51
Table (5-4): study cases general information.....	52
Table (5-5): study cases key facts.....	53
Table (5-6): landscape elements of WU campus.....	74
Table (5-7): Campus outdoor design qualities and campus outdoor landscape design elements Matrix in WU campus in Vienna.....	76
Table (5-8): Types of spaces within the campus and students activities, behavior and needs Matrix in WU campus in Vienna.....	77
Table (5-9): Relation between campus outdoor design qualities and campus outdoor landscape design elements in UNSW Australia.....	91
Table (5-10): the relation between types of spaces within the campus and students activities, behavior and needs in UNSW in Australia.....	92
Table (5-11): Relation between campus outdoor design qualities and campus outdoor landscape design elements in American University Campus Beirut.....	109
Table (5-12): the relation between types of spaces within the campus and students activities, behavior and needs in American University Campus Beirut.....	110
Table (5-13): Comparative table between campus outdoor design qualities and campus outdoor landscape design elements.....	111
Table (5-14): Comparative table between types of spaces within the campus and students activities, behavior and needs.....	112
Table (6-1): case studies general information.....	115
Table (6-2): case studies detailed information.....	115
Table (6-3): MSA main and sub open spaces description.....	125
Table (6-4): MSA landscape elements.....	129
Table(6-5): Campus outdoor design qualities and campus outdoor landscape design elements Matrix in MSA 6 October campus.....	132
Table (6-6): Types of spaces within the campus and students activities, behavior and needs Matrix in MSA 6 October campus	136
Table (6-7): MSA- SWOT analysis elements.....	138
Table (6-8): AUC main and sub open spaces description.....	151

Table (6-9): AUC landscape elements.....	157
Table (6-10): shows Relation between campus outdoor design qualities and campus outdoor landscape design elements in AUC CAMPUS in New Cairo, Egypt.....	160
Table (6-11): shows the relation between types of spaces within the campus and students activities, behavior and needs in American University Campus Cairo.....	164
Table (6-12): AUC-SWOT analysis elements.....	166
Table (7-1) :comparative results Campus outdoor design qualities and campus outdoor landscape design elements.....	167
Table (7-2): Comparative results of spaces of spaces within the campus and students activities, behavior and need.....	171

List of Figures

Fig(2-1): Definition of open space in Hong Kong	9
Fig (2-2): delineation between public and private space.....	10
Fig (2-3): Main landscape elements	11
Fig (2-4): landscape types.....	12
Fig (2-5): Schematic diagram shows the learning ration from down to up.....	14
Fig (2-6): Different types of educational informal learning.	15
Fig (3-1): Place making diagram.....	18
Fig (3-2): A successful place elements.....	19
Fig (3-3): Walkways inside the campus.....	20
Fig (3-4): Different gates.....	25
Fig (3-5): Campus heart.....	26
Fig (3-6): Courtyard.....	26
Fig (3-7): Nodes	26
Fig (3-8): Building entrances	26
Fig (3-9): Front yard	27
Fig (3-10): Back yard	27
Fig (3-11): Sports facility.....	27
Fig (3-12): Private space	28
Fig (3-13): screen fencing	28
Fig (3-14): Outdoor research space	28
Fig (3-15): parking lots.....	29
Fig (3-16): physical character elements.....	38
Fig (4-1): users' needs elements.....	47
Fig (5-1): Components /Parameters of Outdoor Spaces Quality on Campus.....	48
Fig (5-2): WU campus.....	54
Fig (5-3) WU campus logo.....	54
Fig (5-4) the landscape's four seasonal dimensions.....	55
Fig (5-5) Master plan.....	56
Fig (5-6) urban network.....	57
Fig (5-7) ecological urbanism	58
Fig (5-8) layered visualization for composition of the campus.....	58
Fig (5-9) Solid and void masses.....	59
Fig (5-10) buildings details solid and void master plan.....	59
Fig (5-11) building forms in master plan.....	60
Fig (5-12) campus buildings panorama.....	60
Fig (5-13) WU campus buildings.....	61
Fig (5-14) Campus entrances and buildings entrances.....	62
Fig (5-15) main campus welcoming entrance with the underground exit.....	62
Fig (5-16) naturally illuminated light wells.....	63
Fig (5-17) Public transport.....	63
Fig (5-18) Underground master plan showing parking area.....	63
Fig (5-19) Parking area and entrance.....	64

Fig (5-20) bicycles racks.....	64
Fig (5-21) open spaces.....	65
Fig (5-22) the campus passages, flow design, and the splitting & continuity of stations.....	66
Fig (5-23) plazas “walk along park “.....	67
Fig (5-24) the lounge plaza views.....	68
Fig (5-25) the relax plaza views.....	69
Fig (5-26) the expo plaza views.....	70
Fig (5-27) the stage plaza views.....	71
Fig (5-28) the patio plaza views.....	72
Fig (5-29) the forum plaza views.....	73
Fig (5-31) Sports facilities.....	74
Fig (5-32): University of New South Wales in Australia view.....	79
Fig (5-33): the campus in the mid-1980.....	80
Fig (5-34) UNSW master plan.....	81
Fig (5-35) concepts.....	81
Fig (5-36) contextual master plan.....	82
Fig (5-37) solid and void master plan.....	82
Fig (5-38) building sitting.....	83
Fig (5-39) building forms.....	83
Fig (5-40) building forms.....	84
Fig (5-41) UNSW Campus Structure Strategy -Arrival numbers and movement strategy.....	84
Fig (5-42) primary pedestrian route -and secondary route –university walk.....	85
Fig (5-43) university mall perspective and plan.....	85
Fig (5-44) multistory parking & underground.....	86
Fig (5-45) parking areas’.....	86
Fig (5-46) master plan with open spaces clusters.....	87
Fig (5-47) Decomposition of the urban structural unit.....	87
Fig (5-48) main units pictures.....	88
Fig (5-49) activity hubs.....	89
Fig (5-50) landscape features.....	89
Fig (5-51) Informal open spaces	90
Fig (5-52) open spaces structure and pictures.....	90
Fig (5-53) key plan 2020 master plans.....	93
Fig (5-54) AUB master plan.....	94
Fig (5-55) environmental condition effect on design.....	95
Fig (5-56) AUB Master plan.....	96
Fig (5-57) the Neighborhood.....	97
Fig (5-58) topography masterplan.....	97
Fig (5-59) different views from upper campus.....	98
Fig (5-60) stairways.....	98
Fig (5-61) Cross Sections.....	98
Fig (5-62) Campus View Corridors.....	99

Fig (5-63) AUB solid and void.....	99
Fig (5-64) Existing Land Use.....	100
Fig (5-65) Aerial View of AUB.....	100
Fig (5-66) AUB campus layers.....	101
Fig (5-67) various buildings forms.....	102
Fig (5-68) Master plan and entrances.....	102
Fig (5-69) AUB Campus edges and Gateways.....	103
Fig (5-70) campus edges.....	103
Fig (5-71) Vehicular roads.....	104
Fig (5-72) Sea Parking is the largest surface parking supply on campus.....	104
Fig (5-73) Service Vehicle and Shuttle Circulation.....	104
Fig (5-74): Pedestrian Circulation.....	105
Fig (5-75): Existing Open Space and Vegetation.....	106
Fig (5-76): Middle Campus Landscape Zones.....	107
Fig (5-77): Gardens and Greens.....	107
Fig (5-78): student's activities and spaces.....	108
Fig (6-1): October University of Modern Sciences and Arts (MSA University) view.....	116
Fig (6-2): Climate analysis for MSA University.....	117
Fig (6-3): MSA layout	117
Fig (6-4): MSA location on Wahat road	118
Fig (6 -5): All academic institutions in this area.....	118
Fig (6-6): main roads and surroundings.....	118
Fig (6-7): MSA solid and void.....	119
Fig (6-8): Campus buildings -Elevation theme.....	120
Fig (6-9): Building sitting.....	120
Fig (6-10): Buildings entrances from side and back elevation.....	121
Fig (6-11): Approaches& Accessibility.....	122
Fig (6-12): street parking.....	122
Fig (6-13): main gates and parking	123
Fig (6-14): Roads/pedestrian pathways.....	123
Fig (6-15): Open Spaces-space distribution.....	124
Fig (6-16): Main and Sub zones.....	124
Fig (6-17): AUC GATE.....	139
Fig (6-18): environmental strategy diagram.....	140
Fig (6-19): AUC Master Plan.....	141
Fig (6-20): urban context.....	142
Fig (6-21): solid and void masses.....	142
Fig (6-22): campus main zones division.....	143
Fig (6-23): Buildings and open spaces plan.....	144
Fig (6-24): elevation forms.....	145
Fig (6-25): AUC front and back gates.....	145
Fig (6-26): vehicle and pedestrian entrance.....	146
Fig (6-27): outer streets network and gates positions with parking places.....	146
Fig (6-28): Parking and signage.....	147

Fig (6-29): parking lots of disabled users and deciduous vegetation in parking areas.....	147
Fig (6-30): the jogging path, the cycling path and bike track.....	147
Fig (6-31): Bicycle racks at important points on campus.....	148
Fig(6-32): Pedestrian circulation.....	148
Fig (6-33): open spaces landscape master plan.....	149
Fig (6-34): open space structure.....	150
Fig (6-35): main and sub zones.....	151
Fig (6-36): informal outdoor settings.....	156
Fig (6-37) Landscape and architecture.....	156
Fig (6-38) Landscape and architecture.....	156

Nomenclature

SWOT: Strengths, Weaknesses, Opportunities and Threats

WU: Vienna University of Economics and Business

UNSW: The University of New South Wales

AUB: American University Campus in Beirut

MSA: Modern Science and Arts University

AUC: American University Campus in Cairo