"Exteriore Landscape Design of College Using Delphi Methode"

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Abstract: *The main objective of study was to re design exterior landscape of college to commensurate needs of campus users through putting various proposals and choosing the best, using Delphi questionnaire. Research implemented in colleges of Education for Girls and Agriculture, University of AL-Anbar for the period from 1\7\2012-30\5\2013 conducted a field study to exterior space for college, studied the reality of the exterior spaces through field survey included, Chosen a central garden of two colleges(1&5) to be evaluated by five experts in the field of landscape design using questionnaire which includes two phases (inductive and restricted) questionnaire .the research reached to several conclusions, lack of recruitment of design standards, principles and features in campus landscape gardens design ,there was a clear lack in gardens achieving of their environmental, beauty, expediency and social goals because of management neglect, bad organizing, weak planning, random cultivation of plants and lack of the complementary components of most gardens landscape, high salinity of soil and water, shortage in service and maintenance works, low percentage of gardens and green area in the studied locations, which were18.07% for college of Agriculture ,percent should be 40% at least of total area according to universal standards. For determining most appropriate design proposed to central garden of College of Agriculture, questionnaire using Delphi method at dependence of the Superiority of the proposed design for the first garden purpose on the other two, as first proposed rate reached 34.22%, while the selection of the proposed second 33.11% , third32. 66, respectively.*

Key words: *landscape design, exterior space, campus, Delphi technique.*

I. Introduction

Campus External spaces are important part complementary urban environment at the universities, the buildings represent a closed part while gardens and green spaces between them represent open space integration of the campus environment, since that man is exposed to external spaces directly in contact with them before exposure closed buildings (Dober, 2000). Millions of people live and work on college campuses every day, there is no doubt that campus landscape design is of great importance to millions of students, faculty, and staff , surrounding communities are also significantly affected by college campuses as colleges often provide education and social events, as well as economic activities, however, in the past, the design of campus landscape spaces have been overlooked or treated as a leftover of buildings, even though campus landscape spaces are more than the" face of colleges.(yang,2007). Colleges and universities become significant resources, like health care, science and technology, etc. for surrounding communities; they affect people's lives by providing diverse social, economic, and cultural activities, it is easy to see the importance of campus landscape and its impact on how people use such spaces, research and studies discuss how students, faculty, staff, and members in community use campus landscape spaces based on the areas of environmental behavior and environmental perception, the design focus is switched from traditional emphasis on the landscape spaces' forms and function to their real human use, research also indicates that, in a setting such as a university campus with a wide range of users from young freshmen to college and staff and active retiree, landscape spaces need to span from Active urban to passive natural and large open lawns or hillsides to Secluded spaces (Abu-Ghazzeh 1999), Researchers have shown that active interactions with nature have been related to improved psychological and physiological health, including increased confident and reduced stress levels (Cammack etal,2002 and Waliczek etal 2005). The mere presence of plants has been found to improve life satisfaction environmentally, economically, socially, culturally and physically (Zampini, 1994). Kaplan and Kaplan (1989) reported that individuals who had access to natural settings where happier with their home, job, and life in general. Such positive results have been found with views of vegetation, water, (Heerwagen, 1990, White Heerwagen1998). Some theorists have argued that universities should be designed to facilitate a certain quality of life (Caws 1970). (Boyer (1987) found that the appearance of the campus was the most significant factor for students in deciding which university to attend .Im(1984) found that vegetation coverage was one of three important predictors for visual preference of a

familiar campus area for undergraduates and graduate students. Ulrich (1981) found that student felt more positive in stressed situation when viewing plants or other views of nature. However, to date, there is limited literature and research on how to design campus landscape spaces. The first provision of external spaces requirements of an efficient design is to provide the related studies and research seeks to cover part of it. Therefore research aimed to study gardens, external spaces of Anbar University colleges of Agriculture&education to diagnose problems to access solutions and appropriate recommendations by placing three proposed designs of the each (central garden in these colleges) and choose the proposed design most appropriate among them using Delphi method questionnaire.

II. Materials and methods

Field study was conducted to college site for the period 1\7\2012-30\5\2013, in two phases the first- study reality of site included by field survey and second questionnaire contained Delphi method elected to sample of experts.

2.1 Reality of exterior landscape design of site

Through personal observation and field survey we found that exterior landscape design suffering from many problems including recruitment of design standards, principles and features in campus landscape gardens design. In addition, there was a clear lack in gardens achieving of their environmental, beauty, expediency and social goals because of management neglect, bad organizing, weak planning, random cultivation of plants and lack of the complementary components of most gardens landscape.

2.2 field study

College of Agriculture, established in 1993, and college of Education in1987, located east of Rumadi, 3km from center of the city, College of Agriculture only have one entrance, to pedestrians and cars, causing great confusion in the movement, three entrances for education college ,the circulation of roads orthogonal and on its sides pedestrians paths and walkways, these roads suffer from rainwater gathered as a result of the absence of slope on the sides of roads, either parking there two parking in Agric & three in Education college is dedicated parking for students, visitors and employees.

As the Colleges within boundaries of Rumadi city, it is influenced by city environment, which lies between north latitudes $°33.23$and$°33.27$ and east longitudes $°43.10$ and $°43.22$(ALmohamdy2005). City of Rumadi located within dry desert climate range, high temperatures in summer season, which extends for a long period from May to October and goes down in winter January & February, there is a simple transition between summer and winter period, rising maximum temperatures in the months (June to August), while winter months (December to February), lowering the minimum temperatures, there is a clear variance in temperature between summer and winter (Al-sbehy, 2002). Cause of high and low temperatures due to many factors, including fall of sun at a semi orthogonal angle in summer, and a few clouds in winter and absence in summer increases the amount of solar radiation reaching the earth's surface. Winds is an important environmental factors affecting plant growth and survival properly in terms of mechanical effects as well as its impact on the amount of water evaporated from soil and plant, northwest winds are prevailing in the region, accounting for 35% of the total wind , followed by the west wind by 18%. Relative humidity rates vary in the city of Rumadi, and is characterized increasing in winter and decrease in summer, which represented in the month of December 67.9% in July, reaching 33.1%. Rumadi city located between latitudes rain 100-150mm, this indicates that the city is located in the low rainfall area as well as fluctuating from year to year and is characterized as a quarterly concentrated in the winter and absent in the summer and thus should be noted that the amount of rainfall is not enough to ensure the success of the permanent agriculture which need to 300 mm and more per year (AL-Mohammady, 2005) and (AL- rawi, 1993).

study and evaluate physical and chemical properties of soil, lead to exploit the land better and selection appropriate plants and optimized irrigation style, two sites were selected in Agric College and one site for Education college taking soil samples four depths 0 -30 ,30 - 60 , 60 – 90, and 90-120 cm, and conducted physical and chemical analyzes ,Table 1.

Table1.physical & chemical properties of site soil

Site &Depth cm	E.C ds.m m^{-1}	PH	Texture	CaCo$_{3\%}$	O.M gm\kg	N.available %	P.available ppm	K.available ppm
Agric site 1 0-30	22.60	8.1	SCL	45.0	5.59	0.26	22.3	5
30-60	10.20	8.0	CL	35.0	5.03	0.28	16.2	4
60-90	4.70	8.1	CL	42.5	2.58	0.37	14.1	1

90-120	4.20	8.1	L	35.0	2.88	0.35	12.5	6
Site 2 0-30	6.90	8.0	CL	35.0	6.69	0.26	1.4	8
30-60	7.33	8.3	SL	32.5	4.57	0.29	12.4	9
60-90	5.00	8.5	SL	37.5	0.63	0.37	12.6	8
90-120	4.00	8.1	SL	30.0	3.47	0.31	14.2	8
Educate site 1 0-30	6.70	7.9	SL	34.0	16.32	0.29	13.7	6
30-60	5.50	7.9		35.0	3.73	0.24	14.8	3
60-90	5.90	8.0	SL	30.0	7.89	0.40	19.4	4
90-120	5.50	8.2	L	32.0	3.01	0.28	1.5	7

seen from table, that salinity ratio of tow sites are high, sample 1 depth 1 was the highest , reached 22.60ds.mm^{-1} and the lowest rate in the sample 2 depth 4 for Agric site, The reason may be due to water quality used for irrigation and the level of salinity, as well as the difference in the soil texture, high ground water level and lack of drain, either soil PH was alkaline for all samples ranged ratio between 7.9 – 8.5, the normal ratio within the range of Iraqi soil PH 7.2 – 8.9, soil texture has been shown that loamy the best of sample 1depth 4 for two sites while texture ranged between clay loam and silt loam, in fact the reason may be due to transferred soil from different locations. calcium carbonate proportions in soil samples was within the range of lime in the Iraqi soils as ratio ranged between 30-45%, with regard to organic matter was little ratio in samples of various depths ,reached highest rate (16.32 Gm.kgm) in Education Coll at depth (0-30 cm) . ready-nitrogen ratio was low in samples ranged as 0.26-0.40 %, The rate of phosphorus has reached 22.3 ppm of the sample 1 depth 1 ,while it decreased in sample 2 as a ranged between 1.4- 14.2 ppm, These ratios are within the recommended range 16 – 20 ppm, while in other soil samples were phosphorus ratio (16.2 - 19.4 PPM). Either potassium was low rate in the samples ranged as1-9 ppm.

College gardens are irrigated by several sources, the first of tap water and the second artesian wells and water Euphrates river, despite multiplicity of irrigation sources, but it does not clog the soil and water need, way of irrigation used is flooding. Table2. shows the salinity level of water sources used in gardens irrigate, through the site survey shows lack of drain.

Table 2. Water salinity

College	Source of water	E.C.ds.mm^{-1}
Agric	Pipe water	1.066
	Artesian water	2.35
	Euphrates river	1.13
Educ	Pipe water	1.066
	Artesian water	2.35

Salinity of water measured at laboratories Department of Soil Science and Water Resources College of Agriculture - Anbar University

2.3 Area criteria for site study:
Through personal interviews and statements adopted in Guidebook of Agric & Educ College 2011-2012 were obtained data shown Table 3 and then calculated the land use areas, buildings, exterior spaces APP1. , and select the criteria at each site per person Table 4, which shows not following the green space standards in colleges, as amounted reached 18.07 (gardens and date palm groves), while Educ college 23.78% ,it should not be less than 40% of the total area, while the share per person of green space reached 25.97 m^2 person,6.74 m^2 person respectively, it should not be less than 28 m^2 person according to unesco ,area occupied by the buildings of the College of Agriculture reached 8.51%, 22.82% respectively, it is very little compared to the global standard 20-30%, the table also shows area per person of sports fields as it reached 0.68m^2 0.97 m^2 person, this percentage is very low compared to global universities 141m^2 person ,28.36York University ,121m^2 person Cambridge University, and 95m^2 person Oxford University , this space decrease by increasing the number of students, either total area for each person was 114.69 m^2,28.36 m^2 which is within the recommended limits for university sites in the modern Arab states 120-140m^2 per person, but less than global standard area 160 m^2 per person(unesco,2003).

Table 3. Total area of site & number of users

College	Total Area m^2	Number of Users			
		Teachers	Employees	students	Total
AGRIC	232500	167	57	1394	1618
EDUCA	30100	125	61	875	1061

Table 4. Site uses & Area \ person.m^2

College	Uses	Total Area m^2	%Area occupied	Area \ person.m^2
Agric	Building	19807	8.51	12.24
	Green spaces	15925	6.84	9.84
	Date Palm Groves	261125	11.23	16.13
	Sport Field	1100	0.47	0.68
	Farms	5713.5	2.45	-
	(Parking employees)	2250	0.96	110.04
	(Parking students)	1960	0.84	1.40
	Circulation	6444	2.77	-
	Open spaces	153188	65.88	94.67
	Total	232500	34.11	143.69
Education	Building	6896	6.47	22.82
	Green spaces	6.74	23.78	7160
	Sport Field	0.97	3.42	1032
	(Parking employees)	9.31	5.75	1732
	Circulation	7.78	2342.5	-
	Open spaces	10.33	36.42	10964.5
	Total	**28.36**	**63.75**	**30100**

2.4 Questionnaire (Delphi method):

Delphi method one of the Modern Techniques of the questionnaire as it is one of the best ways to get information from a group of experts are chosen on the basis most important of which: experience in the design of the exterior spaces and reputability, impartiality and objectivity while avoiding confrontation experts personally in order to preserve the validity of decision making .aim of the adoption of Delphi method for the purpose of determining the most appropriate design in future(Aldulaimy &Musa,2009).

2.4.1 Stages of the questionnaire:

First, choose one site of the exterior spaces from each college of the total site area was selected No. 1,5 being the main area and a gathering place for students from different departments of the college as well as the establishment of the university events.   Second, select a sample of experts, five experts was selected to participate in a questionnaire to determine the proposed design best suited for area No 1, 5 of the design proposals made by the researcher. Third: Delphi method questionnaire: It includes two stages:

- Inductive Questionnaire phase: This phase is based on personal interviews with experts and directing questions oral manner and collect answers and ideas about exterior space design that can meet the users of these gardens requirements of functional, environmental, aesthetic, social and reached down to put three proposed designs by the researcher of the site.

- Restricted questionnaire stage (weighting questionnaire): This questionnaire based on the analysis of the survey results inductive as determines by graduated scale to determine the relative weight of (weak, medium, good, very good, excellent), preferably numbering variables in the questionnaire to facilitate input of information's, and ultimately assess the answers of experts and collect their answers to get suitable proposed design. this stage, depend some of principles and elements of design to answer them by experts after brief them on 2and 3dimensional schemes with reality scheme for selected garden, To clarify better experts provide some pictures and videos from the study site , placed three proposed designs for the garden identified in restricted questionnaire to answer by choosing one weights (weak, medium, good, very good, excellent) and each weighted weight of a number of points and ten principles of design for adoption upon a comparison between the proposed designs, APP2.

Fourth: analysis of the questionnaire: unloaded questionnaire information manually using a matrix achieving goals table (Hachim&Ahmed, 2010) .aim of table to evaluate efficiency of proposed designs for garden selected to get out the best suited proposal, has been to find the total and average points each principles for three design proposals to extract percentage of each proposal using Microsoft Excel 2007 according to following equation:-

$$Percentage\ a\ proposed\ design = \frac{tatal\ points\ of\ propos\ ed\ design}{total\ point\ of\ three\ design\ proposals} \times 100$$

III. Results and Discussion

confirmed laboratory analysis on the disparities in the percentage of organic matter and the elements nitrogen, phosphorus, potassium between the selected sites, as well as the high rate of soil salinity, which is one of the main problems that limit the cultivation of a large number of plants, as physical analysis showed A that soils both sites heavy ranged between the clay loam and silty loam , This texture is one of the reasons that lead to the death of plants as a result of high cohesion and not allowing penetration of plant roots deep in the soil as well as high ability to retain water and hence be a cause water logging and death of plants cultivated in them table 1. A rising proportion of irrigation water salinity influenced the deterioration of the gardens for both sites table 2.

The declining or weakness the natural environment of the gardens in the colleges might come from administrative neglect and poor organization as well as poor planning and is influential factor in the preservation of the environment and maintenance.

Disregard global area of the site criteria for both colleges Totaled gardens and green space ratio (23.78%) In the College of Education, Either in the College of Agriculture has reached (18.07%) The per capita green space in the College of Education, average Totaled (6.74m2 \ person) and (25.9774m2 \ person) in agriculture college , the total area allocated to each person was (28.36 m2 \ person) in education college and (143.69 m2 \ person)in agriculture college table 4 .

Table 5. shows the total number of points obtained by each principle of design proposals after presented to the experts, first design proposal got each basics of design simplicity, unity, balance, and harmony on 34 points, respectively, by the experts, followed by basics, proportion, diversity, gradient, variation and contrast got 30,28,28,26,26 points, respectively, while the total points was 306 for the proposal. A second design proposal got each of the diversity and balance on the 32 points, and simplicity, proportion, gradient, variation and harmony on 30 points, whereas unity and rhythm got 28 points, while the total points was 296. Balance got 34 points in the third proposal of design followed by unity 32 points while simplicity, diversity and gradient got 30 points, harmony got 28 and contrast 24 point, rhythm and proportion got 26 points, while the total points was 292. After applying equation above we reached results shown table 6, which explains superiority of first proposed design on the other by 34.2, 33.11, and 32.66% respectively.

Table 5. Weights (Experts answers)

Agric Propo sal	Expert	Simplicity	Unity	Diversity	Balance	Proportion	Rhythm	Gradient	Variation	Harmony	Contrast	Total point
First	1	8	8	8	6	8	8	6	8	8	6	74
	2	6	4	4	4	4	4	6	4	4	4	44
	3	6	6	4	6	8	6	4	4	6	4	50
	4	8	8	8	10	8	8	8	6	8	8	80
	5	6	8	4	8	6	6	4	4	8	4	58
	total	34	34	28	34	30	32	28	26	34	26	306
Second	1	6	4	6	6	6	4	4	4	6	4	50
	2	6	6	6	6	4	4	6	6	6	4	54
	3	4	6	6	6	4	6	6	6	6	6	56
	4	8	8	8	8	10	8	8	8	8	6	80
	5	6	4	6	6	6	6	6	4	6	6	56
	Total	30	28	32	32	30	28	30	30	30	26	296
Third	1	4	4	6	6	4	4	4	6	4	4	46
	2	6	6	4	4	4	4	6	6	6	4	50
	3	6	6	6	6	4	4	4	6	4	4	50
	4	8	8	8	10	8	6	8	8	8	8	80
	5	6	8	6	8	6	8	8	6	6	4	66
	total	30	32	30	34	26	26	30	32	28	24	292
Educate Propo sal	Expert	Simplicity	Unity	Diversity	Balance	Proportion	Rhythm	Gradient	Variation	Harmony	Contrast	Total point
First	1	4	4	6	6	4	4	4	6	4	4	46

	2	6	6	4	4	4	4	6	6	6	6	50
	3	6	6	6	6	4	4	4	6	4	4	50
	4	8	8	8	10	8	6	8	8	8	8	80
	5	6	8	6	8	6	8	8	6	6	6	66
	total	30	32	30	34	26	26	30	32	28	28	292
Second	1	4	8	8	8	6	4	6	8	6	6	64
	2	6	6	4	6	4	4	6	6	4	4	50
	3	4	4	4	4	4	4	4	4	4	4	40
	4	8	10	6	10	8	8	8	8	8	8	80
	5	6	8	8	8	6	8	8	8	6	4	68
	Total	**28**	**36**	**30**	**36**	**28**	**28**	**32**	**34**	**28**	**26**	**302**
Third	1	4	4	6	4	4	4	6	6	4	4	46
	2	4	6	6	4	6	4	6	6	4	4	50
	3	4	4	4	6	4	4	4	4	4	4	42
	4	8	10	8	8	8	8	8	6	8	8	80
	5	6	8	8	8	8	8	6	6	8	6	72
	total	**26**	**32**	**32**	**30**	**30**	**28**	**30**	**28**	**28**	**26**	**290**

Table 6. Assess the efficiency of the proposed designs - Matrix achieve goals

College	Proposal	Average Points of Principles										Total	%
		Simplicity	Unity	Diversity	Balance	Proportion	Rhythm	Gradient	Variation	Harmony	Contrast		
Agric	1	6.8	6.8	5.6	6.8	6.0	6.4	5.6	5.2	6.8	5.2	61.2	34.22
	2	6.0	5.6	6.4	6.4	6.0	5.6	6.0	6.0	6.0	5.2	58.2	33.11
	3	6.0	6.4	6.0	6.8	5.2	5.2	6.0	6.4	5.6	5.2	59.4	32.66
Educate	1	6.8	6.4	6.0	6.0	6.0	5.6	5.6	6.0	6.8	5.2	60.4	33.78
	2	5.6	7.2	6.0	6.4	5.6	5.6	6.4	6.8	5.6	5.2	60.4	33.78
	3	5.2	6.4	6.4	6.0	6.0	5.6	6.0	5.6	5.6	5.2	58.0	32.43

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