

## A CASE STUDY FOR THE DEVELOPMENT OF SCHOOL GARDENS IN DAKAHLIA GOVERNORATE

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**ABSTRACT:** This landscaping study for school gardens in Mansoura City was carried out in the period from 2017-2018. This study was carried out to develop the school gardens in DK Governorate. Eight school gardens located in Mansoura City and Talkha District were under investigation during 2017/2018. The study revealed that most of these school gardens have toxic plants like weed and cactus. Measurements for development of these school gardens were suggested to arrive to an ideal design of the school gardens that can be applied in practice. The obtained data showed that the utilized area of the school gardens are not correctly used and maintenance of the gardens is poor. Roof gardens for these school buildings are suggested to increase garden area for students. Also, it is recommended to improve the use of irrigation systems with the help of experts. Recycling of the residues are necessary for clean environment and designing of traffic gardens for learning traffic roles which is of a great importance.

**Key words:** Mansoura city, school gardens, design, toxic plants, green areas, students, plants and trees.

### INTRODUCTION

The school gardens are of great importance for education and the development of generations of young students and to leave the opportunity to taste beauty and get used to respect flowers and nature, and these gardens are a guiding stage, especially for the centre surrounding the garden and as an extension of kindergartens and sport gardens and young people.

The school garden helps to create a generation that believes in Agricultural work and get used to cooperative work by creating collective and individual practices while working in the school's garden and unifying their efforts as present and future individuals in the community, serving the public interest, love of work and a sense of responsibility towards the nation, (Natalie *et al.*, 2016).

Since the school garden is very diverse, it is the basis for creating agricultural

awareness among students. There are a lot of agricultural work which can be done within the school garden, such as the cultivation of ornamental plants in all its branches and full knowledge of the quality of plants and their different varieties such as the name of the plant and the family to which it belongs and the quality of soil and irrigation in addition to studying the design of gardens and its benefits for human comfort. Most of the daily deals with the children are supported by the surface believes about childhood, and this affects our behaviour towards them and their attitudes. The child cannot grow and develop as an independent personality unless we maintain the factors of development, (Thomas and Wolsey, 2014).

As such children playing is not a waste of time but a part of his growth and development. Recreation is most important for all people and becomes essential for children. Their knowledge are gained

through experience while playing and interaction with environment. Thus, playing, recreation and space design of the children garden has direct effects on the development of their personality, (Fjortoft and Sageie 2000). Many studies emphasized that playing is the introduction to the world of the childhood and educational method for the formation of his personality. Experts of psychology also agree on the importance of the early 4-5 years of the life of the child in making his personality and intelligence, thus he gains 50 % of his intelligence up to the age of 4 and 30% more between the 4-8 years according to the message of, (UNESCO, 1978).

Plants in the children garden provide protection against climatic factors such as winds, noise, dust and direct hot sun. Plant material determines the visual character of the site more than any other factor in the site. The colour and texture exhibited by plants are instrumental in determining sense of place, (Motloch, 1990). Choosing the plants for children garden must receive deep attention. Plants in this respect might be main categories; trees, shrubs, lawns and herbaceous plants. Also the design has to avoid selecting any harmful or poisonous plants.

The provision of play equipment is generally concerned with children garden. Play equipment which might be found in a public park include; swings, slides, climbing frames, sand pits, rocking horses or balances. Playground and play equipment should be regularly visited, inspected and maintained.

El-Keey (1986) mentioned that UN statistics recorded that each person in the UK having 24 m<sup>2</sup> of green areas, against 20 m<sup>2</sup> in Russia, 18 m<sup>2</sup> in the USA while in Egypt it is 2 cm<sup>2</sup>.

Considering the above mentioned factors, an extensive study on Mansoura City was made to show the school gardens devoted for children. The survey included the City in general and the school garden in particular. The study will reveal information

about the sufficiency of playgrounds in the school garden, their distribution, equipment and plants found in these gardens. Thus, the present study is dealing with school gardens in Mansoura City from many aspects; location, area, design, problems and suggestions will be presented for improving or developing these gardens for better use of the children's playground, (Nohl, 1989).

## MATERIALS AND METHODS

This research was conducted in the period 2017/2018 to study some of the school gardens located in Mansoura City. In order to obtain a model vision for designing a school garden that can be applied in practice.

This study included (8) experimental school gardens located in Mansoura City, 5 are located in Mansoura City, and 3 in Talkha District. The studied school gardens were the following:

1. Mansoura Language School
2. Fakhr Language School
3. Al-Firdous Language School
4. French Language School
5. Nasser Language School
6. Talkha (1) Language School
7. Talkha (2) Language School
8. Hisham Barakat Language School

A questioner was designed for these school gardens to have data about school garden name, number of students, location, design type, number of playing areas, building area, playground area (length/width), equipment, existing plants: trees, shrubs, climbers, annuals, palm trees, cacti, succulents, weeds, poisonous plants, type of green areas (natural/artificial), sand pools, walks, walkways, construction buildings: pergolas, fountains, kiosks, seats, play tools, swings, slides, balance, play tools maintenance and security in play tools.

As in all landscape projects we must make a location analysis, according to (Sharaf-El-Den, 1979):

1. The total green areas in the schools.
2. The rates of green areas in the schools:
  - a. The factors that are taken into account when assessing and calculating green spaces.
  - b. The green areas for each student.
  - c. International Norms for Urban Green Spaces – International minimum standard.
3. Distribution of green areas in the schools.
4. Types of green areas and plants in the schools.
5. Maintenance of green areas and types of playing (equipment) in the schools.
6. The total area of schools roof.

Number of students in the Pre-primary and primary school was taken from Mansoura Statistics Center.

The area of school buildings was taken from Mansoura Educational Buildings Authority. The survey was made in 8 schools of Mansoura City by using Mansoura City satellite map 2017/2018 as following:

- Google Earth PRO. 7.0.2.8542 was used in measuring width and length of building and green areas in each school.
- Google Maps/Google Earth Application was used to determine Global Positioning System (GPS) location for schools.

- Real time Landscaping Architect PRO. 2016 by Idea Spectrum) was used to get the total area of schools roof and green areas.
- AutoCAD 2017 – English PRO. was used to get the proposed design for a typical school garden.

## RESULTS AND DISCUSSION

The aim of this work is to study the problems such as the small area and poisonous plants in Mansoura school gardens and try to solve it in order to cope with the international standards. Also, the study aimed to know the problems facing these gardens and constrains Suggestions to develop and improve the available gardens will be made to fulfill the requirements of school gardens in Mansoura City, (Mullins, 1995).

Data in Table (1) showed the school location in Mansoura City and Talkha District.

Table (2) showed the areas and ground types of the studied school gardens in Mansoura City and Talkha District. There is a great variation in the area of each garden, the largest is the Mansoura Language School garden (2076 m<sup>2</sup>) followed by Talkha (1) Language School (1939.70 m<sup>2</sup>) and Talkha (2) Language School garden (1114.90 m<sup>2</sup>), respectively. Some of the examined garden are very small like Nasser Language School (48.60 m<sup>2</sup>) and Fakhr Language School (322.60 m<sup>2</sup>) garden.

**Table 1. GPS location of the studied school gardens.**

School Name	Location (GPS)
1. Mansoura Language School	31°03'19.0"N 31°24'01.2"E
2. Fakhr Language School	31°02'29.3"N 31°23'15.8"E
3. Al-Firdous Language School	31°01'33.4"N 31°22'20.0"E
4. French Language School	31°01'33.1"N 31°23'45.3"E
5. Nasser Language School	31°02'27.6"N 31°22'06.8"E
6. Talkha (1) Language School	31°03'31.5"N 31°23'34.8"E
7. Talkha (2) Language School	31°03'32.0"N 31°23'29.1"E
8. Hisham Barakat Language School	31°03'31.1"N 31°23'29.2"E

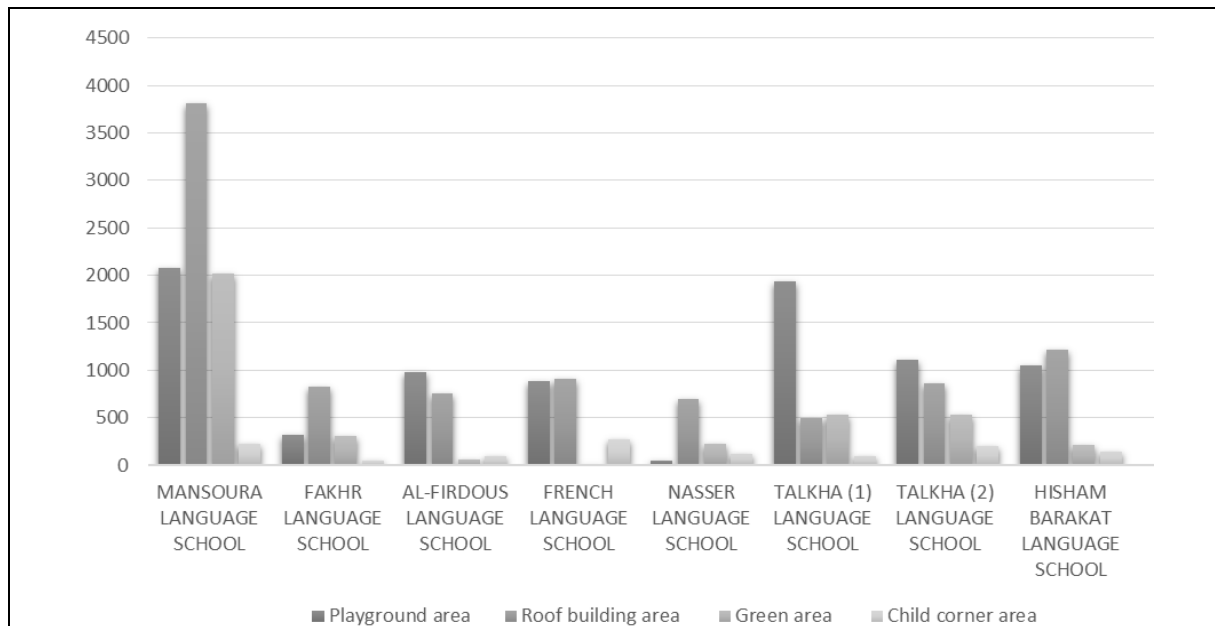
\* Global Positioning System (GPS) Source from Google Earth/Google

**Table 2. Areas and ground types of the studied school gardens.**

Schools	Ground and Walks	Playground area (m <sup>2</sup> )	Roof building area (m <sup>2</sup> )	Green area (m <sup>2</sup> )	Child corner area (m <sup>2</sup> )
<b>Mansoura City</b>					
1. Mansoura Language School	Concrete & bricks	2076	3817.10	2024.20	225
2. Fakhr Language School	Interlock, bricks & rubber	322.60	830.40	304.30	50
3. Al-Firdous Language School	Artificial grass, Marble, bricks lawn & rubber	986.40	758.30	64	99
4. French Language School	Bricks	884.50	909.60	0	277.10
5. Nasser Language School	Sand & lawn	48.60	700.10	225.40	123
<b>Total Mansoura City area</b>		<b>4318.1</b>	<b>7015.5</b>	<b>2617.9</b>	<b>774.1</b>
<b>Talkha District</b>					
6. Talkha (1) Language School	Artificial grass, interlock, lawn & rubber	1939.70	502	530	90
7. Talkha (2) Language School	Sand, bricks & artificial grass	1114.90	862.40	533.80	200
8. Hisham Barakat Language School	Sand, lawn & rubber	1056.9	1221.90	211.40	144
<b>Total Talkha District area</b>		<b>4111.5</b>	<b>2586.3</b>	<b>1275.2</b>	<b>434</b>
<b>Total area</b>		<b>9550.4</b>	<b>9601.8</b>	<b>3893.1</b>	<b>1208.1</b>

The green area is the largest in Mansoura Language School followed by Fakhr Language School and Nasser Language School, while the French Language School has no green area. In Talkha District, Talkha Language School (2) has the largest green

area followed by Talkha Language School (1) and Hisham Barakat Language School, respectively. The obtained data are also explained in the Fig. (1).



**Fig. 1. Playground area (m<sup>2</sup>), roof building area (m<sup>2</sup>), green area (m<sup>2</sup>) and child corner area (m<sup>2</sup>).**

Data presented in Table (3) showed that Mansoura Language School has the largest number of plants such as, palms, trees, shrubs, fences. However, it has the smallest lawn area compared with the other school gardens under the study. Area of lawns is the largest in Talkha (2) Language School also Mansoura Language School has the largest number of poisonous plants which are harmful for students. Types of harmful plants are mentioned in Table (4). As mentioned in the book of (Muenscher, 1951).

In his book, (Muenscher, 1951) indicated some poisonous plants that must be avoided in school gardens and gave symptoms of injury as indicated in Table (5).

Data presented in Table (6) showed that the types of playing (equipment) in the school gardens, Talkha (1) Language School has the largest number of equipment followed by Mansoura Language School, approximately there is no Play tools equipment found in Nasser Language School and French Language School.

Data presented in Table (7) showed that there is a fountain of using hardscape in the studied school gardens in Fakher Language School and has the largest number of seats in comparison to other schools under the study.

The studied school gardens face many problem, as their area is very small. They also are far from the international standards. Therefore, the main objective of this study was to know the facts about the school gardens, its landscape or design area and sufficiency, (Yehia, 1998).

It is clear from Fig. (2) that French Language School has the largest corner areas (m<sup>2</sup>) for each child in the Pre-primary school, followed by Talkha (2) Language School and Hisham Barakat Language School, respectively, while, Fakher Language School and Mansoura Language School have the smallest corner areas (m<sup>2</sup>) for each child.

It is clear from Fig. (3) that Talkha (1) Language School has the largest playground areas (m<sup>2</sup>) for each child in the primary school, followed by Al-Firdous Language School, respectively. However, Nasser Language School, Fakhr Language School and Mansoura Language School have the smallest playground areas (m<sup>2</sup>) for each child. Hisham Barakat Language School hasn't any student in this year in the primary stage.

**Table 3. Number and space areas of plants in the school gardens.**

School Name /Soft scape	Palms (number)	Trees (number)	Shrubs (number)	Fences (m)	Climbers (m)	Flower Beds (m <sup>2</sup> )	Cacti & Succulents (number)	Lawns (m <sup>2</sup> )	Weeds (number)	Poisonous plants (number)
1. Mansoura Language School	16	31	26	15	6	12	18	216	8	10
2. Fakhr Language School	3	37	2	12	5	2	-	-	6	4
3. Al-Firdous Language School	3	39	7	70	4	-	-	-	2	4
4. French Language School	-	-	14	-	-	1	4	-	-	-
5. Nasser Language School	1	8	24	31	2	2	-	295	11	3
6. Talkha (1) Language School	4	34	-	142	-	-	1	400	2	5
7. Talkha (2) Language School	-	7	7	122	-	-	-	634	4	4
8. Hisham Barakat Language School	1	21	-	-	1	-	-	414	7	3
<b>Total</b>	<b>28</b>	<b>177</b>	<b>80</b>	<b>392</b>	<b>18</b>	<b>17</b>	<b>23</b>	<b>1959</b>	<b>40</b>	<b>33</b>

**Table 4. Type of harmful plants in the school gardens.**

School name /Soft scape	Cacti & succulents	Weeds	Poisonous plants
<b>1. Mansoura Language School</b>	<i>Agave americana</i> – <i>Echinocactus grusonii</i> – <i>Euphorbia trigona</i>	<i>Bidens pilosa</i> – <i>Convolvulus arvensis</i> – <i>Alhagi maurorum</i> – <i>Portulaca oleracea</i> – <i>Anagallis arvensis</i> – <i>Urens urtica</i> – <i>Cyperus rotundus</i> – <i>Arundo donax</i>	<i>Euphorbia pulcherrima</i> – <i>Datura stamonium</i> – <i>Deolnix rigia</i> - <i>Lantana camara</i> – <i>Nerium oleander</i>
<b>2. Fakhr Language School</b>	-	<i>Urens urtica</i> – <i>Polypogon monspeliensis</i> - <i>Alhagi maurorum</i> – <i>Bidens pilosa</i> <i>Conyza dioscoridis</i> – <i>Convolvulus arvensis</i>	<i>Datura stamonium</i> – <i>Lantana camara</i> – <i>Nerium oleander</i>
<b>3. Al-Firdous Language School</b>	-	<i>Chenopodium album</i> – <i>Arundo donax</i>	<i>Euphorbia pulcherrima</i> – <i>Deolnix rigia</i> - <i>Lantana camara</i> – <i>Nerium oleander</i>
<b>4. French Language School</b>	<i>Echinocactus grusonii</i> – <i>Euphorbia trigona</i>	-	-
<b>5. Nasser Language School</b>	-	<i>Chenopodium album</i> – <i>Bidens pilosa</i> – <i>Conyza dioscoridis</i> – <i>Convolvulus arvensis</i> – <i>Alhagi maurorum</i> – <i>Portulaca oleracea</i> – <i>Anagallis arvensis</i> – <i>Urens urtica</i> – <i>Cyperus rotundus</i> – <i>Arundo donax</i> – <i>Polypogon monspeliensis</i>	<i>Euphorbia pulcherrima</i> – <i>Lantana camara</i> – <i>Nerium oleander</i>
<b>6. Talkha (1) Language School</b>	<i>Echinocactus grusonii</i>	<i>Convolvulus arvensis</i> – <i>Anagallis arvensis</i>	<i>Euphorbia pulcherrima</i> – <i>Datura stamonium</i> – <i>Deolnix rigia</i> - <i>Lantana camara</i> – <i>Nerium oleander</i>
<b>7. Talkha (2) Language School</b>	-	<i>Conyza dioscoridis</i> – <i>Portulaca oleracea</i> – <i>Cyperus rotundus</i> – <i>Arundo donax</i> –	<i>Euphorbia pulcherrima</i> – <i>Deolnix rigia</i> - <i>Lantana camara</i> – <i>Nerium oleander</i>
<b>8. Hisham Barakat Language School</b>	-	<i>Bidens pilosa</i> – <i>Convolvulus arvensis</i> – <i>Anagallis arvensis</i> – <i>Urens urtica</i> – <i>Cyperus rotundus</i> – <i>Arundo donax</i> – <i>Polypogon monspeliensis</i>	<i>Euphorbia pulcherrima</i> – <i>Deolnix rigia</i> - <i>Lantana camara</i>

**Table 5. Poisonous plants in the school gardens and symptom of injury.**

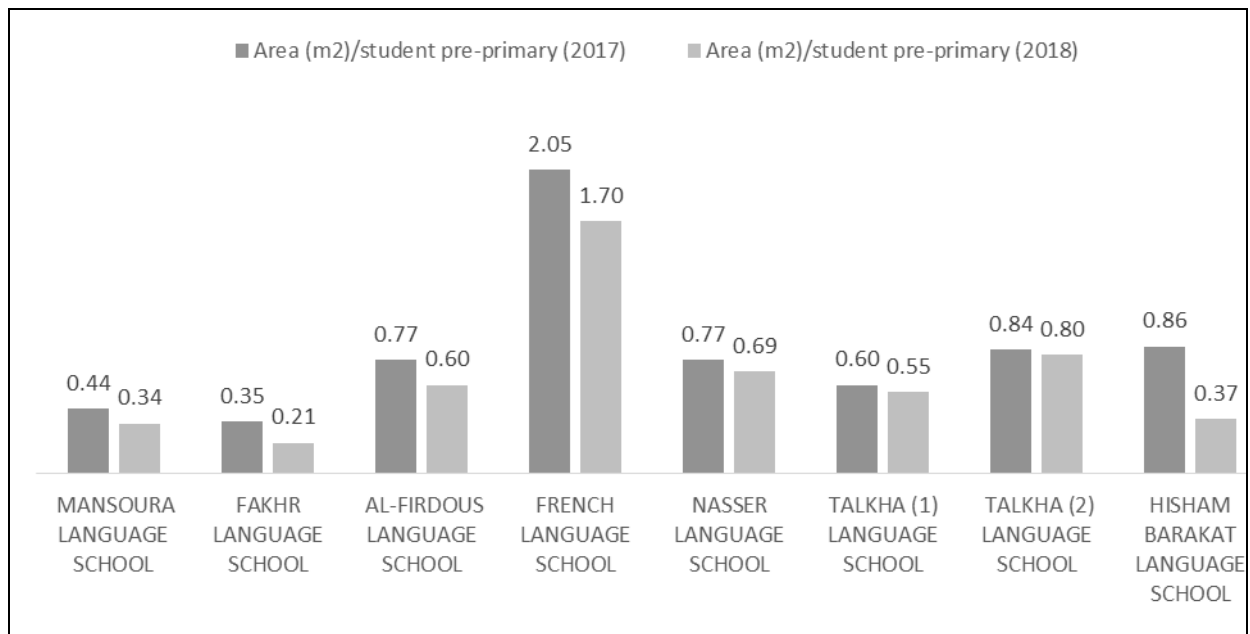
Plant	Symptoms	Poisonous part
1. <i>Ailanthus altissima</i>	Dizziness – Nausea	Flower – leaves
2. <i>Aralia spinosa</i>	Nausea – Colic – Vomiting	Bark
3. <i>Anemone sp</i>	Diarrhea – Vomiting – Death	Flower – Bulbs
4. <i>Asparagus officinalis</i>	Dermatitis in skin	Young stem
5. <i>Catalpa speciosa</i>	Dermatitis in skin	Flowers
6. <i>Datura stramonium</i>	Dizziness – Unconsciousness	Flowers- leaves
7. <i>Delphinium sp</i>	Decreased pleasure – irregular heart action	Leaves – Seed
8. <i>Delonix regia</i>	Dermatitis – Colic – Nausea	Fruits
9. <i>Dieffenbachia sp.</i>	Respiratory paralysis – Death	Flowers-Leaves
10. <i>Euphorbia pulcherrima</i>	Dermatitis eyes and skin	Milky juice
11. <i>Ginkgo biloba</i>	Dermatitis in skin	Fruits
12. <i>Lonicera sp.</i>	Death – Irregular heart action	Flowers-Leaves
13. <i>Lantana camara</i>	Irregular heart action – Death	Flowers– Fruits
14. <i>Ligustrum sp.</i>	Vomiting – Dizziness	Leaves
15. <i>Lobelia inflata</i>	Dermatitis in skin	Flowers-Leaves
16. <i>Nerium oleander</i>	Dermatitis in eyes-Irregular heart action-Death	Flowers-Leaves
17. <i>Narcissus sp.</i>	Vomiting-Diarrhea-Death	Flowers – Bulbs
18. <i>Polygonium sp.</i>	Dermatitis in skin	Leaves
19. <i>Primula sp.</i>	Dizziness-Respiratory paralysis	Flowers-Leaves
20. <i>Rhododendron sp.</i>	Vomiting-Dizziness	Flowers-Leaves

**Table 6. Types of playing (equipment) in the school gardens.**

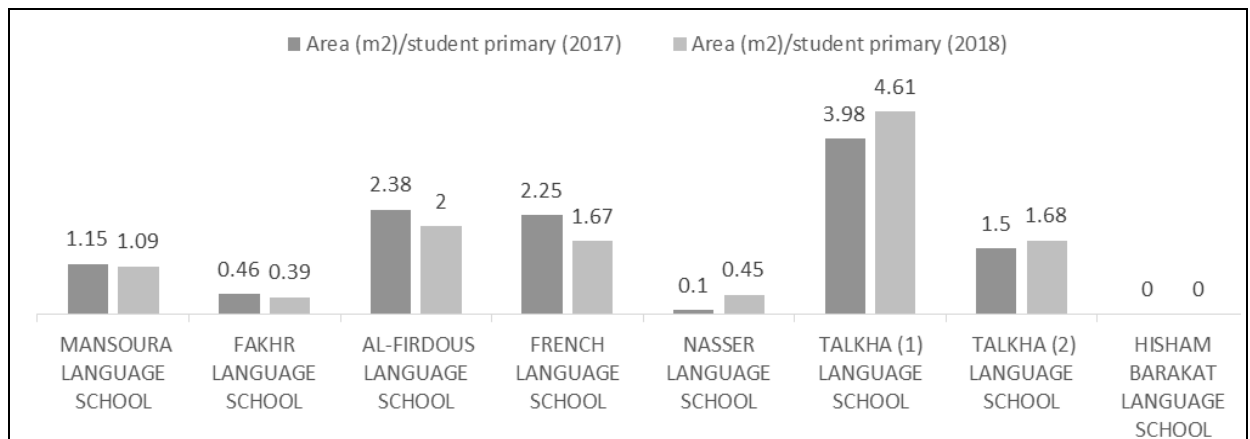
School Name / Play tools	Swings	Slides	Balance	Towers	Others
1. Mansoura Language School	6	4	-	-	-
2. Fakhr Language School	3	2	1	-	1
3. Al-Firdous Language School	1	2	2	-	-
4. French Language School	1	1	1	-	-
5. Nasser Language School	-	-	-	-	-
6. Talkha (1) Language School	10	3	2	1	-
7. Talkha (2) Language School	1	2	-	1	1
8. Hisham Barakat Language School	-	2	1	1	1

**Table 7. Types of hardscape in school gardens.**

School Name /Hardscape	Pergolas	Fountains	Kiosk	Seats	Walks	Others
1. Mansoura Language School	-	-	1	-	-	-
2. Fakhr Language School	-	1	1	13	1	-
3. Al-Firdous Language School	-	-	-	-	-	-
4. French Language School	-	-	-	10	-	-
5. Nasser Language School	-	-	-	-	-	-
6. Talkha (1) Language School	-	-	-	6	-	-
7. Talkha (2) Language School	-	-	-	-	-	-
8. Hisham Barakat Language School	-	-	-	-	-	-



**Fig. 2. Child's corner areas (m<sup>2</sup>) for student numbers in the pre-primary school.**



**Fig. 3. Playground areas (m<sup>2</sup>) for student numbers in the primary school. (Educational Buildings Authority - Statistics Center).**



When discussing the results of this landscaping study about school gardens in Mansoura City and Talkha District, it is obvious that most surveyed gardens are characterized by informal style. In fact design is not according to the needs of students. The Talkha (1) Language School, Al-Firdous Language School and Talkha (2) Language School garden can fall under this type of gardens. Although these gardens can be classified as the best playgrounds established to meet the requirements of the students, but they also suffer from poisonous plants and air pollution. Also some plants are dangerous for children specially cacti and *Agave americana*, *Echinocactus grusonii*, *Euphorbia trigona*, *Chenopodium album*, *Bidens pilosa*, *Conyza dioscoridis*, *Convolvulus arvensis*, *Alhagi maurorum*, *Portulaca oleracea*, *Anagallis arvensis*, *Urens urtica*, *Cyperus rotundus*, *Arundo donax*, *Polypogon monspeliensis*, *Euphorbia pulcherrima*, *Datura stamonium*, *Lantana camara* and *Nerium oleander*. Such plants should be avoided in the garden for student's safety, (Muenscher, 1951).

The design of Talkha (2) Language School garden can serve the needs of the students. Plants especially trees are acted to fulfill the purpose of protection from sun and wind and add to the beauty of the garden. This garden too can be classified as one of the best available children gardens in Mansoura City and Talkha District.

The National Environmental Education and Training Foundation (2000) stated that the environment, "from classroom to schoolyard to local nature centers and parks", enables learning that is problem-based and interdisciplinary, with a significant positive impact on achievement.

School gardens in Mansoura City and Talkha District face many problems, as their area is very small. They also are far from the international standards. Therefore, the main objective of this study was to know the facts about the school gardens, its landscape or design area and sufficiency. Also the study aimed to know the problems facing these

gardens and constrains Suggestions to develop and improve the available gardens will be made to fulfill the requirements of the students. The main features of children gardens include; 1- Isolation of the garden from the outside by plant fences, Concrete borders are not suitable. 2- Planting deciduous trees for more sunshine in winter, bushes are put in the corners; *Euphorbia* spp should not be plated as it makes eye inflections and some succulents are harmful, 3- More lawns. 4- Entrance of the garden at the same level of street for easy movements of the children cars. 5- Distribution of seats and making pergolas, umbrellas, seats must be well fixed and made form stone or marble, better if shaded with some climbers. 6- Play area includes sandpits and swings, slider. 7- Fountain surrounded with seats for the parents, and 9- Drinking water and WC are essential. They also added that a child needs 75 feets of playground, (Salama and Yosry, 1962). In reviewing the results of many research workers, the required designs for school gardens and the principle requirements are not completely fulfilled in many of the examined gardens.

Due to the importance of student playgrounds in the crowded City of Mansoura or Talkha District, the need in the less developed sectors and close housing blocks is essential. In such area a good number of playgrounds is required to meet the needs of the student activities and movement which directly affect their physical health and mental development, (Bini, 1982); (Weinstein and David, 1987).

In general it may be difficult to increase the area of the present school gardens due to many reasons, but improvement of the gardens is possible to make maximum use and advantage of these gardens. This may be achieved by the suggested plans against the actual ones, (Mahdy, 1983).

## CONCLUSION

The study confirms the inadequacy of existing playgrounds and the potential for designing much more child-responsive

improvements for the future. On the long run, it is possible to increase the area of gardens by good utilization of the space areas like roof buildings. The expertise of local master gardeners to come up with a list of recommended plants for the school garden. These should include specific disease-resistant varieties that are easy to grow in school. Make sure that any plants on the recommended list comply with school's policy. Plants with poisonous parts or large thorns should be avoided. Students should share responsibility for tending plants, they will need the support of staff and community members to keep the garden healthy. Creating a schedule for garden maintenance and watering. Identifying resources for continued funding and future garden expansion. Coordinating volunteers to help in the garden.

It is clear from Fig. (4) that proposed area can be used for 114 students. The playground in children garden should have 15-20 m<sup>2</sup> /child for reaction with his environment through, recreation, running and using his power. (Hoda, 1993).

## REFERENCES

- Bini, V. (1982). A playground that goes through the stages of mankind's development. *Impianti*, 3: 28-31.
- El-Keey, T. (1986). *Landscape Gardening*. 3<sup>rd</sup>, d. Knowledge Association, Alex. p. 5. (Arabic).
- Fjortoft, I. and Sageie, J. (2000). The natural environment as a playground for children. *Landscape description and analyses of a natural playscape*. *Landscape and Urban Planning*, 48 (1/2): 83-91.
- Hoda, M.K. (1993). *The Child and Kindergartens*. 1<sup>st</sup> ed. Anglo-Egypt. Library-Cairo. (Arabic).
- Mahdy, M.Z. (1983). *Landscape Gardening in the Arab World*. El-Dar El-Arabia for Books, pp. 235-238. (Arabic).
- Motloch, J. (1990). *Introduction to Landscape Design*. Library of Congress, catalog, 90-32585.
- Muenschler, W. (1951). *Poisons Plants*. The Macmillan Company, New York.
- Mullins, S. (1995). Successful and safer playgrounds. *Parks, Golf Courses & Sports Grounds*, 61(2):6-8.
- Natalie, K.; Nicholas, E.F.; María, N. and David, K. (2016). Predicting teacher likelihood to use school gardens. *Applied Environmental Education and Communication an International Journal*, 15(2):138-149
- National Environmental Education & Training Foundation. (2000). *Environmental-based education: Creating high performance schools and students*. Retrieved May 3, 2006, from <http://www.neetf.org/pubs/index.htm>.
- Nohl, W. (1989). Activity areas instead of playgrounds: the planning of convivial playing environments. *Gartenamt*, 38(4):211-217.
- Salama, H.I. and Yosry, M.f. (1962). *Applied Floriculture, Propagation, Landscape Gardening and Local Fairs*. Egypt Anglo. Lib., pp. 169-174. (Arabic).
- Sharaf-El-Den, M.N. (1979). "Green Areas and Environmental landscaping" Cairo.
- Thomas, D. and Wolsey, D.L. (2014). School Gardens: Situating students within a global context. *The Journal of Education*, 194(3):53-60.
- UNESCO (1978). *Message about children less than 6-Year old*, UNESCO Association office, Cairo, vol.204.
- Weinstein, J. and David, G.C. (1987). *Spaces for Children. The Built Environment and Development*. Plemum Press. New York & London.
- Yehia, A.A. (1998). *Studies on Plants and Landscape Design of Kindergartens for Children From (3-6) Years Old*. Ph.D. Thesis. Fac. Agri. Moshtoher, Zagazig University.

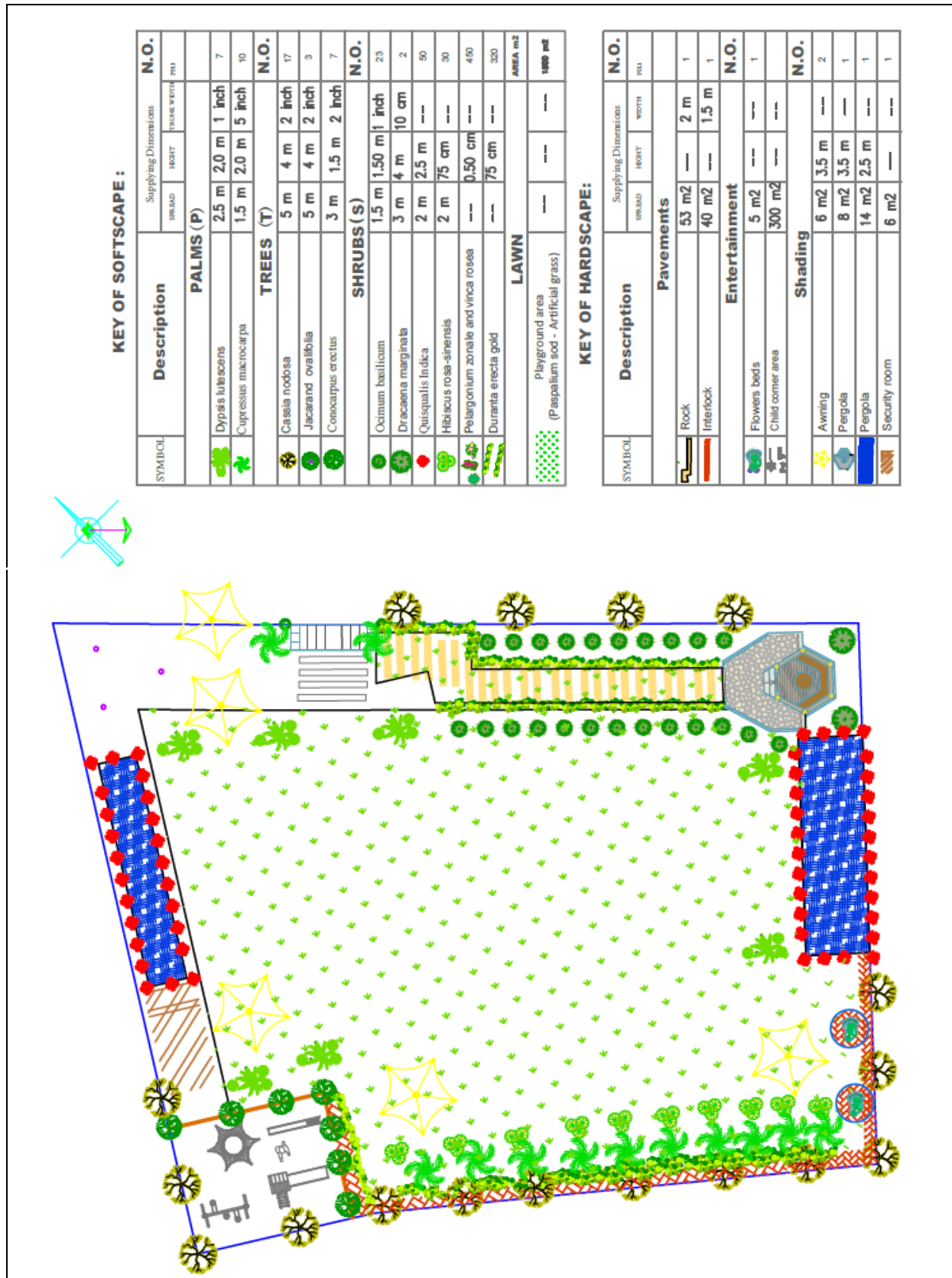



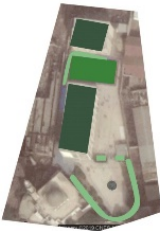

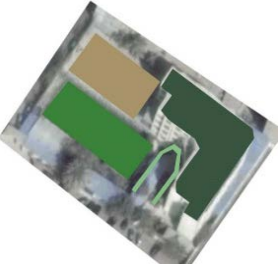

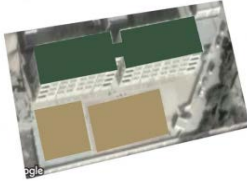




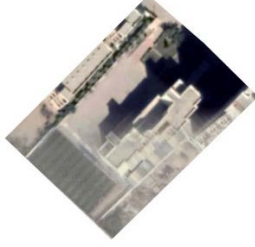
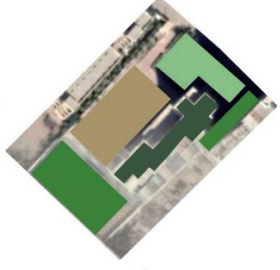
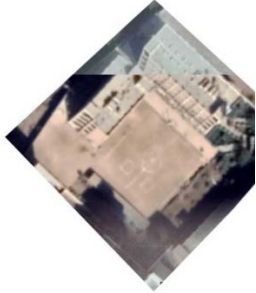
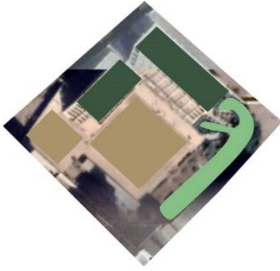

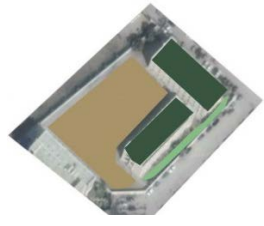
Fig. 4. Proposed design for a typical school garden area of 2000 square meters.

**Table 8. Proposed design for using free areas to make roof gardens.**

School name in (Mansoura City)	The current design	The proposed design	Recommendations
1. Mansoura Language School			The school garden need a new design and removing harmful plants, the site can be rehabilitated as a roof garden.
2. Fakhr Language School			The garden can be designed on roof after being isolated and studied structurally
3. Al-Firdous Language School			The existing garden can be rehabilitated by increasing its area and giving it privacy and protection.
4. French Language School			The school garden can be designed on roof after being isolated and studied structurally, giving it privacy and protection.
5. Nasser Language School			The school garden need a new design and removing some of plants as well as using roof buildings to make roof garden.

**Continued**

Table 8. Continued

School name in (Talkha District)	The current design	The Proposed Design	Recommendations
6. Talkha (1) Language School			The school garden can be designed on the roof of the educational building after its isolation and studying from the structural aspect.
7. Talkha (2) Language School			The school garden can be designed on the roof of the educational building after its isolation and studying from the structural aspect.
8. Hisham Barakat Language School			The school garden can be designed on the roof of the educational building after its isolation and studying from the structural aspect.

\* Design key for each of playground area, green area, playground area and roof building area (m<sup>2</sup>):

Playground area  
(sand or flagstones) (m<sup>2</sup>)



Playground area (Artificial  
grass) (m<sup>2</sup>)



Green area (m<sup>2</sup>)



Roof building area (m<sup>2</sup>)



## دراسة لتطوير الحدائق المدرسية في محافظة الدقهلية

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أجريت هذه الدراسة لتطوير الحدائق المدرسية في محافظة الدقهلية وذلك علي ثمانية حدائق مدرسية توجد في مدينة المنصورة ومنطقة طلخا. وكشفت الدراسة أن معظم هذه الحدائق المدرسية يوجد بها نباتات ضارة مثل الأعشاب الضارة والصبغات. تم عمل اقتراحات تصميمية لتطوير هذه الحدائق المدرسية للوصول إلى تصميم مثالي للحدائق المدرسية يمكن تطبيقه عملياً. أظهرت البيانات التي تم الحصول عليها أن المساحة المستخدمة في الحدائق المدرسية لا يتم استخدامها بشكل أمثل والصيانة لهذه الحدائق كانت سيئة. و من الأفضل الاستفاده واستغلال أسقف هذه المباني المدرسية لعمل حدائق أسطح لزيادة مساحة الحديقة لدي الطلاب وكذلك تحسين استخدام أنظمة الري بمساعدة الخبراء و ضرورة إعادة تدوير المخلفات للعيش في بيئة نظيفة وتصميم حدائق مرورية لتعلم أهمية ارشادات المرور.