The design efficiency of Foundation Schools in the Erbil Governorate: A study of usable area ratios

Dr. Sadar Swar  
BSc. PhD of Architecture: Architecture Engineering (Eng.)  
Dept., Eng. College, Salahaddin University  
Erbil, Kurdistan region/Iraq

Abdulqadir Bayz  
BSc. MSc Architectural Theology and Design: Civil Eng. Dept., Eng. Faculty, Soran University  
Soran, Kurdistan region/Iraq  
a.abdulqadir86@yahoo.com

Asst. Prof. Dr. Mahmood Khayat  
BSc. MSc. PhD of Arch Theory of Architecture: Head of Architecture Engineering Department, Eng.College, Salahaddin University  
Erbil, Kurdistan region/Iraq  
dr.m.khayat@gmail.com

Abstract—the provided area for learning and teaching for each individual pupil is changeable among foundation school categories in Erbil province. The ratio and quality of area have direct and indirect influence on learner’s outcomes and behavior. This paper will investigate area ratio of existing foundation schools in Erbil governorate, compare it with British guideline for schools. The research will start with introduction to physical environment and it is impact on learning and teaching process. It will then go on literature review that contains the description and analyzing of three similar studies. This will be followed by demonstrating the categories of local foundation schools. As research method the quantitative method-comparative approach is adopted in order to compare between foundation school in Erbil and British primary and secondary schools. Finally the study concluded that the gross site area ratio in the UK school is significantly higher than in foundation school in Erbil. In contrast, there is similarity of the supplied space for gross building area between foundation school in Erbil and the UK primary schools. It is recommended that further researches about educative spaces will be valuable for learning and teaching experience, and creating well designed physical environment in local schools.

Keywords-component; foundation school; physical environment; gross area; net area ; learning space; area guidance

I. INTRODUCTION

It is fact, community demand for school building will be increased when population growth. Increasingly, providing comfortable school for teaching and learning process is debatable issues. Learning will be affected by social-cultural factors and built learning environment (Blackmore et al., 2011). Because the physical environment has great impact on learner performance and behavior (CABE, 2010). According to Woolner (2010) learning process will be negatively affected as result of not well designed schools. Furthermore, “poor school conditions make it more difficult for teachers to teach and pupils to learn (Barrett, Zhung, 2009: IV)”. “Although a particular learning environment does not determine the teaching that takes place there, it can clearly help or hinder specific activities or sorts of use (Woolner, 2010:1).” Therefore, it is important to study the physical educative environment relationship with, and influence on learning and teaching process.

There are many factors affecting the physical education environment as Woolner (2010) states noise, air quality, space, temperature and lighting are the most important aspects that effect the learning spaces, among former factors their influence and techniques for solving will vary. “In addition to these direct problems with lack of space, a more crowded classroom or school is also likely to be noisier and more difficult to ventilate, problems which, as described above, can in themselves interfere with learning (Woolner, 2010:22).” Therefore getting adequate space and providing sufficient area standard is the aim of local authority, governments and educational organization, such us, the Building Schools for the Future (BSF) (Leiringer, Cardelline, 2011) and the Government’s Advisor on Architecture and Build Environment (CABE), the latter with Contraction Industry Council (CIC) introduced the Design Quality Indicator for School (DQI for Schools) (CABE, 2010). Although area standards for school in some country was changeable from state to state. For instance, in Germany, the school building aspects will be constructed according to each state guidance (Neufert, 2012). In other hand, some countries like the UK the government provide the area guideline for all country, which is improved and updated annually. The British government have maintained a series of the Building Bulletin (BB), for example (BB98) for secondary schools, and (BB99) for primary schools. In the (BB103) “area guidelines for mainstream schools” have been advocated accurately (BB103, 2014). The intension of “it is to set out simple, non-statutory area guidelines for mainstream school buildings and sites for all age ranges from 3 to 19. (BB103, 2014:3)” The purpose of this study is to explain the area ratio for different space categories in the foundation school in Erbil,
and compare it with other nation guidelines. Foundation schools can be referred as school for pupils from age 6 to 15 years with nine class of education (Ministry of Education, 2015). Improvement of school environment will have positive influence on teaching and learning process. This paper will examine the degree of comfortability for both internal and external space in term of area ratio in foundation school in Erbil, and compare it with British guidelines for primary and secondary schools. This will be begun by reviewing of the previous research about educational spaces.

II. RESEARCH METHODOLOGY

For its comfortability for this type of research, quantitative method-comparative approach is been used. In this paper, the comparative methodology address area ratio for educational facilities in various places. Comparison between different learning spaces in foundation school in Erbil with British schools will provide the similarity and difference between two cases.

III. THEORETICAL FRAMEWORK

Before The educational physical environment quality, influence on learner attainment and behavior have been studied by many educational researchers and organisations. Woolner (2010) in his book (Design of Learning Spaces) has addressed the aspects of learning spaces in terms of its design, design process and estimating good design. Firstly, the unique elements and aspects of design, and special approaches for education have been explained for four exemplar historical schools in UK. Secondly, the factors that affect learning spaces and make it an inadequate and insufficient have been mentioned such as space, noise, light, air quality, temperature, maintenance and renovation. Then, the amount of space have been studied which can increase the improvement of educative spaces. He has also demonstrated the importance of participation of the learners and school users, and collaboration among school designer, pupils, teachers and school staff. Furthermore, the approaches of school refurbishment and demolishment have been addressed that can improve built environment and support social aspects. Finally, the important of refurbishment process have been emphasized which can be appear in from of improving external spaces, decorating interior places and adding new parts to the school premises (Woolner, 2010). In contrast, there are number of issues which are not highlighted such as the flexibility and adaptability of school design, diversity of learning spaces and furniture arrangement with in learning spaces.

In addition, Leiringer and Cardellino have emphasized on the physical environment relationship and influence on learning process outcomes (2011). The vision and responsibility of the BSF (Building School for Future) programme have been described. Their study illustrated the number of well-designed Scandinavian school buildings that enhance the learning transformation process. The physical environment, utilization of spaces and steps of planning and designing school have been explained for each individual schools. In all cases, the educational aim and approached have been achieved and supported via the design strategies such as open plan building, flexibility, adaptability, sharing facilities and transparency among internal and external spaces (Leiringer, Cardellino, 2011). Although, the outdoor space, the amount of space for each pupil have not highlighted which may have impact on learning spaces.

Moreover, the study by Mhlule (معلولي) (2010) have addressed the physical environment conditions in existing foundation schools, environmental activities, and their relationships. Descriptive surveying methodology was utilized for gathering information overall Syrian cities. The analysis and evaluation of physical environment have been indicated via number of school aspects, such as, school site, cleaning, general health, main service, safety, advice form, organization and beauty, and activities and hopes. Although, the majority of school were in intermediate condition in term of physical environment, there was the low ratio of practicing physical environment. The study points out strong relationship among schools physical environment and its environmental activities (Mhlule, 2010). It is clear, that the school design layouts and parameters are not explained which may have impact on environmental issues.

IV. PRACTICAL PART

The current research have been delivered by gathering data from local foundation schools and analyzing them, then comparing with obtained area standards for school guidance in the UK. After a series of interviewing with staff at directorate of project in Ministry of Education, there have not specific guidelines for local school design. The number of most common categories of schools have been selected in order to get sufficient and appropriate information which have been repeated widely. Those schools have been classified according to the classroom number and school design form. For instance, in 2012 inside Erbil city twenty five school of 18- classroom school category have been constructed. In this ratio six of 18L-classroom school type (figure, 6), five of 18A-classroom school type (figure, 4), and two of 18B-classroom school type (figure, 5) (Ministry of Education, 2015). For the comparison purpose school guidance for British schools have been taken from Building Bulletin 103 which provide area recommendation for primary and secondary schools. “The purpose of this document is to set out simple, non-statutory area guidelines for mainstream school building (part A) and (part B) for all age ranges from 3 to 19 (B B103, 2014:3)”.

A. The covered Samples

In order to gather sufficient data about local school buildings, numerous of data have been obtained, which have great value for understanding education facilities. These layouts contain seven most repeated educational building according to directorate of Education-Erbil as shown below.

1) The 6Classroom School

The school consists of six classroom, staffroom and service room within two floor building. The plot area of the school site is 712 m2, while built up area is 420 m2. The school have capacity to hosts 180 pupils, so the school site area for each pupil is 2.33m2 and built up area is 3.96 m2 for each pupil. The usable space (study space) is 144 m2 of built up area and it ratio for built up area is 0.38 “Fig.1”.

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2) **The 9Classroom School**
The school site area is 945 square meter which includes nine classroom, open space and service area. The school building consist of ground floor and first floor the average built up are is 644 square meter. The school have capacity to accommodate 270 pupils, so it can be find out that there is 3.50 square meter per learner of site and 2.39 square meter per student of built up area “Fig. 2”.

3) **The 12Classroom Schools**
The school site area is 3660 m², while built up area is 1615 m² with building foot print 1090. The school capacity is approximately 400 pupils. The school building includes twelve classrooms, multipurpose hall, staff rooms, plat yards, garden and service area. The centre wide corridor is loaded by classrooms in both sides. Furthermore, for each learner, there is 9.15 m² of site area and 4.04 m² of built up area “Fig. 3”.

4) **The 18A Classroom School**
The school building design consists of three zones: staff, usable space and service zone. The usable space area is 950 m² which contains eighteen classroom, laboratories, computer halls, music room. There is two internal court in usable space while staff zone includes large multi-purpose hall and number of staff rooms. Those areas placed into two floor buildings. Moreover, the school site area is 8750 m² and total built up area is 4735 m². The school can provide places for 650 pupils. There is 16.6 m² for each pupil of school site and 7.28 m² of the school built up area “Fig. 4”.

Figure 1 reveals the 6Classroom school design, adopted from Directorate of Education-Erbil.

Figure. 3 illustrate 12Classroom School, adopted from Directorate of Education-Erbil.

Figure. 2 the design layouts for 9Classroom School, adopted from Directorate of Education- Erbil.

Figure. 4 reveal the 18 Classroom School, adopted from Directorate of Education-Erbil.
5) **18B Classroom School**
The two floor building have been constructed on 5525 m² site that compose of three wings, central space and large multi-purpose hall. In each wing, there are number of rooms that can be used as classrooms, staff rooms, laboratory, computer halls and drawing halls, and W.C for males and females. The stairs in each wing and central space connect the two floors. The school accommodate 650 pupils, for each one there is 8.5 m² of school site and 17 m² of average built up area “Fig.5”.

6) **18L Classroom School**
The design shape of school building plan is L shape which consists of two floor building. The classroom, laboratories and staff room have been placed on both sides of internal corridors. The total area of school site is 3320 m² while the school built up area is 2450 m². Furthermore the school provides spaces for 400 pupils “Fig.6”.

**B. Discussion**
This comparison for learning spaces between foundation schools in Kurdistan region and British school will demonstrate the similarity and difference sides in the provided area for the school building and site. School building area ratio for different categories of spaces will be varied according to the capacity of school to accommodate learners. In foundation schools at Erbil, the average of gross building area per learner was 4.44 m² / pupil place (figure 7). This ratio is less than (4.44 m²) in the 6, 9 and 12 classroom school category, but it is more than (4.44 m²) in 18A, 18B, and 18L classroom school category. Furthermore, the average net building area ratio for each pupil is 1.33 m²/pupil. It includes classrooms, laboratories and staff area. Simultaneously, the average of non-net building area ratio for each pupil is 2.62 m² “Fig. 7”. It contains circulation, construction and service areas. It is noticeable that the net building area is less than non-net building area.
While in the United Kingdom, the area provides for each school types accurately, and learning space capacity have been calculated based on pupil place number (BB103, 2014). Firstly, gross building area for primary school have been indication between 4.6 m² as low and 5.1 m² per pupil places as high range (BB103, 2014). Which covers net and non-net and area and their ratio is different from each other. The net building area have been indicated with minimum ratio 3.47 m²/pupil place and maximum ratio 3.75 m²/pupil (figure8). It includes “basic teaching, hall, ding and PE, learning resource areas, staff and administration and storage” (BB103, 2014). While the building non-net area contains the toilets and personal care, kitchen facilities, circulation, plant and internal walls, and their area standard will be change between 1.13 and 1.35 m² per learner. Secondly, gross building area for secondary school have been indicated with 7.466 m²/pupil place as lowest range and 8.511 m²/pupil place as highest range. It also contains the net and non-net building area. For the net building area 5.33 m²/pupil place as minimum and 5.872 m²/pupil as maximum ratio have been guided (Fig. 9). It contains the basic teaching, hall, dining and PE, learning resource areas, staff and administration and storage, and their size and design layout will be different with primary schools (BB 103, 2014. In addition the non-net building area have been recommended among 2.136 and 2.639 m² per each learner, which includes toilets and personal care, kitchen facilities, circulation, plant and internal walls (Fig. 9). Therefore, there is the similarity of average gross building area between local foundation schools and British primary schools, but this ratio is significantly difference in British secondary schools. It is clear that net building area in local foundation schools are significantly less than net building area in the UK schools (Fig. 10). Moreover, there is the diversity among educative interior spaces in the British schools that is not noticeable in the local schools.

During the comparing the total gross school site area between this two case, differences will be obvious. The average of the gross site area for the foundations school in Erbil is approximately 7.71 m² per pupil, and change between minimum was 3.5 m² per pupil place and maximum was 13.46 m² per pupil place “Fig. 11”. While the total gross area for primary school recommended about 45 m² per pupil place as minimum and 55 m² per pupil place as maximum range in the UK “Fig.12”. In addition the gross area have been limited between 67.281 m²/pupil place as minimum and 83.511 m²/pupil place as maximum “Fig.13”. Consequently, there is significant differences among average site gross area of Erbil foundation schools, British primary and secondary schools “Fig.10”.

Figure. 7 the graph shows the Foundation School building area ratios in Erbil Province

Figure. 8 shows the gross and net area for the primary school building (adopted from BB 103, 2014:9).

Figure .9 illustrate the gross and net area for the secondary school building (adopted from BB 103, 2014:10).

Figure. 11 the average gross site area for foundations schools in Erbil have been highlighted
V. CONCLUSION

Providing adequate space and improving learning spaces is the aim for many organization, community and country. The issues that have been impact on physical educative spaces are the target of many scientist studies in order to enhance learning and teaching process. Therefore this study conclude that:

Firstly, there is the diversity in school spaces in the UK which is not obvious in foundation schools in Erbil “Tab. 1”.

Secondly, the average gross building area of Erbil foundation schools is similar to British primary schools, but it is significantly less than average gross building area in British secondary schools “Tab. 1”.

Then, there is great difference between minimum guided gross site area for primary and secondary schools in the UK and foundation schools in Erbil. This due to the having many outdoor categories of spaces which support physical teaching. This study provides deeper understanding of the importance and influence of the school design elements and process on the learning and teaching approaches, and learner behavior. Moreover, increasing ratio and diversity of learning spaces in local schools will improve and support learning and teaching. It can be said, there is great difference in area guidance for foundation school in Erbil governorate and British primary and secondary schools.

VI. RECOMMENDATION

The reviewing school area guidance, studying school conditions and preparing appropriate area guidance will be valuable for improving and developing built environment of local school. Also, involvement the educational staff and pupil, and collaborations between architects, teacher and school staff are necessary to build and refurbish of schools. Furthermore, it is important to look for appropriate design aspects which enhance improvement of physical environment, and support social relationships.

REFERENCES