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# Design Guidelines and Standards for Iraqi Schools - The Future Prospects

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**ABSTRACT**

Educational facilities are among the critical functional types because of their role in preparing future generations to advance the wheel of progress. If these facilities are not qualified to perform their functions, then the educational process is negatively affected. Schools in Iraq suffer from many problems due to the inadequacy of educational facilities to meet the student's needs as a result of the absence of comprehensive standards and guidelines for school designs. According to that, this paper aims to identify the deficiencies in the Iraqi standards of public schools. The paper relied in its methodology on a comprehensive comparison between Iraqi standards and a number of international standards and guidance of schools, then the analyses and assessment of some design criteria in a sample of Iraqi schools to show their compatibility with both Iraqi and international standards. The results of comparative analyses between global and local standards and guidelines revealed the limitation and shortcomings in the Iraqi standards. The paper found a wide range of design specifications the Iraqi school standards lack such as the norms of sustainability, safety, flexibility, comfort parameters, special needs, etc. The investigation of existing Iraqi public schools revealed their incompatibility with both Iraqi and international standards. The contribution of this paper is to provide a future vision to develop Iraqi school designs to meet the common requirements of international standards and guidelines for school designs during the conceptual design and building life cycle.

## 1. INTRODUCTION

Building schools must receive high attention during the conception, design, construction and operation stages to achieve functional efficiency. Standards and regulations of schools are constantly updated in response to future changes and needs in the educational process, which poses a challenge for both designers and teaching staff. Therefore, many countries adopt new approaches based on technical and technological concepts to prepare a sustainable learning environment. The reality of local schools in Iraq revealed two different approaches. The first, adopted by the Ministry of Education in Iraq, depended on constant and specific types of school building plans that are not responsive to changes and adaptation – as an essential feature of educational facilities to cope with technical development. These negative aspects led to design constraints directly affectingly, acoustic and visual comfort. On the other hand, there are many public-school designs funded by international organizations which lack clear standards. These schools vary in their designs, materials used and space characteristics [1].

Many studies dealt with Iraqi school standards and guidelines directly or indirectly by diagnosing the problems that the Iraqi schools suffer from Al-Dabbagh and Mahmood [2]. Al-Dabbagh and Mahmood [2] investigated the problems behind the low efficiency of functional performance of Iraqi schools. To identify the quantitative shortage of existing designs, the study compared specific characteristics of existing school designs such as the functional elements and the floor areas with both international and Iraqi standards. The inefficient designs were adapted using addition, substitution, and subtraction techniques. Then, the validity of generated adapted designs was assessed using criteria such as a percentage of adequate necessities, orientation, financial budget, a percentage of modification, and flexibility [2]. Another study assessed the standards of planning and designing schools in terms of the development and integration with the site, master plan, urban fabric and surrounding residential communities. The study presented the general principles that determine the school sites, the land uses, and the areas to serve, and decided their compliance with the approved standards [3].

Mahmoud [4] highlighted the concept of function sustainability in primary school through the adaptation of functions and activities. He studied and analyzed the architectural and structural characteristics of spaces to determine their responsiveness to current and future requirements by adopting the flexibility concepts such as expansion, integration and change. Al-Jameel et al. [5] dealt with the concept of social sustainability as one of the basic sustainability concepts in parallel with the concepts of environmental and economic sustainability within school buildings. They introduced and analysed the architectural characteristics associated with social sustainability in a sample of Iraqi schools. Alkutbi [6] examined the concept of expansion as one of the methods used to adapt local school building types to meet future needs. Hamid [7] focused on the concept of change in educational buildings resulting from the type of functions by determining a quantitative measure that shows the degree of ability to change.

From previous studies, it is clear that researchers did not comprehensively address the Iraqi school standards. They either highlighted a specific part of school standards or dealt with the design problems arising from ignoring the school standards. In fact, Iraqi schools are characterized by a lack of uniform criteria. Therefore, there is a need to assess the Iraqi standards and guidelines for schools to identify the missing aspects. This can be done by comparing the Iraqi standards with other countries' standards to determine the most common aspects that the Iraqi standards do not highlight.

According to that, the next section describes a research method and reviews both Iraqi and international standards and guidelines for school designs at macro and micro levels. At the macro level the main design criteria of each standard were identified and compared with Iraqi standards for matches and differences. At the micro level, some detailed design criteria were investigated in a sample of existing schools built in Mosul city, Iraq to determine their compatibility with both Iraqi and international standards.

## 2. RESEARCH METHODOLOGY

The research is based on a descriptive-analytical methodology. A comparative analysis was conducted between the Iraqi standards and guidelines for school designs and a number of international standards. The aim is to identify the missing aspects to be added to the Iraqi standards. The investigated Iraqi school standards are characterized by the absence of a uniform standard because they are issued by five different governmental entities in addition to some design requirements that fall short of the standard. On the other hand, twelve international school standards were selected which belong to various government agencies or private companies specialized in educational facilities. These standards and guidelines were selected on the basis of their similarity to the Iraqi educational system which is composed of three levels of learning: primary, intermediate and preparatory. In addition, the standards belong to the developed and developing countries and UNESCO. They reflect the cultural and economic diversity that is the distinguishing feature of Iraqis regions. Figure 1 clarifies the research steps.

### 2.1 Guidelines and standards for school design

In this part, Iraqi standards and guidelines and selected international standards are investigated to define the design aspects covered by these standards. A brief introduction to these standards is presented below:

#### 2.1.1 Iraqi standards

The Iraqi standards, which lack unified standards, were issued by several bodies responsible for giving design and construction guidelines. These guidelines reflect the background of the issuing authority. Therefore, these guidelines and regulations miss many aspects of school design standards. Short descriptions of these standards are shown in Table 1.

#### 2.1.2 International standards

The research reviewed 12 design standards and guidelines issued by different countries or private companies of educational facilities. In this part, the international standards are summarized shown in Table 2.

### 2.2 Key components of design guidance and standards for schools

At the macro level of analyses, the main norms in the Iraqi guidelines and the investigated international standards and guidelines for school designs are determined. Then, the aspects highlighted by the Iraqi school standards are compared with the international standards to indicate the shortcomings of Iraqi standards as shown in Table 3.

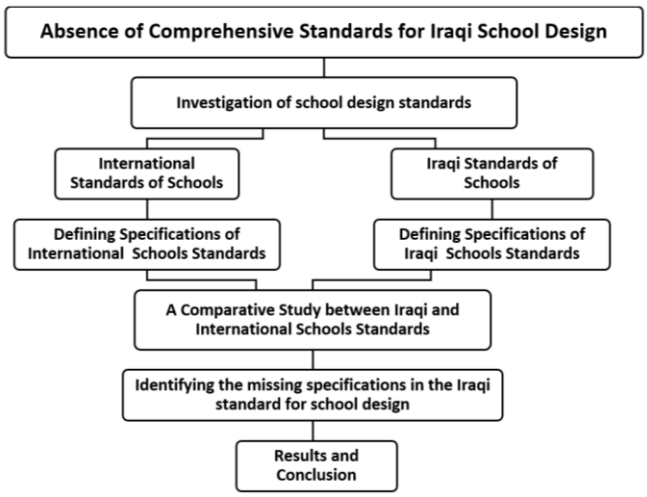


**Figure 1.** Research methodology

**Table 1.** Iraqi standards

| Source of Standard | Description |
|---|---|
| Iraqi Ministry of Planning Standard, 2018 | This standard is issued by the Iraqi Ministry of planning, which includes principles of planning and design of all Iraqi cities besides highlighting the design standards of educational buildings, including nurseries, kindergartens and schools (Primary, intermediate, preparatory and Vocational Schools). This standard is limited to determining the area and the number of students in class, as well as highlighting some design aspects [8] |
| Iraqi Ministry of Education Standard, 2017 | This standard highlights some aspects of the architectural design of school spaces, like proportion, areas for each student, and technical and service aspects. The standard also addresses sites' requirements in general descriptions without determinants such as topographic characteristics or the location within the master plan and student accessibility [9]. |
| Iraqi Ministry of Health Standard, 2016 | This standard is established to grant health approvals to take any building as an educational institution to conduct environmental and health checks by health departments to ensure that health conditions are met by the approved instructions and forms s Health ", which includes the characteristics of the site, building materials in construction as well as certain characteristics related to health services [10]. |

**Table 2.** International standards

| Source of Standard | Description |
|---|---|
| **Oxford Standard, 2019** | This standard includes two instructions, the first concerns singable educational practices, and the second deals with the concepts of design, construction, and occupation. In the light of these concepts some existing schools (primary schools) were analysed [11]. |
| **UNESCO Standard, 1985** | Although this standard is old, it is the basis adopted by many countries in defining the standard concepts of schools. Its legislation and regulations differ from one country to another, including three main parts. Qualitative characteristics, design and construction standards, occupancy and life cycle design [12]. |
| **Seychelles Standard, 2011** | This standard incorporates minimum requirements for the design of educational facilities in terms of design and operational norms, maintenance, infrastructure and services [13]. |
| **Myanmar- UNESCO Standard, 1992** | UNESCO develops this standard to lay the operational design foundations for educational facilities - schools, addressing the minimum requirements for educational spaces, dimensions, values and requirements by comparing (actual schools) reality with UNESCO's standards [14]. |
| **California Standard, 2007** | This standard is for the California State Office of Building Public Schools - the United States. It addresses the design, artistic, technical and general construction aspects of schools and further highlights the cost of schools and the event spaces within them [15]. |
| **Albuquerque standards, 2021** | This standard includes several sections for school design considerations according to different specialisations such as architects, constructors, stakeholders, and community representatives. It addresses considerations for primary and secondary school design [16]. |
| **Healthy Green Schools & Colleges Standard, 2022 (Chicago Standard)** | This standard is not issued by a specific state but a private company in Chicago, which has set its standard for green school buildings, encompassing several aspects aimed at providing students with healthy environments, nutritious food, health services and opportunities for physical activity [17]. |
| **British Standard for School Management, 2020** | is a special type of standard that focuses on a particular aspect. It is approved by some countries where the standards of school design are different in terms of administrative, operational or design aspects as a result of their different geographical location or being influenced by local regulations and requirements [18]. |
| **Saudi Standard, 2019** | This standard is part of a future vision developed by the Kingdom of Saudi Arabia for 2030. The aim is to establish a new approach for planning and designing educational facilities, creating a scientific environment for future generations that will embrace technological intelligence, ambition and the pursuit of the best results. This standard is directed to designers, planners, constructors and owners of the facility. The standard consists of two main sections, the minimum design criteria and the criteria and procedures for approval of existing facilities in line with the standards established for educational facilities [19]. |
| **Ireland Standard, 2011** | This standard includes general design guidelines that determine general principles in primary and post-primary school design to achieve design quality and facilitate the practical completion of buildings during their life cycle [20]. |
| **Victoria State Standard - Australia, 2021** | The Australian Victorian State Government approved this standard for educational facilities - school type in design, practice, maintenance and operation. This standard comprises five main parts: an introduction, philosophical vision, planning, design, certain factors and technical aspects [21]. |
| **Kosoves Standard, 2022** | This standard deals with schools in Kosovo for all levels of education (primary, intermediate, preparatory and vocational school). These standards consist of two types, the first is unified for all schools in the country, while the second is specific for a particular type of school [22]. |

**Table 3.** A comparison between Iraqi standards and international school standards

| Subject of Standard | Sub-subject of Standards | | Oxford | UNESCO | Seychelles | Myanmar | California | Albuquerque | Green Sch. | British | Saudi A. | Ireland | Victoria | Kosovo | Iraq |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **School type** | Public Government Schools | Nursery | | | | | | | | | * | | | | |
| | | Kindergarten | | * | | | | | | | * | | | | * |
| | | Primary | * | * | * | * | * | * | * | * | * | * | * | * | * |
| | | Intermediate | | * | | * | * | * | * | * | * | * | * | * | * |
| | | Secondary | | * | | * | * | * | * | * | * | * | * | * | * |
| | | Preparatory | | * | | * | * | | | | * | | | * | * |
| | | Vocational | | * | | | * | | * | * | * | | | * | * |
| | | Rural | | * | | | * | | | | * | | | * | |
| | Private | | * | | | | | * | | | | | * | | |
| **Sustainability Concepts** | Reducing operational costs | | * | * | | | | | * | | | * | | | |
| | Educational performance | | * | * | | | | | * | | | | | | |
| | Environmentally friendly | | | | | | | | * | | | * | | | |
| | Health and comfort | | | * | | * | | * | * | | | * | * | * | |
| | Social values | | | | | | | | * | * | | | | | |
| **Master plan** | Urban context | | | | | | | | | * | | | * | * | |
| | Sense of place | | | * | | | | | | | | | * | * | |
| | Accessibility | | * | * | | | | * | | * | | * | * | * | |
| | Site Features | | | * | | | | | * | | | * | * | * | |
| | Facilities Integration | | | * | | | | | * | * | | | * | * | |
| | Emergency exits | | | * | | * | | * | * | * | | | * | * | |
| | Car movements | | | * | | * | | | | | | | * | * | * |

| | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Road signs | | | * | | | | * | | | * | | | | * | | |
| | Pedestrian circulation | | | * | * | * | | * | | | * | | | * | * | * | * |
| | Vehicle Arrival | | | * | | * | | * | | | * | | | * | * | * | |
| | Educational needs | | | * | | | | | | | | | | | * | * | |
| **The Site Plan** | Availability of land | | | | | | | | | | | | | | | * | |
| | Relationship with neighbours | | | | | | | | | | | | | * | | * | |
| | School area | * | | * | | * | | * | | | * | * | | | | * | * |
| | Services | | | | | | | * | | | * | | | * | | * | |
| | Topographical features | | | | | | | * | | | | | | | | * | |
| | Geodetic features | | | | | | | | | | | | | | | * | |
| **Landscape Design** | Outdoor spaces | * | | | * | | * | | | | * | * | | * | * | * | * |
| | Walk paths | * | | * | | * | | * | * | | * | * | | * | * | * | |
| | Shadow areas | | | * | | * | | | | | | | | | * | | |
| | Interactive spaces | | | * | | | | | | | | * | | * | | | |
| **Spaces programming** | Spaces | Functional zoning | | | * | * | | | | | | * | | | * | | |
| | | Space layout | * | | * | * | * | * | * | * | | * | * | | * | * | * | * |
| | | Functional Program | * | | * | * | * | * | | * | | * | * | | * | * | | |
| | | Dimension | | | * | * | * | * | * | * | | * | * | | * | * | * | * |
| | | Number of spaces | | | * | * | | * | * | | | | | | | | | * |
| | Activities | Administrative | | | * | * | * | * | * | | | * | * | | | | * | |
| | | Educational | | | * | * | * | * | * | | | * | * | | | | * | |
| | | Services | | | * | * | * | * | * | | | * | * | | | | * | |
| | | Maintenance | | | * | * | | | * | | | * | * | | | | * | |
| **Circulation and Flexibility** | Circulation | | * | | * | * | * | * | * | * | | * | * | * | | | | |
| | Flexibility | Diversity | | | * | | | | | | | * | | | * | | | |
| | | Adaption | | | * | | | | | * | | | | | * | | | |
| | | Integration | | | | * | | | | * | | * | | | | | | |
| | | Reuse | | | | | | * | | | * | | | | * | | | |
| | | Expansion | | | * | * | | * | | | | | | * | | | | |
| **Design Aesthetics** | Interior design | Colour | | | | | | | | | | * | | | | | | |
| | | Harmony | | | | | | | | | | * | | | | | | |
| | Exterior design | Green area | | | * | | * | | | | | * | | | | | | |
| | | Plants | | | | | * | | | | | | | | | | | |
| | | Material | | | | | | * | | | | * | * | | | | * | * |
| | | Interaction | | | | | * | | | | | | | | | | * | |
| **Structural Components** | Roofs | | | | | | | | | | | | * | * | | | * | |
| | Windows | | | | | | | | | | | | * | * | | | * | |
| | Stairs and ramps | | | | | | | | | | | | * | * | | | * | |
| | Doors | | | | | | | | | | | | * | * | | | * | |
| **Cost and budget** | | | | | | | | | | | | | * | * | * | * | | |
| **Technical Specification** | Safety | | | * | | | | * | | | | | * | | * | | | |
| | Fixtures | | | * | | | | | | | | | | | * | | * | |
| | Lighting | | | * | | | | * | * | | | * | * | | * | | * | |
| | Finishings | | | * | | | | * | * | | | * | * | * | * | | | |
| | Acoustic Eng. | | | * | | | | * | * | | | * | * | * | * | | | |
| | Heating and Cooling | | | * | | | | * | * | | | * | * | | * | | | |
| | Ventilation | | | * | | | | * | * | | | * | * | | * | | | |
| | Water supply | | | | | | | * | * | * | | | * | | | | | * |
| | Draining | | | | | | | | * | | | | | | | | | |
| **Comfort Parameters** | Climate condition | | | * | | | | * | * | | | | | | * | | | |
| | Natural and Artificial means (passive and active design) | | | * | | | | * | * | | | | | | | | | * |
| | Building orientation | | | * | | | | * | * | | | | * | * | * | | * | |
| | Building location | | | * | | | | * | * | | | | * | * | * | | * | |
| | Building envelope | | | * | | | | * | * | | | | * | * | * | | | |
| | Building shape | | | * | | | | * | * | | | | * | | * | | | |
| | Surroundings | | | * | | | | * | * | | | | | | * | | | |
| | Landscape | * | | * | | | | * | | | | | * | * | * | | | |
| | Environmental elements | * | | | | | | | * | | | | | | * | | | |
| | Insulation properties of materials | | | | | | | | * | | | | * | * | * | | | |
| **Designing For Safety** | Building security | | | | | | | | * | | | | | | * | | | |
| | Site planning for safety | | | | | | | * | | | | | * | | * | | | |
| | Accidents | | | | | | | * | | | | | | | * | | | |
| | Material durability | | | | | | | | | | | | | | * | | | |

| | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Emergency exits | | * | | | * | | | | * | | * | | * | | | | |
| | Fencing specification | | * | | | | | | | | | | | | | | | * |
| | Natural disasters | | | | | | | | | | | | | | | * | | |
| | Epidemics | | | | | | | | * | | | * | | | | | | |
| **Maintenance Considerations** | Periodic monitoring | | | | | | | | | | | | | * | * | | | |
| | Maintenance schedules | | | | | | | | | | | | | | * | | | |
| | Maintenance cost | | | | | | | | | | | | | * | * | | | |
| | Equipment | | | | | | | | | | | | | * | | * | | |
| **Special Requirements** | Special needs | | | | | | | * | | | | | | | | * | | |
| | Health equipment | | | | | | | * | | | | | | | | * | | |
| | Accessibility | | | | * | | | * | | | | * | | * | | * | | |
| **Furniture and Equipment** | Furniture | Educational | * | | * | | | * | * | * | | | | | | | | |
| | | Administrative | * | | * | | | * | * | * | | | | | | * | | |
| | | Outdoor | * | | | * | | | | | | | | | | | | |
| | Interior elements properties | | * | | | | | | | * | | | | | | * | | |
| | Design compatibility | * | * | * | * | * | * | * | | | * | * | * | * | | | | |
| | Anthropometrics | | * | * | * | * | * | * | * | * | * | | | * | | | | |

### 2.3 The reality of local school buildings in Iraq

At the micro level of analyses, the design specifications of a classroom in Iraqi standards were compared with the investigated international standards (Table 4). The comparison included the number of students in a classroom and the area per student for primary, intermediate, and preparatory schools. In Table 2, different numbers of student in a classroom are found between Iraqi and international standards, and between primary schools and both intermediate and preparatory schools.

However, the investigation of existing public schools in Iraq presents a different reality. Typical design layouts are used for primary, intermediate, and preparatory schools ignoring the different needs of varied student ages. A sample of 50 schools in Mosul city – Iraq, having a typical layout of 12 classroom occupied by primary, intermediate, and preparatory schools was surveyed. The average number of students in the sample was 53 in a classroom, and the average area per student was 0.94m$^2$.

**Table 4.** The design specifications of a classroom in Iraqi standards and international standards

| School type | Classroom criteria | Iraqi Standards | International Standards |
|---|---|---|---|
| Primary | Student Numbers | 30-40 | 20-25 |
| | Area per Student | 1.35-1.68 m$^2$ | 1.3-1.6 m$^2$ |
| Intermediate | Student Numbers | 30-36 | 26-30 |
| | Area per Student | 1.4-1.7 m$^2$ | 1.7 m$^2$ |
| Preparatory | Student Numbers | 30-36 | 26-30 |
| | Area per Student | 1.4-1.7 m$^2$ | 1.4-1.8 m$^2$ |

## 3. RESULTS

From the comparison in Table 3, there is a difference between the Iraqi and the international school standards and guidelines in terms of the main subjects and sub-subjects covered by these standards. The similarities and differences are summarized in the sections below.

### 3.1 Common aspects in the Iraqi school and international standards

The following graphs in Figure 2 represent the commonalities between Iraqi standards and the investigated international standards. The horizontal axis scale at the right of figures measures the percentage of international standards dealing with each aspect. From 83 total aspects, there are 35 shared aspects between Iraqi and international standards, there are 16 aspects existing in more than 50% of international standards.

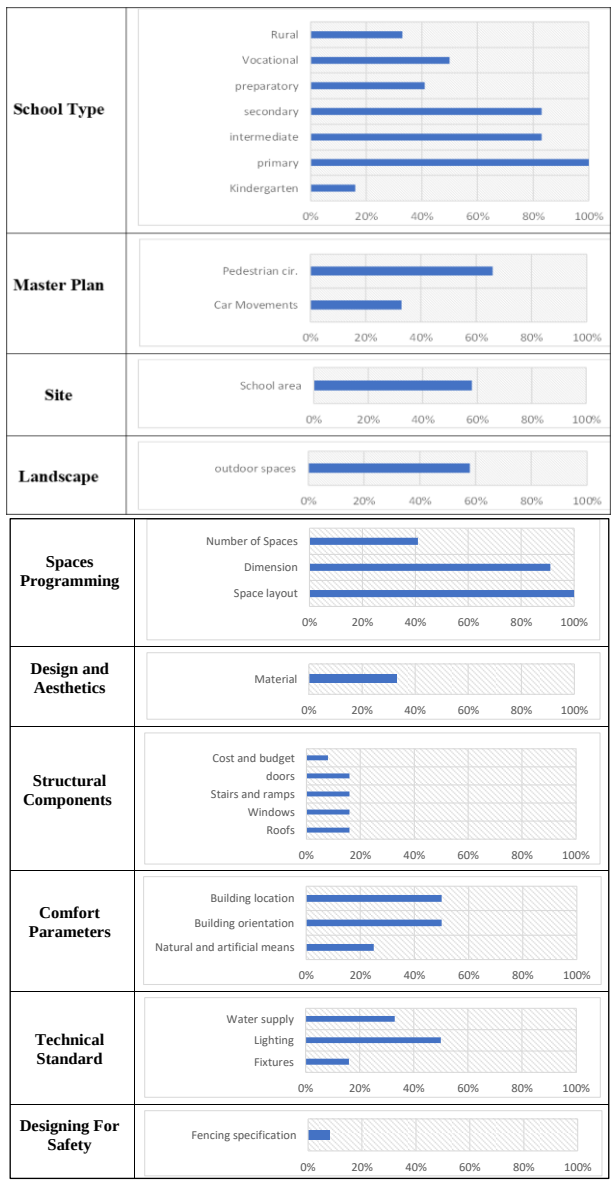


**Figure 2.** Common aspects between the Iraqi school standards and guidelines and the investigated international standards and guidelines

### 3.2 Aspects of the international standard that the Iraqi standard lacks

The following graphs in Figure 3 reveal the missing aspects in the Iraqi standards and guidelines for schools. There are 48 missing aspects from 83 total aspects. The missing aspects belong to the eight main subjects of school standards and guidelines. These subjects are Master Plan, Sustainability concepts, Design Aesthetic, Landscape, Special Requirements, Comfort Parameters, and Design for Safety and Maintenance Consideration. These aspects need to be considered in the future development of Iraqi Standards and guidelines for school design.

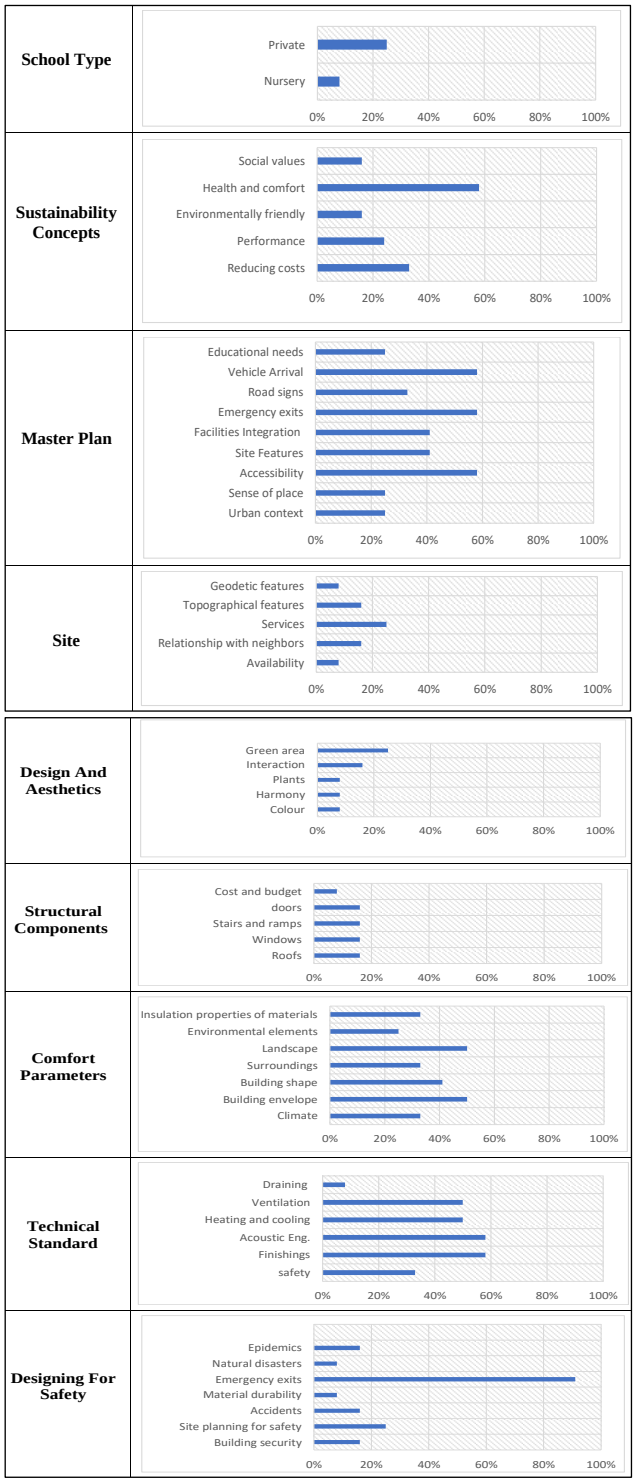


**Figure 3.** Aspects of the international standard that the Iraqi standard lacks

## 4. DISCUSSION

The comparisons between the international standards and the Iraqi school standards reveal the significant divergence. The reason can be attributed to the absence of a uniform Iraqi standard dealing with the conceptual, design, and operational aspects. This deficiency in Iraqi school standards can be attributed to the existence of several governmental or non-governmental bodies who issued different parts of the standard causing a loss of compatibility. The main aspects not addressed by the Iraqi standard are:

- In terms of school type, international standards include different specialized standards according to the educational stages. On the other hand, the Iraqi standards ignore many variables required by different ages of the students in primary, intermediate or preparatory schools. Built on the field investigation of 50 existing Iraqi schools in Mosul city, it was found that the same typical design layout of school was used for different school stages without any adaptation leading to incompatibility and failure to meet the specific requirements imposed by each educational stage. In addition, the number of students in existing classrooms exceeds both Iraqi and international school standards.
- Regarding sustainability standards in schools, Iraq's standards lack to them. Most international standards incorporate part of these concepts within their guidelines. Sustainability concepts focus in 58% of international standards on health and comfort aspects in educational spaces. The need to design schools contributing to wellbeing has been globally recognized [23]. The findings of The Education Consortium of Iraq (ECI) report confirm the failure of some Iraqi schools to achieve this aspect. They referred that WASH infrastructure are insufficient to satisfy user needs [24]. Other sustainable aims in educational buildings such as: reducing the operating costs of schools, including educational performance targets, and addressing social values and environmental protection are mentioned respectively in 33%, 25% and 16.66% of international standards. Iraqi schools suffer from the lack of sufficient spaces for social activities [2].
- Regarding the norms of school location in the master plan such as the criteria of planning, urban design, urban density, and land use; it can be found that most of these aspects are not addressed in the Iraqi standard. Only the guidelines for car movements and pedestrian circulation are included in the Iraqi standards. Missing criteria focus on aspects such as the specification of the urban context, sense of place, accessibility, site features, facilities integration, emergency exits, road signs, vehicle arrival, and educational needs which are covered by the investigated international standards with different rates vary between 25% to 75%. Therefore, the report of The Education Consortium of Iraq (ECI) mentioned that student's safety is threatened in the route to school by road accidents. In fact, the most common safety concern mentioned by focus group discussions involving students was road accidents while walking to and from school [24].
- At the level of site plan design, the location of the school within the master plan is determined according

to several criteria. The Iraqi standard and guidelines referred only to the school area. Other aspects are not elaborated such as the conditions of the availability of land, relationship with neighbours, services, and topographic and geodetic features. The lack of urban standards for school sites in Iraq explains the shortage of school buildings in the public education and the overcrowding in school. In addition, the lack of site plan design criteria led to the use of same typical school plan without taking into consideration the specific conditions of different sites.

- Regarding the design guidelines for external spaces and landscapes, the Iraqi standard addresses only the requirements of outdoor spaces in terms of general recommendations. On the other hand, other specifications are missing in the Iraqi standards such as walk paths, interactive spaces and shadow areas. The instructions for these ignored aspects can be found in 75% and 25% of the investigated international standards. Landscapes and outdoor spaces support communality by offering good spaces for students to socialize and spend time with peers. Ignoring the imposition of these specifications in the Iraqi standard led to the lack of outdoor spaces, such as green spaces, students' playground and sports arenas, in many Iraqi public schools.
- The standards of school's interior design have a wide range of details in the investigated international standards, in particular aspects of consistency, flexible spaces and interactive elements. The academic results are motivated by the classroom design and the quality of indoor environment which facilitate social interaction, and interactive learning [23]. However, the Iraq's standard does not address these aspects.
- With regard to space programming, the functional aspects of design associated with school facilities are elaborated in most investigated school standards. These features deal with functional zoning, space layout, functional program, dimensions, number of spaces, and types of activities in administrative, educational, service, and maintenance spaces. However, the Iraqi standards and guidelines have determined only the space layout, dimensions, and the number of spaces in schools. Many of existing Iraqi schools lack spaces such as cafeteria, library, multi-purpose hall, etc. [1]. They neglect the effects of age or sociocultural differences on the need for area and space. The report of United Nations Development Program (UNDP) showed the poor condition of some Iraqi schools. In their project of "Rehabilitation of School Buildings in Lower South Iraq", additional classrooms and new toilets are attached to rehabilitate and expand existing facilities. The aim is to afford an improved teaching and learning environment and to convert the building of schools to "child friendly standard" which have participated in increasing the rate of students enrolment and reducing the rate of drop out [25].
- Some of the investigated standards and guidelines gave importance to circulation and flexibility in school design. The flexibility in the educational building was defined in terms of diversity, adaptation, integration, reuse, and expansion. Nevertheless, the Iraqi standards and guidelines did not mention any of these concepts.
- Some of the investigated international standards referred to some aspects of design aesthetics in school such as the use of colours and harmony in the interior designs and the use of plants, materials, and interaction in the exterior designs. Barrett et al. have identified the impact of design complexity and colour on stimulating the learning [23]. The Iraqi standards and guidelines for school designs mentioned only some instructions regarding the use of materials in the exterior designs.
- On the construction level, two of the investigated international standards elaborated the structural components of schools such as roofs, windows, doors, stairs and ramps and etc. However, these aspects are not detailed in the Iraqi school's standard. They are just included as general guidance.
- Some aspects of costs and budget were discussed in the Iraqi standard and some investigated international standards.
- In regard to technical specification, some investigated international standards highlighted safety, fixtures, lighting, finishing materials, acoustics, heating and cooling, ventilation, water supply, and draining. On the other hand, Iraq's standard gave instructions for fixtures, lighting and water supply only, ignoring others. In fact, in countries such as Iraq, the temperatures range from 50°C in summer to 0°C in winter. Therefore, optimal indoor temperature and air quality requires to consider good insulation and air conditioning to prevent both overheating and extreme cold.
- Some investigated international standards put forward conditions for comfort parameters in educational spaces such as classrooms and laboratories, which include air temperature, humidity, natural light, sound, and sight. These conditions seek to achieve a high-quality internal environment for the occupants' comfort. Many studies by Barrett et al. have identified the impacts of natural characters such as light, sound, temperature and air quality on active learning [26]. The thermal parameters vary according to the climatic condition of each country. Therefore, the standards offer design specifications that have a key role in determining the values of these parameters, such as: building orientation and location, passive and active design means, building shape and envelope, surroundings, landscape, environmental elements, and insulation properties of materials. However, despite the presence of diverse climatic environments in Iraq ranging from cold, moderate, and hot; the Iraqi standards and guidelines are limited to three thermal comfort parameters which are building orientation and location, and passive and active design means.
- In terms of safety specification, some investigated standards highlighted aspects such as building security, site planning for safety, accidents, material durability, fire safety, emergency exits, fencing specification, natural disasters, and epidemics. The Iraqi standards and guidelines did not address most of them except the fencing specification. The report of The Education Consortium of Iraq (ECI) confirmed that safety measures of COVID-19 are difficult to implement in schools, particularly among younger pupils, because of the overcrowded classrooms [24]. The number of students which exceeds 60 in the same classroom make

the transmission of infections and diseases among the students easier and faster.

- Regarding the operational phase, some international standards included maintenance work details such as periodic monitoring, maintenance costs and maintenance schedules. However, the Iraqi school standards did not shed light on these aspects. The Education Consortium of Iraq (ECI) report confirmed that the infrastructure in Iraqi schools is low quality because of the lack of maintenance works and overuse causing by overcrowded classrooms [24].
- Some investigated standards dealt with the details of special requirements, such as disabled students with special needs, health equipment, and accessibility. Unfortunately, the Iraqi standard is devoid of these details despite the presence of students with disabilities due to the wars, insecurity and political chaos that the country had suffered.
- Regarding furniture and equipment standards, most investigated standards highlighted their compatibility with the design, anthropometric scales and the furniture characteristics for educational activities in classrooms or laboratories. Offering comfortable furniture is likely to promote the learning environments [23]. The Iraqi standards did not mention these features.

## 5. CONCLUSIONS

The development of Iraqi standards and guidelines for school design strengthen the formal educational system by improving and enhancing the quality of the learning environment. The huge shortage of schools in Iraq, and overcrowded students in the classroom have a negative effect on the process and outcome of learning. In addition, the use of the same typical plan for primary, preparatory, and secondary schools affects the building's ability to meet users' requirements. Comparing the Iraqi school standards and guidelines with other international standards reveals its lack of essential requirements of school's design through conceptual design, detailed design, and construction. Iraq's standard did not deal with many important subjects in the world of architectural design nowadays that improve learning and wellbeing such as sustainability, flexibility, comfort parameters, design aesthetic, and design safety. Therefore, the current Iraqi standards, in the form of determinants and design constraints, have made Iraqi schools lack to the flexibility necessary to respond to future changes and adaptation in educational programs.

Therefore, there is a need to expand Iraqi standards and guidelines for school design to include the missing aspects firstly and to combine them within a unified standard, which includes the design, construction and operational stages secondly. These standards and guidelines should cover the building life cycle for the three approved school types in Iraq: primary, intermediate and preparatory school.

Future research will elaborate the differences in school standards and guidelines between primary, intermediate, and secondary schools. These differences can be used to direct the adaptation process of typical school plans to meet the needs of different student ages.

## REFERENCES


[1] General Directorate of Educational Planning - Directorate of School Buildings - School Designs, 2020.

[2] Al-Dabbagh, A.H., Mahmood, M.A. (2022). Method of improving designs of built local schools according to iraqi and international criteria. International Transaction Journal of Engineering, Management, & Applied Sciences & Technologies 13(5): 1-9. https://doi.org/10.14456/ITJEMAST.2022.85

[3] Nasser, I. (2018). Evaluation of educational facilities according to the foundations and strategic standards and their impact on the urban development of the city of Nasiriyah. Thi Qar Univ. J. Eng. Sci., 9(1): 47-53. https://www.researchgate.net/publication/328856972_tqyym_mnshat_altrbyt_wfqaa_llass_w_almayyr_alastratyjyt_w_tathyrha_ly_altnmyt_almranyt_lmdynt_alnasryt.

[4] Mahmood, M., Al-Dabbagh, A.H.H. (2022). Functional durability in local schools-design characteristics affecting the spatial compactness of primary school buildings. Al-Rafidain Engineering Journal (AREJ), 27(1): 1-13. https://doi.org/10.33899/rengj.2021.130823.1126

[5] Al-Jameel, A.H., Alomari, H. (2013). Rehabilitation of Iraqi schools according to the requirements of social sustainability. Al-Rafidain J., 19(9): 112-132.

[6] Al-Jameel, A.H., Al-Omari, A.Y., Abbo Al-Yassi, T.A. (2014). The impact of adding a wing to design pattren of school buildings - evaluation the reality of local schools. Journal of Engineering, 19(9): 112-132. https://www.iasj.net/iasj/download/0a9a19a7b3bf94ce.

[7] Hamid, L. (2010). Assimilation degree of building to the change of activities. J. Inst. Technol., 24(8): A76-A89. https://www.iasj.net/iasj/article/28474.

[8] Iraqi Ministry of Planning Standard, 2018, pp. 225-261.

[9] Iraqi Ministry of Education Standard, 2017, pp. 1-55.

[10] Iraqi Ministry of Health Standard, 2019, pp. 1-112.

[11] Oxford Standard, 2019, pp. 1-6. https://www.education.ox.ac.uk/wp-content/uploads/2018/09/School-Building-Guidance-12-April-2019.pdf, accessed on Mar. 10, 2022.

[12] UNESCO Standard, 1985, pp. 1-16. https://unesdoc.unesco.org/ark:/48223/pf0000070131, accessed on Mar. 10, 2022.

[13] Seychelles Standard, 2011, pp. 1-11. http://wbgfiles.worldbank.org/documents/hdn/ed/saber/supporting_doc/AFR/Seychelles/ECD/32%20Guidelines%20on%20Minimum%20Facilities%20Standards%20for%20Education%20and%20training%20Institutions.pdf, accessed on Mar. 10, 2022

[14] Myanmar- UNESCO. 1992.

[15] California Standard, 2007, pp. 1-17.

[16] Albuquerque Standards, 2021, pp. 1-4. https://www.aps.edu/facilities-design-and-construction/documents/design-standards-and-guidelines/HS_Standards.pdf, accessed on Mar. 10, 2022.

[17] Healthy Green Schools & Colleges Standard, 2022 (Chicago Standard), pp. 1-30. http://www.healthygreenschools.org/wp-content/uploads/HGSC_Standard_9.22.pdf, accessed on Mar. 10, 2022.

[18] British Standard for School Management, 2020, pp. 1-11. https://core.ac.uk/download/pdf/4150692.pdf, accessed on Mar. 10, 2022.

[19] Saudi Standard, 2019, pp. 1-9. https://tarkhees.tbc.sa/assets/files/EtimadFiles/EnglishManual.pdf, accessed on Mar. 10, 2022.
[20] Ireland Standard, 2011, pp. 1-3. https://www.gov.ie/en/publication/7e515-technical-guidance-documents/, accessed on Mar. 10, 2022.
[21] Victoria State Standard – Australia, 2021, pp. 1-7.
[22] Kosoves Standard, 2022. https://www.education.vic.gov.au/Documents/school/principals/infrastructure/vsba-building-quality-handbook.pdf, accessed on Mar. 10, 2022.
[23] Mäkelä, T., Leinonen, T. (2021). Design framework and principles for learning environment co-design: Synthesis from literature and three empirical studies. Buildings, 11(12): 581. https://doi.org/10.3390/buildings11120581
[24] The Education Consortium of Iraq (ECI), Gaps in Formal Education in Iraq Education Consortium of Iraq. Report, 2021. https://doi.org/10.1163/2213-2996_flg_com_100063, accessed on Mar. 10, 2022.
[25] UN-Habitat, completion report for project: rehabilitation of school buildings in lower south Iraq (B1-11), Final progress report. 2006.
[26] Alzalzalee, A. (2021). Iraq's troubled school building lesson. OCCRP Organized Crime and Corruption Reporting Project, 2021. https://www.occrp.org/en/investigations/iraqs-troubled-school-building-lesson.