
The Study of the Characteristics of Flexibility in the Design of Educational Spaces

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Abstract: Throughout history, human needs are constantly changing. Meet some of these needs, like building for various aspects are willing to spend more money and time. Due to the increasing population and limited urban environment, the need to build structures that have a more lasting and are flexible enough to meet the different needs of the community is more considered. Therefore, mankind has been in search of ways that can increase the durability of his building, as a result, more people can do different activities and each activity can be related to their own time. In this study, It is intended to investigate the use of the features of flexibility in making schools which is one of the most important buildings for humans and its stability over time is considered. The study of school architecture has been done due to the use of three flexible approaches including, elements of flexibility, types of flexibility, and scales flexibility. It seems that the criteria for the design of educational facilities are set based on these three approaches and it has been tried to use these features and results to design an educational complex with a flexible approach. The method used in this study is descriptive and analytical and the argument is inductive.

Keywords: Educational Space, Flexibilit, Elements, Types, Scales

1. Introduction

It is considered that permanent change is the source of movement and change in the world and thus the affection will appear in the human's life. So with the growth of changes using flexibility is one of the important concepts of nature and functions as a way toward adaptation to change the situation to meet people's different needs. The main motivations of flexibility are divided into two main parts. The first one is the changing needs of human life as an external factor and the second one is the human inner tendency for change, diversity, and progress as an internal factor. Therefore flexibility is an approach toward responding to life changes and internal human inclinations [5].

Flexibility is playing an important part in human life. Manipulating objects is the way they operate in various ranges of environments to determine and fulfill their

demands. Adaptation for human and spaces, and could be done long for buildings adaptation as well. Buildings are adapted by different kinds of people in their desires. Their custom-made space is changing from space to place, from dwelling to home. And the period of use generates the unique essence of a place that is necessary for established architecture to exist. Walter Benjamin [3] suggested "Because the outside world of today impacts us in the most intense and different ways, our way of life is changing more quickly than in previous times. Our environment will undergo corresponding variable demands. This causes us to layouts, spaces, and buildings of which every part can be altered, which are flexible, and which can be combined in different fashions" such stated necessity of flexibility in architecture [1, 4].

Till and Schneider, 2005 argued that the idea of flexibility is an essential issue in the design of housing, and according to the current study educational complex. Flexibility refers to the concept of accommodating change over time. Thus, a

flexible house corresponds to “a house that can adapt to the changing needs of users”. Based on this researches educational spaces are a kind of place where many people use it for several years during their lives.

Research has shown that flexibility can offer a variety of meanings, but not as a final product of architecture but as a process for improving learning [9]. Research has shown that students are changing their programs and locations in educational environments with flexibility (referring to other definitions) [10].

The findings, based on data gathered from students and faculty, indicate that the renovated classroom increases student engagement, collaboration, flexibility, and learning. A flexible learning space better enables innovative approaches to teaching and learning when compared to the traditional classroom [11].

Acknowledging that learning and cognition must be studied in context, we unpacked learning in maker spaces through the examination of physical artifacts. Taking a sociocultural perspective, which connects knowledge to the “social and material history” of a person’s culture Understanding that learning is inseparable from context and community, we considered how knowledge was distributed in maker spaces that are co-constructed by their members. A distributed cognitive perspective sees knowledge as within the individual and the surrounding physical and social environment, and explores the relationship between individuals and artifacts [12].

The complex relationship between the members of a space and the surrounding environment can be navigated through boundary crossing the movement between and negotiation of tools, rules, language, and the artifacts that make this movement possible.

The term flexibility refers to spatial flexibility and the organization of man-made space and its change to achieve new conditions, needs and applications, some spaces provide many activities without the need for reorganization. Some spaces can be changed to respond to other needs [13]. Flexibility, on the other hand, is valid as a variety of physical compositions that are defined not only for indoor spaces but also for exterior space settings of the unit [14, 4]. Intervention is a little beyond moving furniture or be ready to accept interventions that make a significant difference in the building [15].

2. Proposing the Problem

Today, with the population growth in human societies and their increasing need for efficient use of spaces that could include residential buildings, educational, sports, and... is impressive. It is believed that with proper designs and approaches can solve some of the problems. One of these approaches is flexibility, which meets people’s needs during the time. It is known that one of the major problems is the lack of space in society. If space limitations are related to education and culture consequently the quality of education and culture will not

be as expected and the negative impact on the sector will be more visible. The purpose of this research is to develop a plan for efficient use of space in the building are for educational complexes.

3. The Hypothesis of the Study

1. It seems that the criteria for the design of educational facilities are set based on elements of flexibility.
2. It seems that the criteria for the design of educational facilities are set based on types of flexibility.
3. It seems that the criteria for the design of educational facilities are set based on scales of flexibility.

4. Research Methods

The research is descriptive and analytical and considering the architecture of schools is based and these three approaches: elements, types, and scales of flexibility.

5. The Definitions of Flexibility

Flexible architecture is described by [6] as follows:

“The term flexible architecture describes an architecture from which specific features can be changed in response to external affection, for instance, the users or environment. This change will occur by the building system itself, turned manually into or could be any other ability to transform by an external force” [2].

Ponti, 2005 argued two definitions of flexibility, the first one refers to the brief flexibility and suggested that the possibility of daily changing of the space features such as learning areas, connective, and so on, most of the time is guaranteed by the easy closing and opening of the doors by the quick re-programming of the plant systems of features. This may be occurred, for example, using modular spaces, from amalgamation, even temporary, of spaces.

And the second definition argued about long flexibility and points the modification of adaptability with longer timings like weekly, monthly, quarterly ..., which will be successful to act on the sides and partitions or other internal dividers. This will lead to the inevitable use of industrialized assembling / disassembling elements and plant tricks projected for « modular », with programmable functioning and calibration.

Obviously, a modern and efficient educative architecture has to pay attention even to sustainability.

The pictures showed the use of space in a way that there is no permanent wall or partition to separate the classes. Therefore Temporary partition is a successful way to help the learners when a bigger classroom is needed and certainly the design of classrooms with this method caused to save more energy and cover more students of the educational space.

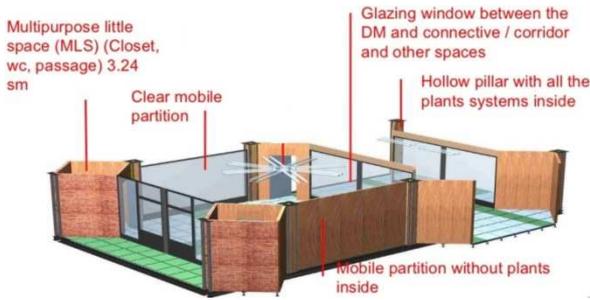


Figure 1. The mobile partitions and the communication between the different spaces [7].



Figure 2. Hive Classroom, Harvard Business School [8].



Figure 3. Learning Space Commons, Fine Hall, Princeton University [8].



Figure 4. Steelcase Learning lab With Media: Scape [8].

6. Considering Similar Samples of Flexible Schools Around the World

6.1. Haileybury Almaty School, Kazakhstan

This is the first private British school in Central Asia and Kazakhstan. The school is designed as an advanced and

inspirational learning environment in different cultures Kazakhstan. This flexible design school consists of four teaching blocks and they are connected through three corridors.



Figure 5. Haileybury Almaty School, Kazakhstan.

Special attention regarding flexibility:

1. The use of natural light for indoor lighting
2. Use special arrangement with moveable furniture in a vast space
3. Create great lighting on two floors
4. Formed part of the roof that allows light passing through the glass

6.2. Blackburn's St Silas School, England

The school has a small yard and this creates crowded. The roof of the school is also used to do some activities. The school site is located in a busy neighborhood and the school is trying to adapt to the large population of the neighborhood, create a safe environment for students. Classes are easily integrated or disintegrated through folding walls of the corridor.



Figure 6. Folding walls Classes.

Special attention regarding flexibility:

1. Create space on the roof
2. The arrangement of furniture in a way that students are facing each other
3. Classes through the walls to show the ability to integrate or disintegrate easily to the corridor.

6.3. Duke School, North Carolina, the United States

There is no passage or corridor so space can be used for learning and the great windows let Light goes well into

space and Because of the huge classes and arrangement of the furniture students have enough space to do different activities.



Figure 7. Duke school flexible classes.



Figure 8. The campus of Duke School, North Carolina, The United States.

Special attention regarding flexibility:

1. Emphasis on the characteristics of the rural environment
2. It has been tried to regard the culture and geographic region of versatility for construction
3. The school contains several bright spaces that are associated with the campus learning environment
4. There are no corridors and passages for communication of classes
5. Arrangement of furniture is placed relative to each other more frequently and can be easily moved
6. The school includes a media center and a gym
7. Library shelves are placed so that they have maximum flexibility and minimal interference with the work of students.

6.4. Brisbane Boys College, Kensington Terrace, Australia

The classes have easily become smaller and larger and there is no permanent wall to separate classes. Concerning the proper use of windows, enough light into the classrooms. Flexible Classes can cover between 25 to 90 students.

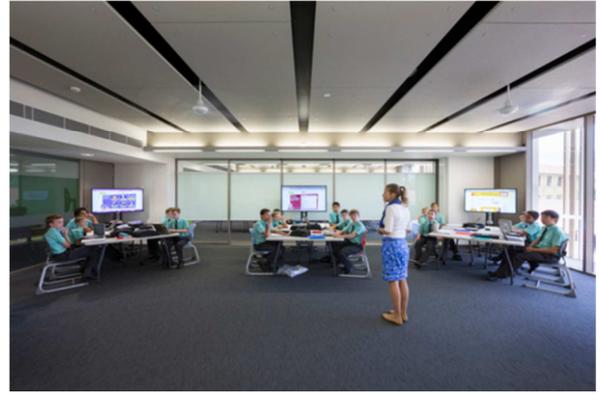


Figure 9. The space of Classes are getting smaller and larger.

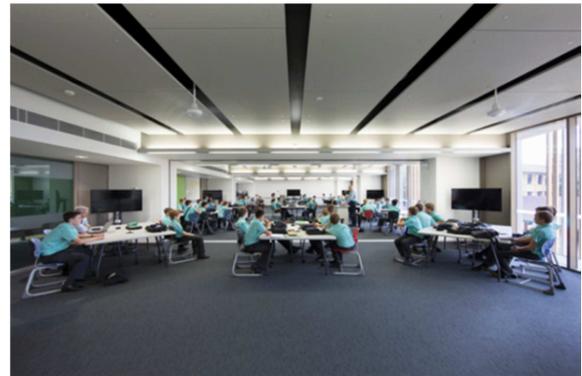


Figure 10. The space of Classes are getting smaller and larger.



Figure 11. Appropriate use of windows.

Special attention regarding flexibility:

1. Flexibility classes in such a way that they can cover between 25 to 90 students.
2. The green space on the roof is an effective way to improve indoor air quality and school as well.
3. Classes easily have become smaller and larger capacity.
4. Concerning the proper use of windows, enough light into the classrooms.
5. Even skylights are designed in such a way that if It is necessary can be used simply to sit by students. 7. No walls or columns are between classes.

6.5. Canberra Primary School, Singapore

The school in dimensions of 71 × 63 meters, which is surrounded on three sides by tall buildings, and the fourth

side of the main road is linked to the city.



Figure 12. Canberra Primary School, Singapore.



Figure 13. Canberra Primary School, Singapore.



Figure 14. Canberra Primary School, Singapore.

Special attention regarding flexibility:

1. The library is designed to use as an amphitheater for students and their families as appropriate.
2. The interior arrangement of furniture in a way that natural light entering through the window classes
3. Classes are designed in such a way that the width of the front of lengths greater and as a result students have a clearly better view of the board.
4. Use colorful space indoor and outdoor play equipment creates an attractive and diversified space for children.

6.6. Reece School, New York, the United States

The school was founded in 1948 for students who had special needs. The building is full of light and has an outer wall with rectangular colorful windows. The furniture arrangement is flexible and easily can be moved.



Figure 15. Transparent and colorful windows help light to through better.



Figure 16. Transparent and colorful windows help light to through better.

Special attention regarding flexibility:

1. Colorful windows improve the versatility and make an exciting place.
2. The school is located just one block from the central park and New York Museum so the close destination creates a good cultural and educational atmosphere in the area.

3. The place of furniture caused students to be faced with each other and therefore It helps to improve the learning

process.
4. The school uses its multi-gym.

7. Discussion

Table 1. Evaluation of schools in terms of the elements of flexibility (Authors, 2016).

Schools	Fixed space	A semi-fixed space	Variable space
Blackburn's St Silas School, England	1) Schools and classrooms on three floors of the three fixed sides 2) The topography of the site will allow the school to be built on three floors.	1) Arrangement of furniture in a particular way to get a better light through the windows. 2) Folding walls of classes can integrate or disintegrate.	Includes a part to play in the roof and the addition of 800 square meters to the site.
Reece School, New York, The United States	Full of light and has an outer wall with rectangular colorful windows.	1) The arrangement of furniture is flexible and is easily moved. 2) Having shelves in classes	
Duke School, North Carolina, The United States	Use of metal roof and certain floors.	1) Numerous internal and external communication between the buildings and learning environment 2) Because of the huge class of arrangement of furniture are placed at a greater distance relative to each other.	Buildings capable of forming several bright spaces for research groups, dining, and discussion
Haileybury Almaty School, Kazakhstan	Four formal teaching blocks that the blocks are connected through three aisles.	Use of special arrangement with moveable furniture in a vast space and variability.	By changing the place of furniture It can make a bigger space for other activities such as exhibitions or galleries.

Table 2. Evaluation of schools in terms of Types of flexibility (Authors, 2016).

Schools	Versatility	Adaptation	Variability
Canberra Primary School, Singapore	Library that is designed for outdoor can be used as well as the amphitheater.	Due to the hot and humid climate, in the north-south and classes organized by discipline teeth to prevent direct sunlight.	Different play yards and the capability of making these yards smaller for some other games.
Haileybury Almaty School, Kazakhstan	Use special arrangements with moveable furniture in a vast space.	1) The formation of the glass ceiling that light is allowed to pass. 2) Designing the school as a learning environment, and inspired by different cultures of Kazakhstan.	Specific arrangement of furniture and thus the ability to change the carrier space into a place for larger gatherings such as exhibitions and...
Blackburn's St Silas School, England	Apart to play on the roof.	The school is located in a busy neighborhood and the school is trying to adapt to the large population of the neighborhood, create a safe environment for students	Classes with folding walls can integrate or disintegrate easily into the corridor.
Duke School, North Carolina, The United States	Buildings contain bright space to create several research groups, dining, debate, and so on.	Emphasis on the characteristics of the rural school environment, such as using a metal roof, certain floors with plenty of internal and external communication.	There is no corridor, so the usage of space can be easily changed by changing the arrangement of their belongings such as its furniture.

Table 3. Evaluation of schools in terms of scale and flexibility (Authors, 2016).

School	Minor	Middle	Massive
Haileybury Almaty School, Kazakhstan	Use of special arrangement with moveable furniture in a vast space	1) Create great lighting on two floors 2) The formation of the glass ceiling so that light is allowed to pass.	Four formal teaching blocks that the blocks are connected through three aisles and the ability to integrate
Brisbane Boys College, Kensington Terrace, Australia	Sofa and chairs have been placed all around a table and easily can be moved or sometimes benches are used in collaborative activities.	1) Concerning the proper use of windows, enough light into the classrooms. 2) The green space on the roof is an effective way to improve indoor air quality and school as well.	The ability to convert the school into an office environment in the future
Blackburn's St Silas School, England	Arrangement of furniture which is located in a way that students are facing each other	Classes with folding wall can be integrated or disintegrate from the corridor	Roof space is in a small built-in height so that there is a football pitch with the capability of being divided into smaller parts and changed the usage of a football pitch.
Canberra Primary School, Singapore	Arrangement of furniture is in a way that natural light entering through the window can light the classes on from the front side.	Use proper lighting for classrooms and halls	Contact with the main road and the possibility of change to build an office environment due to the position set

8. Conclusion

According to the survey, the use of appropriate structures with great windows or even roofs that are made of glasses is rising. Thus by doing this during the day, enough light enters the educational spaces and as a consequence, various activities could be done without any problems in terms of brightness, and saving energy comes well done.

Another point in connection with the flexibility of the schools refers to the arrangement of furniture and equipment in educational space. In most of the places, the furniture is capable of being moved easily and therefore more flexible spaces will appear to do different activities which need more space. Flexibility is not limited only to the layout. The result showed that some schools used folding walls to separate their classes from the corridor and halls. Folding walls as a semi-fixed element caused larger or smaller changes in the educational space and create great flexibility for the schools.

It is expected that the use of more versatility and even the use of nature and somehow linking it to the learning environment for future schools will be considered. With increasing the population and limitation of spaces in urban areas, the need for using different features of flexibility is expected more to meet more people's needs.

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Biography



Seyed Kasra Mirpadyab is an architect, critic, author, and professor of the university is a poet is a successful architect and international architectural figure. He is currently teaching at the Ten Architecture Universities, who has been trying to educate students on new ideas and architectural visions. He is an architect interested in architectural psychology and the world's first specialist couples sex therapist by design. Kasra After a lot of research about Gender Differences of Perception and Architecture, he is now investigating architecture and determining the sex of the fetus and the height of orgasm, sexual satisfaction, and pleasure also sexual behavior and the quality of flirting by space. He is trying to bring about significant changes in architecture with the slogan (Sex Is More).