

# Assessment of Educational Outputs of Low-income Housing Project

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**Abstract**—The provision of housing to meet the rapid increase in population from all economic classes is a target of most housing programs. This paper aims to suggest a new type of economic housing in Gaza- Palestine through an architectural education studio and analyzing its acceptance through a questionnaire and interviews. The need for this type of multi-storey attached apartments in Gaza is essential considering matching it with socio-cultural values to be accepted by society members. The results clarify the best characteristics of the low-income housing. The degree of acceptance among the students was higher than among interviewees from responsible authorities.

**Index Terms**— Educational outputs; Architectural studio; Low-income housing; Assessment.

## I Introduction

Planning housing for all classes of society from low-income to high-income is an objective for most governments. Gaza is the main city in the Gaza Strip with an area of 55.5 Km<sup>2</sup> according to the Department of Urban Planning in Gaza Municipality. The population in Gaza according to the 2016 Palestinian Central Bureau of Statistics [1] is around 645 205 out of 1 881 135 for the whole Gaza Strip. The percentage of the unemployment in the Gaza Strip (for persons 15 years and above) in 2015 among men is 35.9% and among women is 59.6%. Depending on the monthly consumption of a household, the rate of poverty among individuals in the Gaza Strip is 38.8 and in Gaza city is 29.8 in 2011 [1].

Nevertheless, most of the government housing projects and the private sector supply are apartments with an area above 110 m<sup>2</sup> in Gaza which address the middle-income class. The academic work at the Department of Architecture in the largest university in Gaza is not far away from this. Hence, the idea of a new learning experience for the students of Design Studio 1 at the Department of Architecture in the College of Engineering at the Islamic University of Gaza emerged. The new project concept aimed to improve the students' design capabilities for low-income class. They had to design a multi-storey residential building for this class; each floor consists of 12-15 apartments; each one has an area of 70-80 m<sup>2</sup>. This type of attached apartments is not available in Gaza city. Most multi-storey residential buildings contain three to four apartments per floor. Additionally, it is common in educating residential buildings to have design problems such as villa, row houses, detached houses, multi-storey residential building with three to four apartments per floor and apartment's size above 150 m<sup>2</sup> for medium-income from the experience of the author which extend for more than 20 years. These types of housing were proper

many years ago, but there is a need to change as the circumstances changed. The project tries to address both housing need and housing demand to suit the local society better. Housing need is associated to the social necessity which is connected with values and norms of the society, while housing demand is connected with residents' capability to pay. The students were asked to do the best of their abilities to provide privacy, natural lighting and ventilation and the needed spaces for the apartments. Privacy is more difficult to be achieved in small area apartments, and natural lighting and ventilation are not easy to be achieved in attached apartments.

This study aims to analyze and evaluate the outcomes of a new experience of multi-storey residential buildings for low-income households. It also examines the students' acceptability of the idea of small attached apartments via a questionnaire. The students who participated in the course and others who didn't participate filled up the questionnaire. The opinion of stakeholders from local authority is the final aim to evaluate this type of apartments in Gaza case through interviews.

This study is important as it offers different plans solution for low-income apartments by reducing the area and time of construction while solving the problems of privacy and natural lighting and ventilation. The students were asked to think about solutions that meet residents' needs. Its importance can expand to face the fact that urban sprawl cannot be the optimum solution for housing in countries that suffer from scarcity in lands and overpopulation. In addition, it assesses an architectural studio experience.

## II HOUSING DEVELOPMENT IN GAZA-PALESTINE

Housing characteristics develop over years depending on changes of the lifestyle of a society and the changes in construction materials and techniques. In Gaza case, a traditional house consists of a courtyard opened to the sky surrounded by rooms which mostly opened towards the courtyard. The entrance is indirect to prevent visitors from seeing different spaces of the house except for their room [2]. Actually, the small rooms' areas, use of multi-function space and the attached houses were characteristics of these traditional houses (Figure 1) [3].

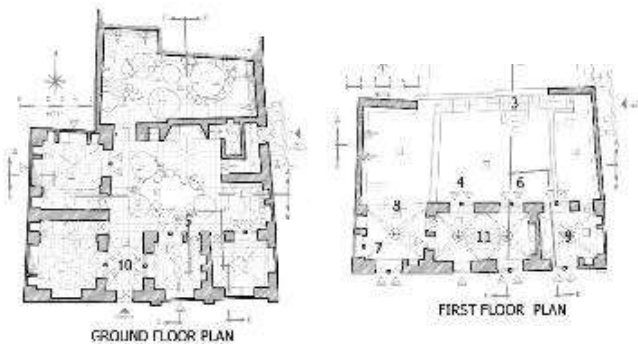


Figure 1 A traditional house plan  
Source: [3]



Figure 2 An Example of a house before 1980

After the First World War in in (1917), the courtyard was replaced by a living room covered with a concrete slab which is better for rainy weather in winter. The rooms' windows were oriented towards the setbacks. The houses were mostly two to three storeys with one apartment per floor and this continues during the Israeli occupation (1967-1994). Later and gradually from 1980, the plans of houses began to change towards separating the bedrooms to a private zone with doors open towards a small lobby and the storeys number increased. This was associated with the increase in architects' number at that time (Figure2).

The multi-storey residential buildings became commonplace after the arrival of the Palestinian National Authority in 1994 to cope with the increasing need of housing due to the normal increase in population and the return of the Pal-

estinian people to their homeland. Jabareen and Carmon [4] believed that these buildings disrupt the cultural and social fabrics because people were used to detached houses that facilitate better relationships with their neighbors.

In such buildings, each floor consists of three to four apartments, and the living room is a separate space and not the central space towards which most spaces open (Figure3).

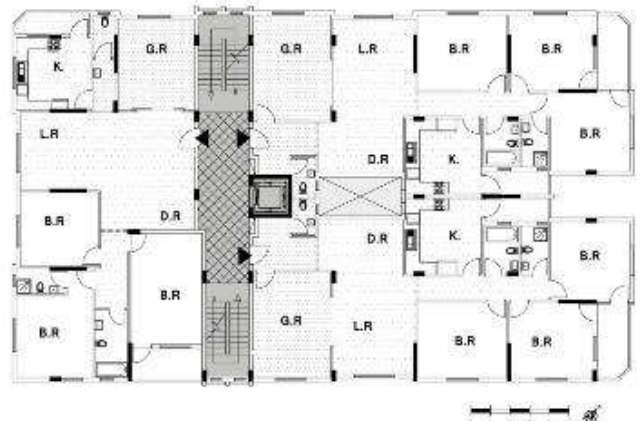


Figure 3: An example of apartments of a multi-storey building after 1980

All This type of housing became familiar for the new generation who are born in these buildings and more acceptable for new families. The change from a type to another followed the increase of architects' number in the area, and as a result of the appearance of new construction materials and methods, in addition to the effect of the colonialism. The increase in population and limited area of land were main reasons for multi-storey residential buildings appearance. Referring to a survey in 2015 conducted by the [5] 79% of the houses in the Gaza Strip are owned, 5.7 are rented and 15.2 are without payment which includes living in a house owned by parents. The percentage of owning houses was 89.42% in 2007. This gives an indication that the residents prefer to own their houses as a social value, but the percentage decreased to 79 % in 2015 following the affordability of residents.

The distribution percentage of households in Palestine by type of housing units in 2015 was 53.7 for apartments, 44.6 for house which is called locally Dar and has 1-3 storeys with one apartment per floor for relatives, 1.1 for villa and 0.6 for others which include tent and independent room [6, 7]. According to a survey in 2015, the Palestinian Central Bureau of Statistics [7] published that the average area of a house in urban areas in Palestine is 129 m<sup>2</sup>. The housing density in 2015 was 12.5% for less than 1 person for room, 46% for 1 to 1.99 person for room, 28.3% for 2 to 2.99 person for room and 13.2 for 3 or more person for room [6]. However, in a country like Ireland, the guidelines of the Government of Ireland defines a minimum area of 45m<sup>2</sup> for one bedroom apartment, 73 m<sup>2</sup> for two bedrooms apartment, 90 m<sup>2</sup> for three bedrooms apartment [8]. In a study about Palestine, Abdullah and Dudeen [9] stated that the govern-

ment strategy should enable the low-income residents who cannot allocate at least 30% of their income for buying a 100m<sup>2</sup> apartment for a period of 20 years.

In a study conducted about Jordan, which to some extent similar to Gaza case study, Al-Homoud, Al-Oun [10] declared that socio-cultural values of the users in Jordan increased the unit area and cost; there are wasted areas such as guest rooms which are rarely used in many cases. In addition, the value of users' ownership priority is for detached single-family homes first followed by apartments in buildings with a limited number of units. They pointed out to the need to change of social and cultural values of the low-income group, who required area bigger than they can afford.

The idea of the project was to design adequate low-income housing units to address some of the local housing problems, namely, the gap between supply and demand, the limitation of land and its high cost, the shortage in low-income housing by suggesting economic units that respect the socio-cultural values. Accordingly, the supposed area for the attached apartments in the design studio was from 70 to 80 m<sup>2</sup>.

### **A Provision of housing for low-income**

Locally, the government projects at the Ministry of Public Works and Housing for poor can be divided into three groups. The first includes beneficiaries who are registered at the Ministry of Social Affairs. This one is semi-free. In case the economic situation of the family gets better, it moves to a low-income housing project within facilitating from the Ministry. The apartment which the family left will be used by another poor family. The second group includes the low-income and medium income families. This type is a long-term owning project for a period of twenty years and the land is given free from the government. The apartments' areas vary from 100 to 130 m<sup>2</sup>.

The third one is housing association projects. The government participates with 40% of the land price and the remaining is paid as payments extend to 20 years. The apartment's areas vary from 150 to 190 m<sup>2</sup>.

There is another type implemented by the UNRWA on lands given free from the government. However, the private sector is still the main provider of housing as the government projects represent a low percentage of residents' demand.

However, the private sector is still the main provider of housing and addresses the needs of medium and high-income classes as in most of developing countries. Although of all these programs, there is still a need for more small size economic apartments for the poor, low-income.

### **III APARTMENTS IN MULTI-STOREY RESIDENTIAL BUILDINGS**

In a study about healthy-natural lighting in apartments in Korea Kim and Kim [11] stated that apartments in multi-storey residential buildings suffer from a shortage of natural light because of their depth. This was a challenge for students in this study particularly in a city like Gaza which suffers from shortage of electricity throughout the year.

In his study of space-saving homes, Romero [12] stated that the home with a small area is richer in possibilities than in limitations. He indicated that micro or minimal architecture disregards any useless space, decorative expression and use the flexibility of spaces. The area of entrance halls and passageways should be minimized. In addition, he refers to the importance of benefiting from interior design principles to visually expand small rooms such as color, pattern, and texture. The principles of minimal architecture are the most suitable for low-income class to give them good qualities of small size houses. Husin, Nawawi [13] and Zainal, Kaur [14] demonstrated that housing conditions plays a noteworthy role in the quality of life of poor and low-cost housing. Zainal, Kaur [14] added that a socio-economic indicator should be considered in urban issues for the poor and low-income to meet residents' needs and demands. Actually, this type of attached apartments is economic and widely used in countries like Malaysia and Indonesia and other countries for both low-income and medium-income.

### **IV METHODOLOGY**

To achieve the study aims, three tools are used. The first is plan analysis of five different configurations of the students' works in design studio1 to catch the advantages and disadvantages of each one. A questionnaire for students who participated in this course from the second year in architecture and others from the third year who did not try this type of projects to compare the effect of participating in course experience. The third is interviews with governmental officials in the field.

The project began by asking each student to look at similar projects all around the world to criticize them in the light of the local lifestyle. Oh, Ishizaki [15] considered critiquing as a fundamental practice in teaching architecture design studio, and it should take place between teachers and students and among students themselves. While analyzing the projects the students think about the problems included in each one, and how to solve these problems in their projects. Thinking about problems and how to solve them were defined by Ustaomeroglu [16] as the main aim of a design studio. He added that the instructor guidance can help.

This was followed by a group discussing, in the class, of the positive and negative aspects of each one related to local social and environmental aspects. The sites and the requirements of the project were submitted to students. This includes six different sites. The students were asked to design from 12-15 apartments in each floor with an area of 70-80 m<sup>2</sup> for each one, and at least two stairs. The floor number is three in addition to a ground floor. Each apartment consists of a living room, two to three bedrooms, a bath, a kitchen and a water closet. They were asked to consider natural lighting and ventilation for at least bedrooms and living rooms to minimize running cost post-residing. This was a big challenge in this type of attached apartments. A description of the value of flexibility of using a space for different activities and multi-use of furniture was explained to stu-

dents, for example, using a living room as a space for social interaction, studying, eating or even sleeping at night. Students have to adapt with the area and requirements to innovate distinctive solutions. Actually, after the students had the requirements for the project, they recognized the problem, then, they began thinking to achieve solutions using free-hand sketching at the beginning to imagine the scale. They began to minimize the negative aspects with the help of the instructors. Fifty projects were submitted.

A questionnaire for both the students who attended the class who did not attend it. The questionnaire aimed to assess their low-income projects. It consists of three parts; the first is general information about the respondent, and the second part measures the better characteristics of the economic housing and the degree of acceptance of this type of housing. The best five students' plans with different configurations were used in the third question to be evaluated. An electronic questionnaire was distributed through students' groups on Facebook. This is an easy way to get fast responses and high response rate. There were 46 respondents out of 50 from the students who participated design studio1 and 44 respondents out of 50 from other years. The questionnaire was analyzed using SPSS software.

The opinion of governmental officials in the field, including senior officials, was important as this type of housing projects is not available. There are 13 interviewees; five from the Ministry of Public Works and Housing, five from the Ministry of Local Government including architects and non-architects, two from municipalities and one from Palestinian Housing Council.

These two ministries are the most relevant authorities in housing provision. The interview consists of four open-ended questions; one is related to the government housing projects, and the others are to evaluate the positives and negatives of the outcomes of the five plans of students' works and the possibility to apply such design locally. The fourth was to assess the importance of the educational process in forming the ideas of local architects to find creative solutions for the housing projects in Gaza.

## V DISCUSSION AND ANALYSIS

### A Discussion and analysis of the plans

The students' configurations of the apartments diverse to include five major types: open corridors around a closed courtyard, two corridors around an open courtyard, an open corridor around a closed linear courtyard, an internal corridor and three clusters around two semi-separated closed courtyards. The challenge was to achieve as much as possible privacy, natural lighting, and ventilation. Natural lighting and ventilation are important in all countries, but they are of special importance in a city like Gaza which suffers from lack of electricity for many years. Natural lighting and ventilation for all spaces is not easy. Hadid [2] argued that privacy is an important value in a society such as Palestinian people. Privacy is more difficult to be achieved in small area apartments. However, all students' plans have the three major zones in an apartment public (living room), semi-public

(the kitchen) and private (the bedrooms). Still, living room in this type of economic housing can be used for both family and visitors, the kitchen is separated and can be used from all family members; the bedrooms are exclusively for family members. The kitchen in many of the apartments belongs to the lobby of bed rooms. According to the society cultures and values, this keeps the privacy of the family when it has visitors in the living room. In addition, living room is a flexible place that can be used for different activities such as a sitting area for family members, a sitting for visitors. Asfour et al. [17] assured the importance of flexibility in housing design as it increases housing utilization efficiency. Actually, according to family number in Gaza, there is a need for three bedrooms, but for saving spaces, the living room can be used as a third bedroom at night. Most of the apartments at the corners of the architectural plans have three bedrooms as they have two outside facades (Figure 9). The five different best projects' plans are shown in Figures 4 to 8. The students try to avoid the negative aspects they saw in other projects such as lack of privacy. Many spaces in these projects have their windows looking towards the open corridors which are not accepted locally. In the following, a discussion of these plans using critical thinking which is defined by Çakır and Yurtsever [18] as to think about many things at the same time including positive and negative aspects. In all configurations, to minimize the area used for corridors the passageways are through the living rooms, and entrance halls are part of the living rooms.

Each of Figure 4 & 5 has a courtyard. However, in case 1 the land is larger, the courtyard is closed, and the corridors and four apartments opened on it. In case 2 the courtyard is opened from one side which is the direction of the lovely wind in summer and the benefit for lighting and ventilation from the courtyard is for the apartments and stairs.

To allow the lovely wind to get into the courtyard in case 1 there is a window in the middle space between the two west apartments. In addition, ten of the apartments in both cases have ventilation for their kitchens from small inner courts. The apartments are divided into two groups separated from each other.





Figure 4 Case 1-Open corridors around a closed courtyard

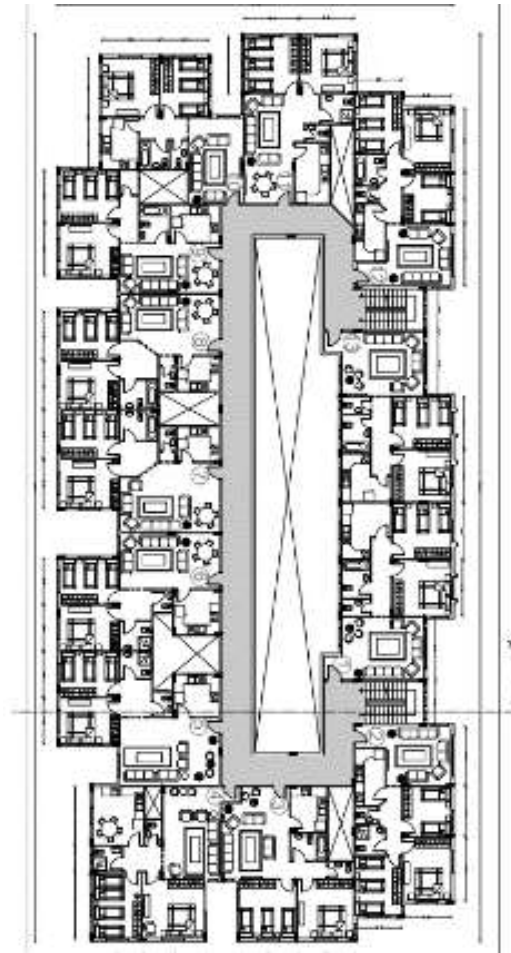


Figure 6 Case 3- An open corridor around a closed linear courtyard

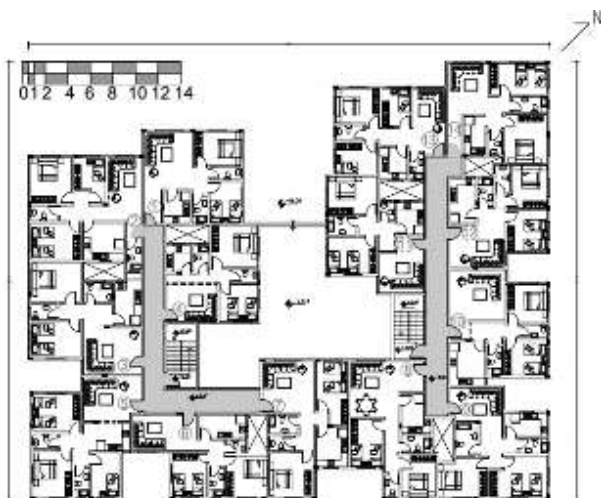


Figure 5 Case 2- Two corridors around an open courtyard

In both cases 3 and 4, the plots have the shape of a linear rectangle. So, the solution was to gather the apartments around a linear courtyard surrounded by an open corridor that links the whole apartments in case 3 and around an internal corridor in case 4. In case 3, the two stairs are at the ends of the corridor (Figure 6). As a result, they are far from some apartments. In case 4, there are three stairs among the whole apartments (Figure7). The corridor is closed and get its natural ventilation and lighting from the stairs. Most of the apartments' kitchens have ventilation from small inner courts.

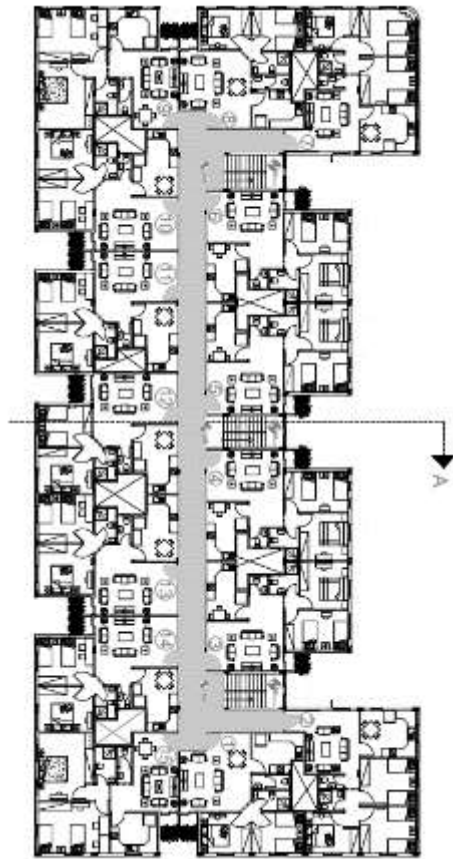


Figure 7 Case 4- An internal corridor



Figure 8 Case 5-Three clusters around two closed courtyards

Case 5 in Figure 8 is different as it divides the apartments into three groups, and each group has a separate stair. There are two courtyards that give natural ventilation and lighting for eight apartments and for the corridors. Half of the apartments' kitchens get natural ventilation from small inner courts. In general, it can be seen that case 3 and 4 have a horizontal continuity movement among the whole apartments in one floor. Case 1 and 2 are divided into two groups, and case 5 has three groups. Cases 2 and 5 benefit from the courts for natural ventilation for apartments while case 1 and 3 benefit from the court mostly for the corridors and partly for some apartments. Case 4 which does not have a courtyard, has the largest number of apartments, eight small inner courts and the highest percentage of the built area. However, it is less efficient in natural light and ventilation (Table 1).

TABLE 1 Assessment of the Five Types of Plans Configuration

	Item	Case1	Case 2	Case 3	Case 4	Case 5
1	Area of plot	2252	2056	2010	2010	2056
2	Built area	1311	1270	1204	1310	1200
3	Percentage of built area	%58	61.8%	59.9%	%65	%58
4	Number of units	14	14	13	15	12
5	Number of small inner courts	6	6	5	8	5
6	Existence of a large court	Yes	Yes	Yes	No	Yes
7	Number of stairs	2	2	2	3	3
8	Ventilation for kitchens	10 towards small courts	10 towards small courts	9 towards small courts	13 towards small courts	8 towards small courts
9	Continuity of a corridor	Not available	Not available	available	available	Not available
10	Opposite entrance doors	8 apartments	2 apartments	no apartment	10 apartments	4 apartments
11	Linkage between apartments	2 groups	2 groups	1 group	1 group	

While using a large percentage of built area, less quality of natural ventilation and lighting can be achieved. It is clear that the higher percentage of built area, in case 4, is associated with the largest number of the apartments per floor and there is no large courtyard while there was a need for extra small inner courts among the apartments.

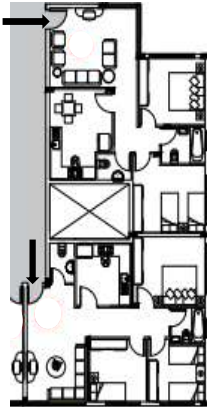


Figure 9 An enlarged corner apartment

Both cases 1 and 2 have almost the same characteristics, but the percentage of built area is higher in case 2 as the courtyard is smaller. Although the courtyard is smaller, the lighting and ventilation are better as it is open from one side. Case 5 has a courtyard divided into two parts by a passage-way. It has the same percentage of the built area as case 1, however, case 1 has two more apartments as its plot area is larger. Table 1 shows a comparison between the five types.

**B Discussion and Analysis of the Questionnaire**

The first part of the questionnaire defines an optional name, the academic level, area of the house in which the student lives. 46 respondents are from the second year in architecture and 44 are from the third year considering that there is a year for studying general engineering at the beginning of the study. The results show that 29.5% of the respondents live in a house with an area more than 200m<sup>2</sup>, 44.3% in a house of an area between 150-200m<sup>2</sup>, 25.0% in a house of an area between 100-149m<sup>2</sup> and 1.1% in a house of an area less than 100m<sup>2</sup>. The second part of the questionnaire asks about the proper characteristics of housing for low-income. To investigate the internal consistency reliability for the items, there is a need to measure Cronbach's Alpha value. Table 2 shows a very good value of (0.86).

TABLE 2 Reliability Statistics

Reliability Statistics		
Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	No of Items
.857	.865	18

The five-point Likert scale was used; it ranged from strongly agree with 5 points to strongly disagree with 1 point. The items which have the highest means are: "Privacy is essential for bedrooms" with a mean of 4.24, "Using a multi-storey building is a good solution for low-income" with a mean of 4.14, "Flexibility in using one space for different uses is acceptable" with a mean of 4.01, "Living room is the most important space" with a mean of 3.92, "It is enough to have a bathroom and a water closet" with a mean of 3.85, "Living room can be used as a guest room" with a mean of 3.84, "70-80 m<sup>2</sup> area is proper for low-income families" with a mean of 3.82, "Living room can be used for eating" with a mean of 3.82. It is clear that the importance of living rooms decreased in this generation. It could be the effect of the wide spread of laptops and mobile phones.

The lowest items are: "It is acceptable to open a bedroom window on an inner small courtyard" with a mean of 1.61. It is important in the social life in Gaza to have natural lighting and ventilation for bedrooms as they are used for the study, play, read and other uses, in addition, to sleeping. The other low mean items are "Opposite external doors are acceptable" with a mean of 2.89, "It is acceptable to open a kitchen window on a courtyard" with a mean of 2.89. The answers are almost moderate. Opposite external doors can penetrate the privacy of others just in case both of apartments' doors opened at the same time. In Gaza, the kitchen is so important for the whole family; it is a space to cook, eat, and talk while a mother is cooking. "This type of housing is essential in Gaza" is the last item, and it has a mean of 4.23 (Table 3).

Ustaomeroglu [16] approved that a good design is not associated with the larger areas or expensive cost. The item of "Passing through living room is better than using a corridor" has a mean of 2.94. This mean is low and some students are still unconvinced of passing through the living room space to minimize the less important spaces in the apartment. There are no significant differences between the answers of the two groups. Eigbeonan [19] stated that there are many similarities in ideas among students since they share their society culture, but if these ideas are not accepted scientifically it is hard to change them.

In the third part of the questionnaire, the respondents were asked to arrange the plans from 1 to 5 considering number 1 is the best.

The answers were reversed in analyzing. Table 3 shows that the best plan was case 2 with a mean of 4.0 followed by case 1 with a mean of 3.5. The last one was case 4 which does not have a courtyard with SD 1.6. About 48% choose it the last choice. Case 5 was chosen to be the first, fourth, fifth with a percentage of about 23% for each, and as the second and third with a percentage of about 15% for each. The following part discussed the reasons for choosing (Table 4).



**TABLE 3** Descriptive Statistics of the Characteristics of the Low-income Housing

No.	Item	Mean First year	Mean second year	Total mean
1	Living room is the most important space.	4.00	3.83	3.92
2	70-80 m <sup>2</sup> area is proper for low-income families.	3.89	3.74	3.82
3	Living room can be used as a bed room.	3.24	3.12	3.18
4	Living room can be used as a guest room.	3.74	3.95	3.84
5	Living room can be used for eating.	3.93	3.69	3.82
6	Opposite external doors are acceptable.	2.85	2.93	2.89
7	One balcony is enough.	3.13	3.60	3.35
8	Flexibility in using one space for different uses is acceptable.	3.96	4.07	4.01
9	Passing through living room is better than using a corridor.	3.09	2.79	2.94
10	It is enough to have a bathroom and a water closet.	3.93	3.76	3.85
11	Using multi-storey buildings is a good solution for low-income.	4.02	4.26	4.14
12	Using many apartments in one storey is proper for low-income.	3.70	3.86	3.77
13	It is acceptable to open a kitchen window on an inner small courtyard.	2.98	2.79	2.89
14	It is acceptable to open a bathroom window on an inner small courtyard.	3.63	3.33	3.49
15	It is acceptable to open a bedroom window on an inner small courtyard.	1.54	1.69	1.61
16	There is no need for entrance hall.	3.74	3.52	3.64
17	Privacy is essential for bedrooms.	4.22	4.26	4.24
18	This type of housing is essential in Gaza	4.15	4.31	4.23

Regarding plans of Figures 4 and 5 the respondents, who like them, stated that they have a good natural lighting for the external corridors and the accessibility to the apartments are easy; each plan is divided into two parts which minimize the number of neighbors at the same storey, minimize social problems and noisy and minimize crowded at the external corridors.

**TABLE 4** Descriptive Statistics of the Five Plans

	Min.	Max.	Mean	Std. Deviation
Case 1	1	5	3.5	.982
Case 2	1	5	4.0	1.088
Case 3	1	5	2.6	1.143
Case 4	1	5	2.4	1.609
Case 5	1	5	2.9	1.500
Valid N (list-wise)				

For Figure 5, they added that opening the courtyard towards the lovely wind in summer is good for the spaces which are oriented towards the internal courtyard. Another positive point is the external doors are not opposite. The internal courtyard will give a good view for the residents.

For both Figures 6 and 7, the external corridors are very long for reaching the apartments, and this is not good visually. They added that the very long courtyard in Figure 6 is not good for natural lighting and getting sunshine. Some stated that Figure 7 is the best for economic housing as it has the highest percentage of the built area; the layout of the building is very long which help in giving natural lighting for more spaces; they admired the existence of a balcony for each apartment. However, this plan has opposite exterior doors which is not good for privacy. For the last case in Figure 9, some like the irregular external corridors, while others dislike them. Some admired dividing the plan into three groups to minimize social problems and minimize the number of persons in external corridors which are short compared with other figures.

In general, many appreciate using courtyards for this type of housing which adds a natural view for residents, give their children a space to play and give an external view and natural lighting and ventilation for apartments and corridors. For me as a lecturer, I think this questionnaire gives the students the opportunity to scrutinize and inspect the five projects at the end of the semester and most of them gave good and convincing reasons for their answers.

The last question was to evaluate studying this experience. Most of the opinions are positive except three. The most repeated expressions are: beneficial, interesting, realistic to Gaza case, distinguished, functional, important, rich, proper, very satisfied, unique, and nice. Some referred to its importance to young spouses; others said: "I became more acceptance to this type of houses".

For the students who didn't attend the studio, the same expressions are used; some students declared that they hope if they try it themselves as a design project or as a house to live in.

**C Discussion and Analysis of the Interviews with Stakeholders**

The interview has four questions. The first question asks about the extent to which the government projects addressed the low-income housing. All respondents replied that in terms of number, the projects are not enough. Some explained that they are



associated with the availability of external fund. In terms of quality and price, some considered that most of these projects cannot address the need of low-income because they cannot afford the payments.

Regarding the second question about the proper apartment area for low-income housing, the respondents from the Ministry of Public Works and Housing stated that the area should be estimated according to the number of family members. They added that the low-income families are large families, and 120 m<sup>2</sup> is proper. Two attendants considered 80-90m<sup>2</sup> is enough, another two respondents defined 145 m<sup>2</sup>, while the others defined a wide range from 80-120m<sup>2</sup>. In general, it is clear that most of the attendants are against 80 m<sup>2</sup> as a proper area for low-income, and some considered multi-storey attached housing is not accepted socially. The evaluation of the outputs of the students' works in the third question supports this.

The lowest number considers the output of students suitable for the category mentioned, while most of the attendants see that they do not fit the large number of the family members, and they may be rejected by residents as there are a lot of apartments on the same floor which minimizes the privacy and may cause social problems among residents. This makes case 5, which divides the project for three separated groups more appropriate as it reduces the number of families in the shared hallways on each floor. Some added that there is a need to have socially homogenous categories in each building to reduce the cultural and social gap.

The same social characteristics are found in Jordan which is near to Palestine in the previously mentioned study of [10]. They affirmed the need to change the social and cultural values of the low-income group, to suit their financial capabilities. In this study, there is a need to change the social and cultural values so as to follow the effective demand which links the demand with the financial capabilities of residents, not the potential demand which represents their dreams. Everyone agrees that this type of apartment is suitable for young couples, as owning or renting, to serve the first family years of life.

In general, the whole interviewees praised the advantages of the designs in terms of economy in space and cost and providing a good level of natural ventilation and lighting. However, they expressed their concern about the possibilities of social problems occurrence among the neighbors because of the numbers of neighbors on the same floor. Locally, three or four apartments per floor are the normal cases. Additionally, problems related to the management and maintenance of the shared spaces and noise were defined.

From the total comments, we can conclude that there is a need to increase the area slightly to reach 100 m<sup>2</sup> by adding a third bedroom, and to minimize the number of apartments sharing the same common spaces in the same floor, and this will be considered in the course for the next years. The concept is to minimize the area gradually so as the residents can acclimate to these changes bit by bit.

Since the development in housing, over the years, is associated with the changes happened in social life and the economic and technological potential, it is supposed that human beings have to adapt themselves to these changes. This will help to find proper solutions to the housing problems in the developing

countries, including Gaza, one of which the gap between demand and supply. There is a lack of supply for low-income class. One of the interviewees indicates that there is a need to study the market needs for each class of residents to minimize the gap between demand and supply.

Regarding the fourth question, the whole agreed on the importance of the educational process in forming the ideas of local architects to find creative solutions for the housing projects in Gaza. One of the participants suggests the participation of officials from the governments' authorities in the educational process to link it with the local reality.

## VI CONCLUSION AND RECOMMENDATIONS

This study presents a new experience in an architectural studio that addresses the needs of low-income class by suggesting small attached apartments in multi-storey-buildings. The students were asked to evaluate such universal buildings from internet websites to find out the disadvantages from the local perspective. They were asked to find different solutions that overcome these weaknesses. The study displays five different solutions: open corridors around a closed courtyard, two corridors around an open courtyard, an open corridor around a closed linear courtyard, an internal corridor, and three clusters around two closed courtyards.

The architectural analysis compares the strength and weakness of each one. A questionnaire is used to define the proper characteristics of apartments for low-income housing and to evaluate these five solutions. The sample size in the questionnaire is limited due to the number of students who participated in the class. However, they give important and sufficient findings. The statistical analysis of the questionnaire showed the proper characteristics of apartments for low-income housing from the students' perspectives. The most important characteristics were: 'Privacy is essential for bedrooms, Using a multi-storey building is a good solution for low-income, Flexibility in using one space for different uses is acceptable, Living room is the most important space, It is enough to have a bathroom and a water closet for an apartment, Living room can be used as a guest room, 70-80 m<sup>2</sup> area is proper for low-income families respectively'. Opening a bedroom window towards an inner small courtyard was not accepted. The students choose the solutions of 'two corridors around an open courtyard' and 'open corridors around a closed courtyard' as the best from their opinion, while the officials who participated through interviews prefer the solution of three clusters around two closed courtyards. The students appreciate architectural characteristics such as natural ventilation and lighting from a large courtyard, while the officials pay more attention to the privacy and crowded. They supposed that the fewer the numbers of families at the same floor the lower the social problems. The interviews show that the government housing projects are not enough and some added that they are not affordable for low-income families. Most of them were not satisfied with the suggested area for the apartments (70-80 m<sup>2</sup>). From their experience, they think that the area should be proportional to the number of family members even for low-income class. As such, they consider the five cases

of students' projects suitable for young couples. From a different perspective, when the choice is between the less-than-ideal or nothing, the suggested areas of studio output would appear sufficient and suitable. Actually, there is a need to change the social and cultural values regarding housing size so as to follow the effective demand which links the demand with the affordability of residents, not the potential demand which represents their dreams. The whole of interviewees assured the importance of the educational process in forming the ideas of local architects to find creative solutions.

As the participants in the interviews are not satisfied with the suggested small apartments, there is a need for a future study about the needs of the youth for their future houses. These youths will be the inhabitants of the houses in the near future.

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