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The interior design development of the Engineering College building at Al-Azhar University

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ABSTRACT

Summary of research

Universities are considered one of the key pillars upon which countries build their future across various fields, whether in education, scientific research, or community development. In Egypt, which has a long history of higher education, the need to develop universities and improve their performance to keep pace with global changes and meet the evolving needs of the job market has become urgent. This development includes improving the quality of education, enhancing scientific research, developing infrastructure, and offering innovative educational programs that suit the needs of the modern era. In addition, it is essential to update educational systems and apply modern, interactive, and innovative learning methods, as well as integrate universities with economic and industrial institutions to achieve sustainable development. This research discusses the main challenges facing Egyptian universities in their journey toward development, along with an overview of some possible solutions that could contribute to achieving this goal. Furthermore, the number of international students enrolled at Al-Azhar University was around 40,000 to 50,000 students annually.

Scientific Research Methodology:

- Al-Azhar is one of the oldest heritage buildings in Egypt, especially in Cairo. The project's problem is divided into several issues:[١]

1- Distribution of spaces: Designing spaces in a way that achieves balance in the horizontal plan.
2- The traditional shape of universities, including conventional classrooms and lecture halls.[٢]
3- The underutilization of the university's outdoor courtyard: Green architecture and the presence of green spaces play a positive role in the health and productivity of students.[٢]
4- Neglecting the university's exterior design, as well as the lack of maintenance or restoration of the building to make it harmonious with the environment.[٢]
5- The unequal distribution of spaces for students and teachers: Designing clear pathways and easy access to student areas, classrooms, and faculty offices.

Objectives of the Research:

1-Enhancing and supporting education in Egypt.

2-Providing an exceptional experience for international students.

3-Offering interactive educational resources for university students.[١]

4-Contributing to the state's economy through sustainable income sources.[٢]

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5-Developing universities in Egypt.

Research Questions:
1-Can sustainability be achieved through the interior design of the Faculty of Engineering building at Al-Azhar University?[٢]

2-What is the impact of developing the interior design of universities on the learning environment?[٢]

3-What is the impact of integrating interior design with artificial intelligence applications?[٢]

Research Sample:

- The sample of this research focuses on the development of the Faculty of Engineering building at Al-Azhar University. It explores new design proposals, incorporating artificial intelligence-based teaching tools and blending AI education with Islamic culture.

Expected Results of the Research:

- Reaching new and innovative designs to rejuvenate the Faculty of Engineering building at Al-Azhar University.[٢]
- Integrating design thinking with artificial intelligence and Islamic culture.[٢]
- Merging interactive education with Islamic culture.[٢]

Introduction:

- The process of developing the interior design of the Faculty of Engineering building at Al-Azhar University is crucial for improving the educational environment and creating a suitable academic space for both students and faculty members. The interior design reflects the identity of the educational institution and significantly influences the learning experience and social interaction within the campus.
- This study aims to improve the quality of the internal spaces of the building to meet the needs of students and faculty members, while also enhancing the aesthetic and functional aspects of the building. This includes improving space distribution, selecting appropriate colors and furniture, and ensuring the creation of a productive environment that fosters interaction among students.
- The study will address the stages of the design development process for the building, starting with an analysis of the current situation, followed by development proposals that align with global interior design standards, leading to innovative design solutions that provide an ideal educational environment.
- The importance of this research has increased due to the continuous advancements in architecture and interior design fields, requiring a thoughtful and applied approach that reflects the needs of the modern era and the requirements of contemporary educational environments.[1]

Study Area of the Project:

Location of the Faculty of Engineering at Al-Azhar University:

- The Faculty of Engineering is located in Cairo, specifically in the Nasr City area, within the university's campus.[٤]

Nature of Surrounding Buildings of the Faculty of Engineering at Al-Azhar University:

- Educational and Administrative Buildings:

- There are several buildings that house the various academic departments of the

[1] Al-Zaydi, A. & Al-Akili, A. (2017). *Al-Azhar Al-Sharif and its Impact on Cultural Thought in Egypt*.
Fahim, M., Abdel-Hadi, S., & Al-Barmagly, H. (2022). *A Proposed Framework for Designing Smart Campus Spaces*.
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faculty, such as laboratories, lecture halls, libraries, and administrative offices.[ٔ]

- Student Housing Buildings:

- Some residential buildings may be located in the surrounding area to accommodate students coming from distant regions.

- Commercial and Service Buildings:

- In some nearby areas, there are commercial and service buildings that provide amenities to students and staff.

Surrounding Context of the Faculty of Engineering Building:

- The Faculty of Engineering building is bordered by **Engineering Street**, and the **Al-Azhar University Girls' College** is located nearby. To the east, there is the **Faculty of Engineering's Computer and Systems Engineering Department**.
- The **Faculty of Engineering's Urban Engineering Department** is also close by, along with the **Al-Azhar University Specialized Hospital**, the **Al-Azhar University Girls' College of Nursing**, and the **Emirates University Dormitory**.
- The area is also surrounded by buildings of the **Faculty of Agriculture**.
- This context highlights the central location of the Faculty of Engineering within a vibrant educational and service-oriented environment at Al-Azhar University.

The Main Buildings:

Civil Engineering Building:

- The building consists of 5 floors and includes 7 specialized laboratories for the Civil Engineering Department, as well as the required spaces and classrooms for lectures.[ٔ]

Electrical Engineering Building:

- The building consists of 4 floors and contains 5 laboratories, along with main spaces and classrooms.[ٔ]

Systems and Computer Engineering Building:

- The building consists of 4 floors and includes 11 laboratories, along with the necessary academic spaces and classrooms.[ٔ]

Preliminary Year Building:

- The building consists of 2 floors and includes 2 laboratories, along with academic spaces and classrooms.[ٔ]

Mechanical Engineering Department:

- (Note: You didn't provide further details on the Mechanical Engineering Department, but based on the pattern, it would likely include similar features such as classrooms and specialized laboratories for mechanical engineering studies.)[ٔ]
- These buildings are designed to support the academic and practical needs of students in their respective engineering fields, offering both lecture halls and specialized laboratories.

The department consists of three buildings:

-The **old building** .

- The **new building**, both located next to the **workshops building**.

The department includes 9 laboratories, 7 workshops, and various academic spaces and classrooms.[2]

Figure 1 shows the location of the Faculty of Engineering building at Al-Azhar University.

The Electronic Portal of the Faculty of Engineering, Al-Azhar University.

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Surrounding Environment of the Site:

-The Faculty of Engineering building at Al-Azhar University is located in Cairo, specifically in an area that is one of the most vibrant in the city, containing many residential and commercial establishments.

Urban Environment:

- The surroundings of the Faculty of Engineering are characterized by an urban environment, with residential and commercial buildings surrounding the area. The region is filled with main roads and public utilities.

Gardens and Green Spaces:

- Despite the urban character of the area, there are some small gardens and scattered green spaces throughout the city, although they are not large or expansive.

History of the Establishment of the Faculty of Engineering at Al-Azhar University :

- The Faculty of Engineering at Al-Azhar University was established following Law No. 103 of 1961. It was one of the first modern faculties created during that time. The academic year 1963/1964 marked the start of studies at the faculty, and the first batch of graduates completed their studies in the academic year 1968/1969. The total number of graduates in the first batch was 113 students, distributed across various departments such as Civil Engineering, Electrical Engineering, Mining and Petroleum Engineering, Mechanical Engineering, Architecture, and Planning. The total number of enrolled students in the same academic year was 1,557.[٤]

- The history of the development of the Faculty of Engineering at Al-Azhar University is part of the broader development of the university itself, which was founded in 1961. Al-Azhar University is one of the oldest universities in the Islamic world and plays a significant role in higher education in Egypt and the Arab world.[٤]

- The development of the Faculty of Engineering at Al-Azhar University began in the early 1970s as part of the expansion of engineering education in Egypt. Initially, the faculty offered educational programs in various engineering disciplines, including Civil Engineering, Architecture, and Electrical Engineering.[٤] Since the 1970s, the building has not received significant attention for development, and as a result, the building has not achieved any form of sustainability, as shown in Figure No.1

Figure 2 illustrates the lack of external maintenance and attention to the building.

Figure 2 shows the design of the exterior facade of the Faculty of Engineering building at Al-Azhar University.

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Type of Building:

- The building type used in the project consists of a ground floor and two upper floors (first and second floors). The building is characterized by a structural system made of columns and beams.[٥]

Structural System:

- The structural system in the building determines how loads and forces are distributed across the different elements of the structure, such as columns, walls, and surfaces. This system ensures the building's structural stability, allowing it to withstand various loads such as the building's self-weight, live loads (people, furniture), and external forces like wind and earthquakes.[٦]
- The structural system used is the traditional structural system with columns and beams.[٦]

Design Issues of the Faculty of Engineering Building at Al-Azhar University:

Deteriorating Condition of the Building: The building is in a deteriorated state, which negatively affects the students' experience, as shown in Figure No. 2.

Lack of Sustainability Goals: The building does not meet sustainability criteria in terms of materials, lighting openings, and ventilation.

Neglect of the Building's Exterior: The exterior of the building has been neglected, and the building materials have not been updated.[3]

Neglect of the Surrounding Courtyard: There are no intellectual gardens or spaces for students around the university.

Lack of Modern Equipment and Facilities: The laboratories within the faculty are equipped with outdated equipment.

Proposed Design Concept and Objective:

- The aim of this research is to study and renovate the Faculty of Engineering building at Al-Azhar University in line with sustainability standards. The renovation will include upgrading building materials, refreshing the building's interior design, and improving the classrooms and laboratories by incorporating modern educational tools.
- Additionally, the design aims to reorganize the spatial distribution and take full advantage of natural lighting within the building.[٢]

Design Standards to Be Considered in the Building:

- **Preserving the Structural System and Exterior Design:** The structural system and the exterior of the building should be maintained in accordance with Figure No. 3.
- **Reworking the Spatial Layout:** Redesigning the distribution of spaces inside the building.[٥]
- **Renewing the Ventilation System:** The design will incorporate Islamic architectural heritage elements.[٣]
- **Intellectual Gardens:** Implementing the concept of intellectual gardens within the building and improving the surrounding courtyard, as shown in Figure No. 5.
- **Sustainability Standards:** Striving to achieve maximum sustainability standards, in accordance with LEED (Leadership in Energy and Environmental Design) criteria.
- **Global Design Standards:** Introducing design principles that align with global standards for interior and architectural design.
- This proposed approach aims to revitalize the Faculty of Engineering building while enhancing its functionality,

٤Faculty of Engineering, Al-Azhar University.

٥-Departments of the Faculty of Engineering, Al-Azhar University, Cairo for International Students, 2024. EDU GATE.

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sustainability, and overall educational environment.

- Facilitating the Presence of Corridor Areas for Students to Ease Movement Inside the Building.

Figure 3 illustrates the design of the exterior courtyard of the college.

Figure 4 illustrates the exterior design of the university.

Intellectual Gardens

-Intellectual gardens in universities are spaces dedicated to promoting intellectual and cultural discussions between students and faculty members. These spaces are -- not only physical, such as gardens or open areas on campus, but also include intellectual activities and discussions that focus on developing critical and creative thinking.

The area surrounding the college building can be used as an **intellectual garden** for students, which enhances their **critical thinking**.[٥]

It fosters **creative processes** among students.

It enhances relationships between students.[4]

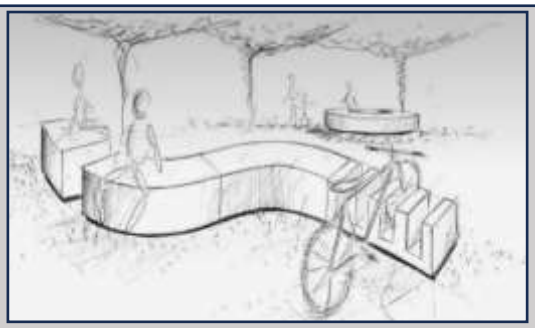

Figure 5 is an illustrative image that shows the design of the intellectual gardens for students.

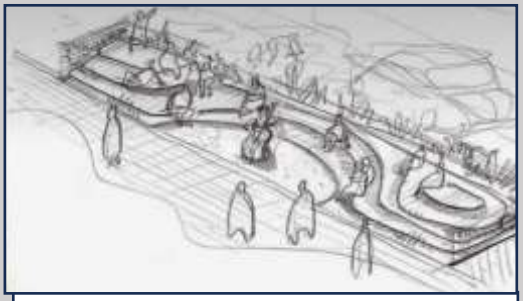

Figure 6 is an illustrative image that shows the design of seating areas within the intellectual garden in the courtyard of the Faculty of Engineering building at Al-Azhar

٤-Departments of the Faculty of Engineering, Al-Azhar University, Cairo for International ٥-Students, 2024. EDU GATE.

Rashidi, A. (2022). Towards Design Standards for Spaces in Egyptian University Plans.

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Problems with the Building's Exterior Facade:

-The small size of the windows in the building prevents a significant amount of natural light from entering the building.
-Neglect of the building's exterior.
-Damage to parts of the building.
-Lack of proper ventilation in the building.

Proposed Design Solutions for the Facade of the Faculty of Engineering, Al-Azhar University:

-Use of light deflectors for the building.
-Increase the number of openings in the building's facade.[5]
- Incorporate decorative designs that reflect the Islamic identity in the building's exterior.

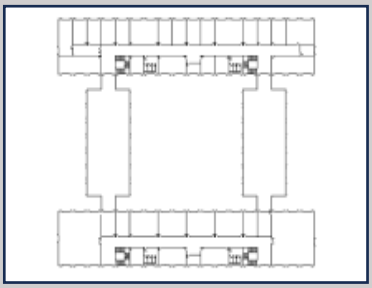
An explanatory image showing the current condition of the building's facade.

An explanatory image showing the proposed design for the facade.

Interior design problems of the building

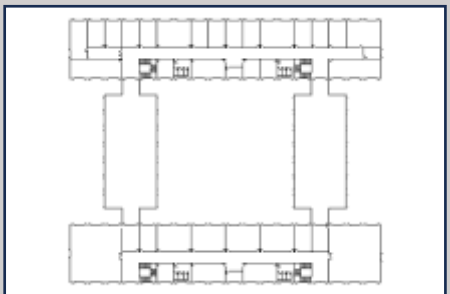
- Difficulty in movement and navigation within the building.
- Difficulty in accessing student rooms more quickly.
- Use of non-renewable materials and reliance on traditional materials.
- Failure to introduce modern educational methods for students.[٦]

Plan of the current situation in the Faculty of Engineering building, Al-



The horizontal section of the current situation in the building.

The horizontal section of the current situation in the building.



of the building showing the area that will be changed, with the design modified to meet sustainability standards, improve movement within the building,

٤-Rashidi, A. (2022). Towards Design Standards for Spaces in Egyptian University Plans.
٥-Fahim, M., Abdel-Hadi, S., & Al-Barmagly, H. (2022). A Proposed Framework for Designing Smart Campus Spaces.

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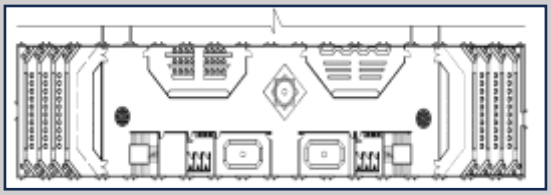

A horizontal section showing changes in the architectural spaces within the Faculty of Engineering building at Al-Azhar University, illustrating the shift from sharp lines in the design and the relocation of student halls. The design is characterized by symmetry and helps facilitate student movement paths within the building, while focusing on achieving sustainability (designed by the researcher).

A 3D shot that illustrates the interior of the college laboratory, ensuring the highest standards of sustainability within the building, while also incorporating elements that reflect Arab-Islamic identity (designed by the researcher).

An explanatory shot that illustrates the layout of the rooms inside the building, highlighting the design's consideration of sustainability standards within the building and the use of specific materials in the design (designed by the researcher).

A 3D shot that illustrates the laboratory inside the Faculty of Engineering building at Al-Azhar University (designed by the researcher).

A 3D shot that illustrates the design of the college building entrance and helps achieve maximum sustainability by using eco-friendly materials and allowing the maximum amount of sunlight to pass through (designed by the researcher).

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A 3D shot that illustrates the design of the laboratory inside the Faculty of Engineering at Al-Azhar University, showcasing the Arab-Islamic identity incorporated into the building design (designed by the researcher).

A 3D shot that illustrates the design of the library inside the Faculty of Engineering building at Al-Azhar University (designed by the researcher).

A 3D shot that illustrates the design of the corridors in the Faculty of Engineering at Al-Azhar University, highlighting the incorporation of Arab-Islamic identity while achieving maximum sustainability within the building (designed by the researcher).

A 3D shot illustrating the design of the corridors inside the Faculty of Engineering building at Al-Azhar University, with the building incorporating Islamic identity in its design and achieving the highest level of sustainability (designed by the researcher).

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A 3D shot that illustrates the design of the intellectual gardens in the outdoor courtyard of the Faculty of Engineering building at Al-Azhar University, highlighting the incorporation of Islamic identity in the courtyard design (designed by the researcher).

A 3D shot that illustrates the design of the intellectual gardens in the outdoor courtyard of the Faculty of Engineering building at Al-Azhar University, highlighting the incorporation of Islamic identity in the courtyard design (designed by the researcher).

Research Results:

-Achieving the highest level of sustainability within the Faculty of Engineering building at Al-Azhar University.
-Preserving the architectural form of the building without significant alterations.
-Creating an interactive learning environment for students inside the building.
-Increasing the number of window openings in the building.
-Increasing the percentage of eco-friendly materials inside the building.
-Maintaining the Arab-Islamic identity within the building.
-Rearranging the locations of lecture halls inside the building.
-Increasing the green spaces outside the building.
-Implementing the concept of intellectual gardens.
-Improving the quality of education inside the building.

Research Recommendations:

- Sustainability must be achieved in educational buildings.
- It is essential to incorporate the maximum amount of natural light and daylight into educational buildings to improve student productivity.
-Educational buildings should be designed to ensure flexibility in movement within the space.
-It is crucial to include a higher percentage of eco-friendly materials within the building.
-Increasing the percentage of green spaces outside the educational building is important.
-Global design standards for educational buildings should be considered.
-Sustainable educational buildings should be maintained, and their numbers should be increased.

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