Designed Green Toolbox as Built Environment Educating Method

Analytical comparison between two groups of students with different cultural background

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ABSTRACT: This paper is concerned with evaluating and testing the application process of green architecture design strategies using a tool-box as a built environment educating method and a pre-design reminder. Understanding the suggested green design strategies, testing the tool-box effectiveness, investigating the stages of design process and developing the proposed sustainable prototypes, while studying the cultural aspects impact, are the main concerns of the work. A case study of green housing units design and an urban planning of a neighbourhood in Toshka region, southwest desert, Egypt, were required to be submitted by two groups of students with different cultural backgrounds (Dutch and Egyptian architecture students). Results of utilizing the designed tool-box are analyzed and the design process of both groups was thoroughly discussed in two workshops. As a result; the tool-box has been examined and updated, the culture understanding was tested, and lessons needed to improve the built environment education in both schools were generated. Finally, the paper proves the importance of sustaining cultural communication among different civilizations in order to reach a better understanding of different environments.

Keywords: Built environment education, building culture, green architecture

1 INTRODUCTION

An important branch of competence, related to the architectural profession and education, includes cultural familiarity and understanding of history, art, social relationships, psychology, and other humanities. Peter Rowe supports these words: "Finally, in the educational arena, emphasis on the design speculation, together with greater collaboration and cultural understanding seem inevitable. [8]

2 GREEN ARCHITECTURE DESIGN STRATEGIES TOOLBOX (GADS)

Green Architecture Design strategies; GADS Toolbox is a primary design tool designed by the authors (text version). [4] It is a collection of green architecture design strategies to be used by architects and urban designers in order to incorporate the green architecture principles in the new urban settlements generally in hot arid zones and particularly in Egypt's vast desert.

In the text version of the toolbox, a list of green architecture design strategies for hot arid region around the world are organized in two main groups urban design strategies and Architecture design strategies. Each main group is divided into seven sub-fields.

The seven fields are organised to follow the logic phases of the design process to help the designer to corporate the green design features in the project easily during the first design stages. Each item is technically described in details. The following is the order of the main sub-fields in each main group of the toolbox.

1. URBAN	2. ARCHITECTUR
1.1 Urban fabric	2.1 site selection
1.2 Land use	2.2 Form, zoning and orientation
1.3 Public Landscape	2.3 Building Envelop
1.4 Streets	2.4 Construction Systems
1.5 Open spaces	2.5 Building Materials partially used
1.6 Transportation and accessibility	2.6 Building facilities and installations
1.7 Infrastructure	2.7 Private Landscape

Figure 1: The main fields of the toolbox

The same list of green design strategies is attached to the first list which contains the same green design strategies but with acceptance level generally for the whole of Egypt as well as for the four different regions around Egypt. The acceptance level was presented by percentage, where more than 50% meant accepted and less than 50% means unaccepted.

3 INTENTION OF THE WORKSHOPS

The main goal of the workshops is to utilize the Toolbox to develop sustainable prototype designs for the new region of Toshka in the southwest desert of Egypt. [6] This has to comply with both green architecture principles and Egyptian building culture. [5] This process aims to evaluate the green toolbox from students. The following questions needed to be answered:

- To what extend were the students concern about building cultural aspects and what misunderstand come up if any?
- What were the most green design strategies that the students have choose and did they add new strategies?
- Did the toolbox help the students to achieve high percentage of green design strategies and what were the defects of the toolbox if any?
- What stages of the design process did the students follow in their design?
- What are the possibilities of developing a sustainable prototype design for Toshka region?

4 WORKSHOP PROCESS

Two workshops supported the process of the evaluation. The first was in Netherlands and the second was in Egypt. In both workshops, the students were asked to design a housing unit with its technical details and its urban fabric (neighbourhood of two thousands in the Toshka region. The projects had to cover the following areas: building form, Construction system and materials, Design details installation, building density, Landscape elements, Street design and accessibility.

At the beginning of the project, a lecture on green architecture and the background of Egypt and in the region of the project (Toshka) was given to both groups of students. At the end of the project, a questionnaire for the toolbox evaluation - first part - was given to the students. After the student filled in the questionnaire, a cultural indicator sheet for each green design strategies in the toolbox was given to the students with the second part of the questionnaire to fill in.

4.1 Workshop in TU\e - the Netherlands

A workshop with third year students from different department (Building Technology, architecture, urban design and technology management) - Technical University Eindhoven – The Netherlands was carried out from September 1st to November 10th 2004. Eight groups were formed from 21 students subscribe to the design workshop course. Each group consisted of two to three students from different departments. The toolbox was used from day one of the workshop. One week after, the students submitted an A4 sheet to outlining their projects concept and goals as well as the green design strategies from the toolbox, which they would use in their projects. After long discussion with each group, the students submitted their first sketches after one week. After five weeks of refining the project, the students submitted eight digital projects and reports.

4.2 Workshop in Alexandria University - Egypt

A workshop with third year architectural students in Alexandria University - Egypt was carried out from February 5th to March 31st 2005. 21 groups were formed from 104 students. Each group consist of 5 students. After two weeks of research in the department's library and on the Internet, the students received the GADS toolbox to use in their designs. The toolbox (text version) was used after following the staff members' instructions and supervision of student's projects, to help the students to apply green architecture principles within their projects. During eight weeks, a group of 6 members of the teaching staff had refined the projects with the students. At the end of the workshop, some of the students submitted digital projects and others submitted traditional drawing boards.

5 COMPARISON AND RELEVANT FINDINGS OF BOTH GROUPS OF STUDENTS

5.1 General comparison of both workshops

1 - Regarding the architecture education style in Egypt, Egyptian students used the toolbox after research in the library and on the Internet. Most of Egyptian students complained that it was too late to offer the toolbox after two weeks of the workshop and they preferred to use it from day one. On the contrary, Dutch students used the toolbox from the first day of the workshop. Therefore, Dutch students got more benefits from the toolbox and applied green design strategies as much as possible.

2 – Reviewing the student's projects in both workshops, Egyptian students used modern and post modern styles contrary to Dutch students who used Egyptian tradition techniques.

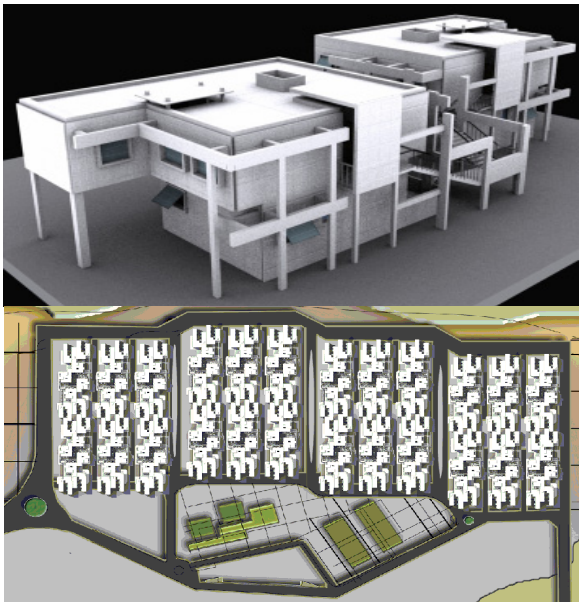

Photo 1: Egyptian students group 1

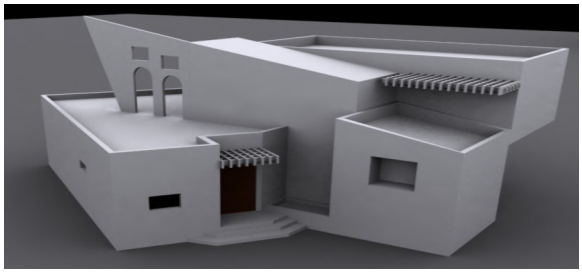

Photo 2: Egyptian students group 9

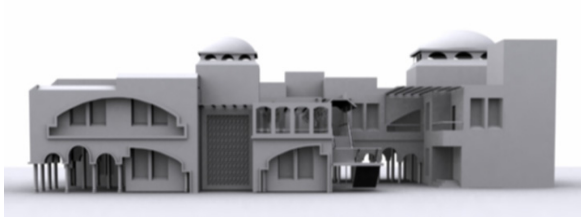

Photo 3: Egyptian students group 13

Photo 4: Egyptian students group 19

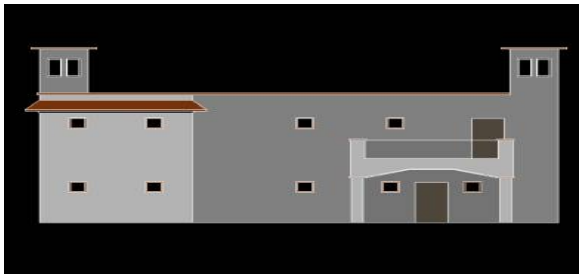

Photo 5: Dutch students group 1

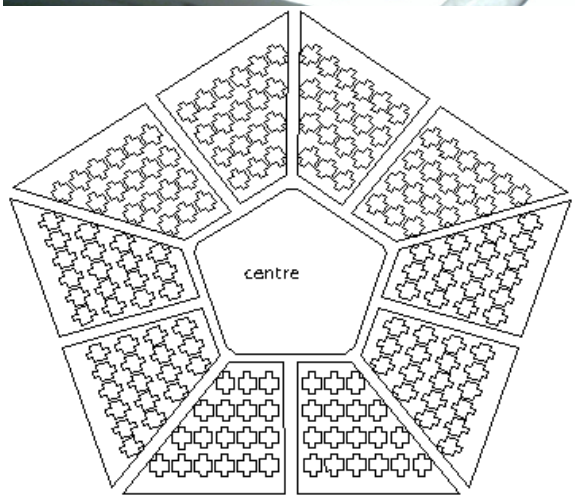

Photo 6: Dutch students group 5

Photo 7: Dutch students group 6

3 – Following the student's progress through the design process, Egyptian students started from zero and invented new forms and techniques for solving the climatic problems. They kept trying to improve them contrary to Dutch students who used forms and techniques which already existed are were scientifically proved.

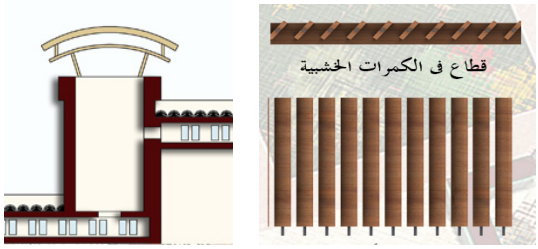

Figure 2: Solar chimney and wooden cover of the courtyard designed by Egyptian students

4 – Regarding the cultural background of both groups of students, some differences in cultural aspect were found.For example; Dutch students used artificial light and ventilation for bathrooms and toilets. They also gave less concern about the privacy of house occupants.

5 - Both groups of students, in spite of having different cultural background, were curious to use the toolbox and showed interest in its help as a pre-design tool. For Dutch students the weight of benefit was 68% and 78% for Egyptian students.

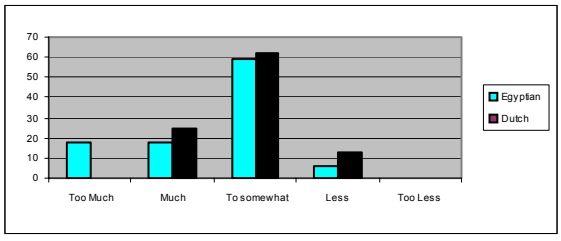

Chart 1: Weight of benefit of the toolbox without building cultural indicators

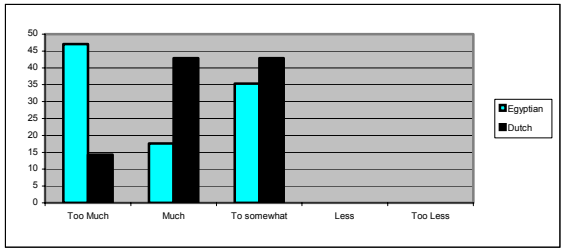

Chart 2: Weight of benefit of the toolbox with building cultural indicators

6 - Both groups of students answered the question of: to what extend is it a good organized tool. For Dutch students good organized percentage was 69% and 70% for Egyptian students.

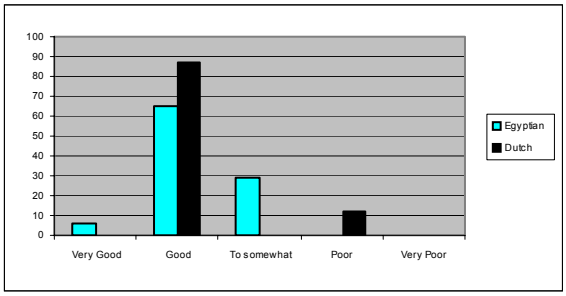

Chart 3: Toolbox organizing Quality

7 - Concerning the design process phases that students have followed, we can say that Dutch students do not follow a specific sequence. Some students move from urban to architecture then details and other go contrary and other go parallel with urban and architecture. For Egyptian students, they gave more concern for data collection and analysis and strategic gaols in advance then alternatives developing and evaluation ending with best alternative choice and details.

8 - Regarding the findings of both workshops, more information is needed to explain why such design strategies are green and culturally accepted or unaccepted. Other information like preconditions for such design strategies to achieve high levels of greenness is also needed.

9 - Dutch students have added some design strategies, which are appreciated as green design strategies such as energy storage in the ground in addition to some design strategies related to human comfort such as social security, privacy and aesthetic. On the other hand, Egyptian students add some design strategies which are appreciated as green design strategies such as desert cooler and pergola for roof.

5.2 Comparison between design strategies that students have used

5.2.1 Urban design strategies

Comparing urban design strategies that Dutch students used with cultural indicators (field survey findings) it is clear how much the Dutch students were misunderstanding Egyptian building culture. For example, they used attached and row houses, mixed land use and narrow streets, as well as bicycle and mass transportation paths, which are not accepted in Egyptian society. On the other hand, they used less Hi-rise buildings, water bodies, shading constructing surfaces, colonnades or green power which are strongly accepted in Egyptian society.

Comparing urban design strategies that Egyptian students used with cultural indicators (field survey findings) it is clear how much the Egyptian students also were misunderstanding Egyptian building culture. For example they used attached houses, mixed land use and narrow streets, as well as bicycle and mass transportation paths, which are not accepted in Egyptian society. On the other hand, they used less used hi-rise buildings, ground cover, water bodies or colonnades which are strongly accepted in Egyptian society. The following charts show comparisons among different urban design strategies been used by both groups of students.

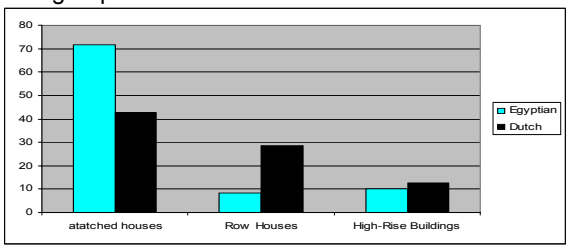

Chart 4: urban fabric green design strategies

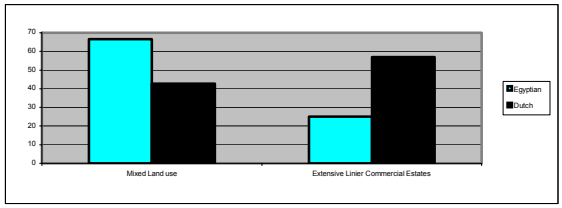

Chart 5: Land use green design strategies

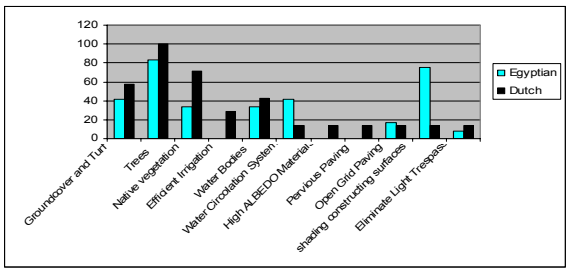

Chart 6: public landscape green design strategies

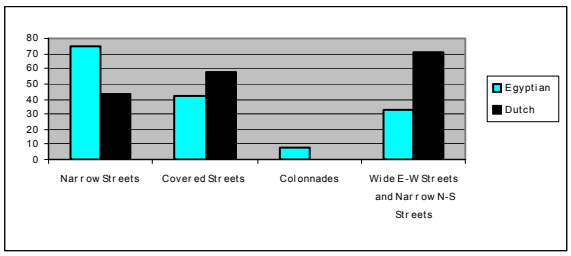

Chart 7: green design strategies for street

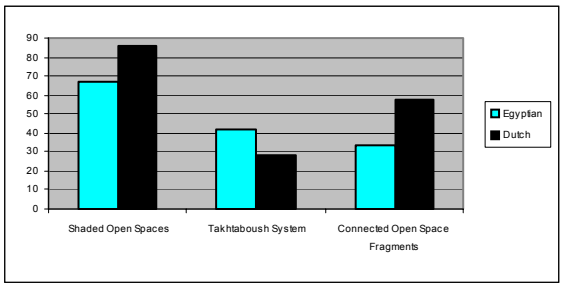

Chart 8: green design strategies for open spaces

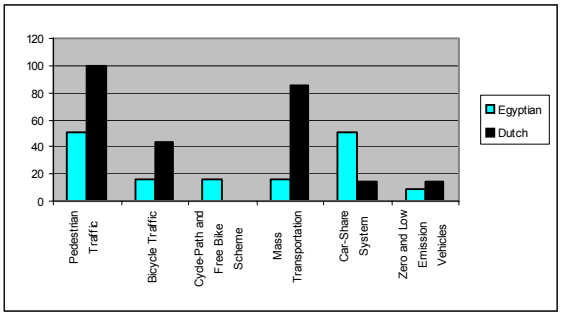

Chart 9: green design strategies for transportation

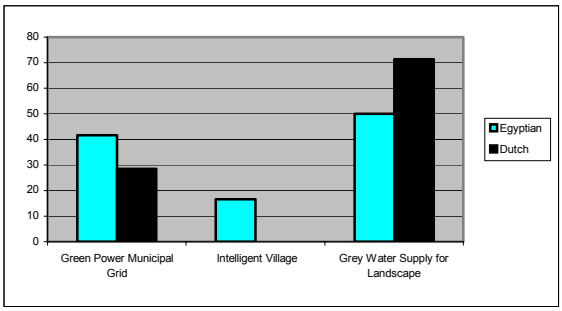

Chart 10: green design strategies for infrastructure

5.2.2 Architecture design strategies

Comparing architecture design strategies that Dutch students used with cultural indicators (field survey findings) it is clear how much the Dutch students were misunderstanding Egyptian building culture. For example, they used partially underground buildings, domes, vaults and mud brick construction, which are not accepted in Egyptian society. On the other hand, they used less 'Mashrabia' (wooden screen window), shutter window, pitched roof, balconies, vines, hi-tech insulation for wall and roof, and dry water fixtures, which are strongly accepted in Egyptian society.

Comparing architecture design strategies that Egyptian students used with cultural indicators (field survey findings) it is clear how much the Egyptian students were misunderstanding Egyptian building culture.For example they used partially underground buildings, domes, vaults, double roof and concrete skeleton with mud brick, which are not accepted in Egyptian society. On the other hand, they used less shuttered windows, pitched roofs, balconies, vines, hi-tech insulation for walls and roofs and dry water fixtures, which are strongly accepted in Egyptian society. The following charts show comparisons among different architecture design strategies been used by both groups of students.

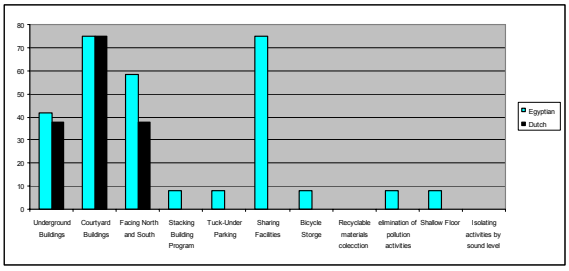

Chart 11: green design strategies for zoning, forming and orientation

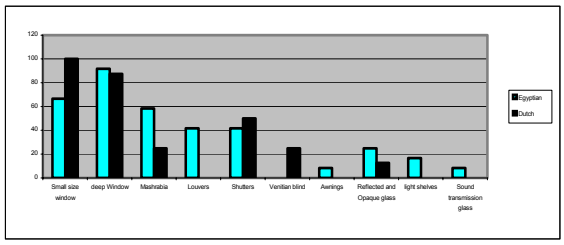

Chart 12: green design strategies for openings design

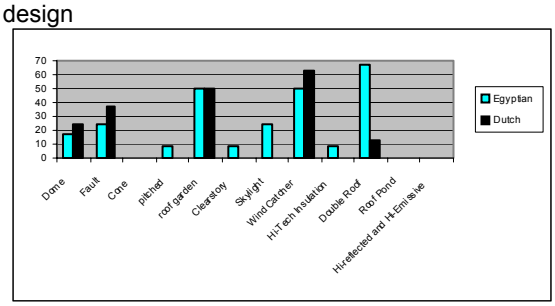

Chart 13: green design strategies for roof design

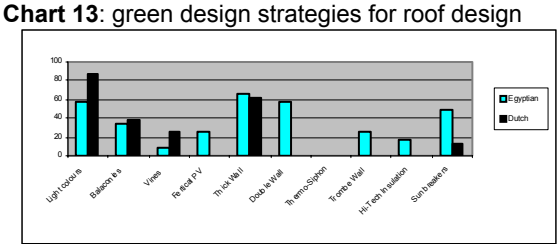

Chart 14: green design strategies for wall design

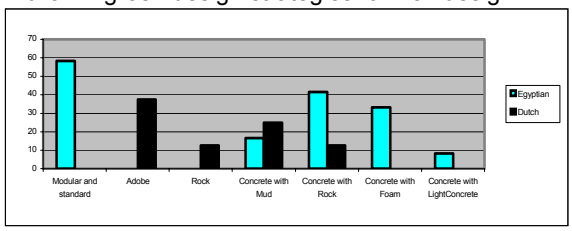

Chart 15: green design strategies for roof design

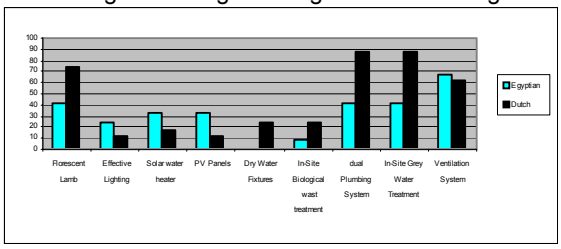

Chart 16: green design strategies for installation

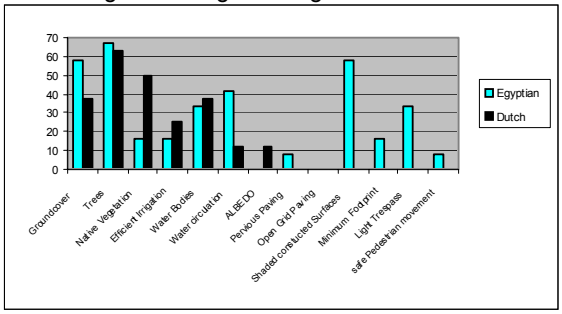

Chart 17: green design strategies for private landscape

6 GREEN TOOLBOX REFINEMENTS

Regarding previous findings of the two workshops, some refinements have to be added to the toolbox.

Refinement 1: some groups in both workshops did not choose from the listed items within the toolbox in some fields and added new items. The toolbox needs an easy technique to help the user to add new items with his responsibility for greenness and cultural acceptance.

Refinement 2: Both groups of students misunderstand the use of different items within the toolbox. Indeed, they use the items that could not be used with each other. The toolbox needs some constraints added to notify the user of such conflicts.

Refinement 3: changing the method of showing the culture indicator for each design strategy from percentages to level of acceptance is very readable for architects and urban designers.

Refinement 4: Showing total culture indicator and green certificate for the whole project during the design process is very important to help the designer evaluate how many green points the project achieved and to what extend it will be culturally accepted.

Refinement 5: In addition to technical details of each green design strategy, more information is needed to be added to the toolbox explaining why such design strategies are green and culturally accepted or unaccepted. Other information like preconditions for such design strategies to achieve high level of greenness also is needed. Relevant references like books, project examples and website links are very important.

Refinement 6: Considering that both groups of student did not follow a specific sequence of the design process, the toolbox has to be designed with free movement among its parts.

Refinement 7: Since not all items in the toolbox have the same weight in the design process, different green values (points) have to be given to each design strategy.

Refinement 8: Since most features of the toolbox are used to some extend, a scale should be included for every design strategy (low, average, high).

Refinement 9: Some design strategies need to be extended into more detailed strategies.

CONCLUSIONS

A big gap between theoretical knowledge and application exists in the field of architectural education. This paper presents, a toolbox led learning, to overcome this gap through a direct facilitating, process which proved to be of great help.

In addition, the previous study explored the concept generation in architectural design from a knowledge impact point of view. First it considers providing the students from two different universities with a toolbox containing related knowledge about green architecture underlying the generation of meaningful concept. The resulting proposals from both parties are used in an experiment to explore the effect of cultural background on the design output.

As one might expect, globalization resulted in considerable challenges for the country's architectural students and tomorrow practitioners. The effect of local transformation indicated in the Egyptian student's proposals, using modern techniques. The need to develop a responsible local strategy to guide the global principles and its application is of higher importance. On the other hand, a deeper understanding of vernacular design concepts and the cultural spirits is required. The interpretation of students was more attached to design elements that might reflect the outlook of local desert architecture, but not its state of art.

The developed version of the toolbox software adapt most previous refinements such as adding new items if any, constraints, showing total culture indicator and green certificate for whole project, free movement among toolbox chapters and more information. Some of previous refinements could be added in later version such as: different green values (points) for each green design strategy, a gradation for every feature and branched some items into more detailed items.

There is a lack of knowledge concerning the Egyptian building culture and its expected influence on the design process. Both Egyptian and Dutch students had the same problem with different levels. Many design strategies used in the design were highly believed to be culturally accepted in Egypt but they are not matching with the result of the field survey. This finding supports the research approach and hypothesis.

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