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Sustainable Design of the Built Environment

Project Proposal

'Marketing and consumption of luxury goods in Greece'

Project Proposal submitted to _____ University in partial fulfillments of the requirements for the degree of Master of Sustainable Design of the Built Environment

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Topic:

"To what extent we can improve student's performance and productivity by using interior green walling in university classroom in the UAE"

Introduction:

The idea of common plants solving Indoor Air Quality (IAQ) problems is familiar to most people, they like having plants in their homes, offices and public buildings they visit. Previously many researchers study the effect of green built environment on IAQ (Young S, 2009; U.S. Green Building Council Research Committee 2007; Sundell J, 2004) However, important questions that still needs to be answered is, 'whether plants have potential to actually affect indoor air sufficiently to warrant their use as air cleaners?, what amount of plants is required in the space to remove indoor air pollutant as effectively as normal air exchange in a particular space? Does presence of indoor plants in a place affect people performance and productivity whether in an office, classroom or house?

Previously research has proved that Indoor Environmental Quality (IEQ) issues relates to air pollutant and thermal qualities such as Thermal comfort quality, Sound Quality, Light Quality, Odor Quality and air quality (USGBC, 2007). Further it has been noted that plants are a reasonable method for indoor air pollution control such as its effect on air, thermal, lighting and sound in a space, and its influence on the sensory systems of human body. (Frontczak M, Wargocki P, 2011)

Through this study the researcher aims to investigate incorporating interior green wall in indoor educational spaces and its impact on the IEQ of classroom and students learning. A green wall is a different design technique that allows the designer to indicate huge numbers of plants in a space which can affect more on indoor classroom environment, and it is a way to attract the

attention of occupants to the presence of plants and works as good visual item which will affect their performance and productivity. Interior green walls can survive more than exterior green walls especially in hot climates like UAE which will enhance indoor environments in a simple and inexpensive way.

Research Plan

Aim:

The research aims to explore the impact of incorporating green wall in educational environments indoor climate via subjective assessment and objective measurement. The researcher will assess impact of green walling in terms of improvement in indoor learning environments as well as Indoor Environmental Quality (IEQ). For the purpose of this experimental case study the researcher will select a university in UAE. The research will evaluate the feasibility and impact of integrating interior green wall in university classroom setting in terms of its effect on space air quality, thermal comfort, sound quality and odor quality, and therefore their influence on sensory systems of human body which will affect respectively on students learning performance (in calculating, reading, understanding designing and drawing) all this data will be evaluated against standard educational classrooms.

Furthermore, the research will evaluate the feasibility of incorporating green walls in classrooms as a way to improve indoor environments, its study green wall technical construction and which kind of plants that can be used, also its study wall life expectance and cost analysis.

The research will comprise technical and statistical assessment components and attempt to document its effect by applying field experimental approach in university classrooms, in order to achieve this aim needs many objectives have to be done.

- Identify benefits to comfort in using indoor plants, such as: Thermal, Acoustical and Visual comfort.

- Study different kinds of indoor plants that can be used in UAE indoor environment and the possible configurations of green wall construction techniques and its irrigation systems.

- Determine the varying parameters of green wall like orientation, the percentage of plant area coverage relative to the façade wall and classroom space.

- Analysis the impact of interior green wall on classroom indoor climatic conditions and its reflection on student's performance and their outcomes.

- Predicted comfort benefits due to impact on students overall performance and grades.

- Comparison of the classroom with green wall performance with that of a standard classroom.

- Comparison of above results for hot climates and other climate types where this system has been applied through literature review and case studies.

- Cost analysis and Viability of interior green walls screens in terms of investment and life coast analysis.

Methodology:

An Experimental Approach will be used to conduct this research due to its realistic settings in terms of typical indoor climatic conditions and natural human patterns. The methodology will be divided into the following steps:

Experimental method:

o   Select the study site which will be in a classroom of a University, with a proper selection of student's sample.

o   Establish an interior green wall in classrooms with the logistics of the space taken into consideration.

o   Measuring parameters of indoor climate conditions such as (Temperature, ventilation, moisture control), that will be done by using temperature sensors, measuring equipments and Self-monitoring. The results obtained from experimental classroom and control classroom has to be compared to find any changes in the quality of classroom indoor environment which directly will affect student's attitudes and productivity.

Use of Survey:

o   Demographic data has to be collected from students such as: Gender, Ethnicity, there over all GPA.

o   A questionnaires and interviews have to be done by the researcher to students and professors.

o   Questions from the official university course evaluation survey will be used to collect information on student perceptions of the course and the instructor.

o   Comparison of obtained results from student's marks between experimental classrooms and control classrooms has to be done to assess the change in student's productivity.

Use of Simulation:

o   To select the appropriate size of the interior green wall via classroom space which means choosing the best amount of plants need to clean indoor air, IES simulation software will be used to model ideal settings to drive results.

Analysis Method:

o   The data collected by site measurements, questioners, interviews and self observations will be analyzed using Statistical method.

o   Statistical procedures included descriptive statistics, frequencies, and analysis of variance tests to determine differences between overall grades and scores, categories of responses, individual statements, and individual course comparisons.

o   Comparison of results after using climatic measuring equipments between Experimental classrooms and Standard classrooms.

o   Cost Benefits, life expectance and maintenance will be recorded.

Expected Outcomes:

This research highlights the importance of using indoor plants in terms of improving Indoor Air Quality and Indoor Climatic Conditions and its reflection on human performance and productivity in a space.

The research documents the performance and feasibility of integrating interior green walls in UAE indoor climatic conditions. Will directed people to the new style in implementing plants in their interior spaces which may give an impetus to their use in this region.

This research will be as reference clarifies different technique of applying green walls differs in their way of irrigation, growing media and construction. It shows which kind of indoor plants can survive in UAE indoor conditions.

The research reported suggests a significant role for plants in cleaning indoor air and affecting people performance and productivity to a reasonable degree.

Research Assessment:

The research will include an assessment to indoor learning environments which is in a classroom after incorporating planted wall.

Plants will be implemented by using different design technique which is green walling as a way to attract the attention of students to the presence of plants and allow them to see the plants from their seat whatever its position in the forward or backward.

Monitor and record any changes on student's grades and performance during a lecture in addition to recording any changes occur on classroom indoor climatic conditions quality.

An experiment will be applied in University classrooms during entire semester, the study will be held on three sets each set contains two classes, Experimental classroom and Standard classroom.

The three sets are an interior design courses, each set has to be taught by the same professor in the same room during one semester. All six classes should offered during the same period of time (morning or evening hours), although each course should met for the same amount of time.

Set A

Experimental classroom

Standard classroom

Set B

Experimental classroom

Standard classroom

Set C

Experimental classroom

Standard classroom
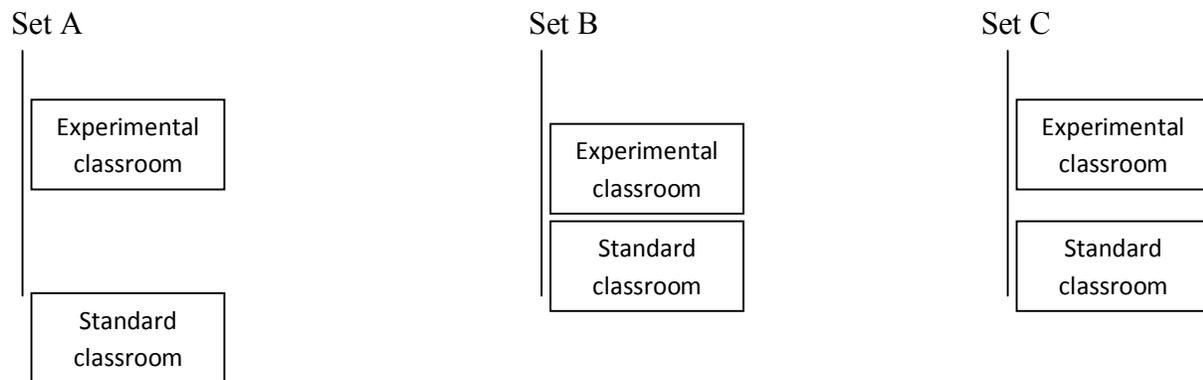
Students who participate in this study will be chosen randomly after telling them the experimental and obtaining their approval. The students will be asked to provide anonymous information for the research, such as Demographic data, including class rank (freshman, sophomore, junior, senior), gender, and ethnicity. Students and instructors will be subjected to

questioners and interviews too. Student's names will not be mentioned, so that all information provided remained unidentified.

The Experimental classroom of students was treated by including a variety of indoor plants designed as green walling within the classroom while there are no plants presented in the Control classroom.

An assortment of plants will be used in each classroom of the Experimental rooms. Classroom design and space will be taken into consideration before locating plants. Green wall construction and way of plants irrigation has to be studied before to choose the best techniques that match with classroom environments. Plants types will be selected after studying UAE indoor environments that matched with the appropriate indoor plants that can survive in such like these conditions.

Plants will be located in a way of green walling on one of the walls of the classroom. Location of plants depends on the direction of the vision of the students which is the front of the classroom, near to the white board and projector because visibility of the plants on that location will be the most obvious to the students.

The National Aeronautics and Space Administrates (NASA) research demonstrates the efficacy of plants as indoor air cleaners; they say that using plants is the most reasonable method for indoor pollution control. In addition, there is number of studies shows the effect of indoor plants on humans, they can affect human performance, task perception and mood for just looking at nature which promotes recovery from stress. The visual contact with nature may be important to the occupant's attitudes. On the other hand testing or promoting the use of plants to clean indoor air should be encouraged by more experimental design. Research done to date does not

demonstrate familiarity with many of the techniques now widely used by indoor air researchers, the researches and the limited methodologies reported on indoor plants are inadequate.

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