GREENING THE ARCHITECTURAL CURRICULUM IN ALL THE MALAYSIAN INSTITUTES OF HIGHER LEARNING - IT IS NOT AN OPTION

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Abstract
Preparations toward sustainability and energy efficiency in buildings begun about a decade ago with many aspects of tangible and intangible results such as the existence of a The Ministry of Energy, Green Technology & Water (MEGTW - Low Energy Office), The Malaysian Energy Center (Green Energy Office) and the forthcoming office building for the Energy Commission known as the Green Office. Other initiatives are the high efficient motor, the increase of the electricity tariffs, the introduction of the Renewable Energy as the 5th Fuel Policy with a national campaign known as the Suria 1000 where the use of solar electricity for the building industry is encouraged. At the same time there needs a parallel development for the critical mass otherwise initial noble efforts would be jeopardized due to lack of knowledge and skill support infrastructure. Training has been going on but only for specific tasks initiated either by non-governmental organizations (NGOs) or government agencies. But as for the architecture profession, the efforts fully depended on individuals' interests and passion. This slows the process of assimilation and adaptation. There should be a thorough awareness throughout the practicing and academic architects as to the seriousness of having green buildings as the next future direction for Malaysian buildings. This paper does not attempt to set an agenda for education in architecture but rather to espouse the idea. It sets to show one way to accelerate the change in the mindsets of architects as a whole towards designing for architectural sustainability, is to revamp the architectural courses and curriculums in institutes of higher learning.

Keywords
Green architecture course, sustainability, green building index.

Introduction
It is common knowledge that to change the mindset from one viewpoint to the desired viewpoint is via education, training, and application. There is now the momentum in education to not only talk about sustainability in building designs among the professionals but also to act on it. Other countries have already applied for the so-called checklist to assess building compliance to given standards. Some examples already being applied and frequently referred to are the Leadership in Energy and Environmental Design (LEED) for the United States, the British Rating Energy Efficiency Assessment Method (BREEAM) for the United Kingdom, the GreenStar for Australia and New Zealand, the Green Mark for Singapore, the Comprehensive Assessment System for Building Energy Efficiency...
India has been using LEED for their assessment and they refer to it as LEED-India. Rating levels are given as Certified, Silver, Gold, and Platinum. As a variation, the hotel industry in Thailand has their own ratings and those hotels that subscribe to this system would be rated and given the number of Green Leafs. Five Green Leafs is the uppermost, just as the refrigerators in Malaysia and some other countries have been given ratings of one, two, three, four, or five Stars to epitomize energy efficiency in energy consumption (Azusa, 2009).

For continuity and consistency, it is right that every discipline in the building industry should take initiatives towards improving and assessing this system of assessment. The Malaysian Institute of Architects is taking a proactive measure to this effort to begin by the education sector inculcating and educating the budding architects from the relevant Institutes of Higher Learning. It is felt that to nurture is better than to enforce, although enforcement has to determine immediate effectiveness.

This pilot study is being carried out between the Academic Section of the Malaysian Institute of Architects (Pertubuhan Akitek Malaysia (PAM)) and the University of Science, Malaysia (Universiti Sains Malaysia (USM)). As a whole even Malaysian public universities are given ratings such as Research Universities and non-research universities. And among the four research universities there is a need for an APEX (Accelerated Program for Excellence) Research University. By conferring designations like this means there is a form of ranking. There are at least 20 Institutes of Higher Learning (IHL) in Malaysia and only seven provide architectural courses recognized and to be recognized by the Board of Architects, Malaysia (BAM) as shown in Table 1.

<table>
<thead>
<tr>
<th>Public Universities</th>
<th>Status</th>
<th>BAM’s Accreditation</th>
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<tbody>
<tr>
<td>1. Universiti Sains Malaysia (USM)</td>
<td>Research University APEX status</td>
<td>Part I &amp; II</td>
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<tr>
<td>2. Universiti Putra Malaysia (UPM)</td>
<td>Research University</td>
<td>Part I &amp; II</td>
</tr>
<tr>
<td>3. Universiti Teknologi Malaysia (UTM)</td>
<td>Non RU base</td>
<td>Part I &amp; II</td>
</tr>
<tr>
<td>4. Universiti Malaya (UM)</td>
<td>Research University</td>
<td>Part I &amp; II</td>
</tr>
<tr>
<td>5. Universiti Teknologi MARA (UiTM)</td>
<td>Non RU base</td>
<td>Part I &amp; II</td>
</tr>
<tr>
<td>6. Universiti Islam Antarabangsa Malaysia (UIAM)</td>
<td>Non RU base</td>
<td>Part I &amp; II</td>
</tr>
<tr>
<td>7. Universiti Kebangsaan Malaysia (UKM)</td>
<td>Research University</td>
<td>(In process for Part I)</td>
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Part III qualification which is the Professional qualification is the responsibility of BAM and do not fall within the auspices of the Universities.

**PRIVATE INSTITUTIONS OF HIGHER LEARNING (in process for recognition for Part I)**

| 8. TAYLOR’S COLLEGE                   | Non RU base                  |                           |
| 9. UNIVERSITY COLLEGE SEDAYA          | Non RU base                  |                           |

Table 1: The Seven Malaysian Universities Offering Professional Programs in Architecture. (Source: Author).
Among the Institutes of Higher Learning as shown in the table above, UTM is the oldest university to provide an architecture program. UM is the oldest university in Malaysia but the architecture program was introduce about ten years ago. There are several basic components that need to be wisely integrated to produce future architects, such as the need to interplay among the educators, students, physical spaces, the program itself, course content, and the resource center.

**Conventional Course Structural Components**

Lecturers, students, studio, and course content, physical spaces, and the time factors are the normal variables that are needed to carry out any typical course. The existence of students is most important, for without them there is no reason why the course should exist. Students normally look at the length of time period of a course structure provided by the institutions. To spend a longer time in one institution than the others to achieve the same recognition would not be attractive enough for most potential students due to additional tuition cost and the employment opportunity cost. Normally a minimum of five years of architectural education is required for recognition of the architecture program. Students go through courses and studio exercises determined by the lecturers of the institution, and upon assessment would then gain their degree as recognition and license to work in an architect’s office before they embark on the Professional Practice Examination to qualify as a Professional Architect. Therefore, the variables such as lecturers, students, studio content, course content, and the time factor as mentioned above are important ingredients to make a successful architecture education. Of course the physical space was not mentioned because that is inherent when “studio” was referred to.

Figure 1 shows a diagram of a typical conventional architectural course structure where time and studio content are discussed in a sequence:

1. Year one to five shows the minimum time factor for an accredited architecture course.
2. A mini row column next to the year column represents a 2-week period i.e. the column to the right of the first column. Therefore each academic year has 28 working weeks with two 14-week semesters.
3. Throughout the year several design projects were given by the lecturers for the students’ progress and to assess them on two basic categories of skills (i.e. their design philosophy and the ability to portray their ideas via the required methods of visualization). Design philosophy will present rational and intelligent way of providing space requirements, whether vertical or horizontal and as common to all schools of architecture all over the world, the need for plans, elevations, sections, and perspectives by mode of manual hand sketches or with the aid of computer-aided-design software.
4. Within the stretched arrows are the number and complexity of projects deemed fit by the architecture committee or the studio coordinator. Generally, the first year will have more short term projects to familiarize the architecture students with the basic skills needed for them to carry them through to the five-year program.
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Evaluations from the point of view of sustainability were rarely done by most lecturers. Students develop design strategies from reading magazine articles such as Architects Journal, Architecture Today, Architecture Malaysia etc. (Hancock, 2008). Case studies should focus more on the successful designs that save the environment and a deeper understanding of the climatic elements in determining the shape of buildings would eventually be the norm. With the world approaching hot, flat and crowded, this has to change (Friedman, 2008).

Figure 2 shows that the trend is now towards improving the environmental performance of houses by design and material choice as a passive strategy and also from energy-efficient active systems. It shows the summary of the energy consumption for representative of domestic buildings from a simple shelter in a hammock under the shade of a tree up to the proposed bioclimatic house typology. The simplest shelter has no energy involved, so it has zero energy but it is not appropriate for living conditions. Therefore the Malay Traditional Village house was constructed responding well with the climatic conditions for the rural areas and the Colonial House epitomizes the urban prototype of a traditional house, both using less energy since at that time the population is small and development less hectic and furthermore electricity is cheap. But the modern house cut corners due to increased population and economic growth. Comfort at that time refers to material comfort and not environmental comfort, because air-conditioning was easily available. Thus energy consumption was high. With the advent of global warming, architects must develop an acceptable bioclimatic house, bearing in mind the thermal behavior as shown in Graph A below.

The arrow pointing downward shown in the circle shows that a paradigm shift is needed to examine the criteria in designing future buildings in Malaysia. To solve problems affected by global warming, one must be in a totally different frame of thinking and not in an existing frame of mind. In other words, one needs to be thinking “out of the box” with different set of design rules.

Figure 1: The present architectural studio format implemented in the institutes of higher learning. (Source: Author)
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Figure 2: The sequence of domestic architecture and the amount of energy consumption that comes with it. (Source: Author).

Graph A: Graphic representation of strategies needed to reduce energy consumption in a building in Tropical Malaysia. (Source: Author).

Requirements for Changes in Studio Content

“In a speech to the 2007 AIA Convention in San Antonio, Nobel Prize recipient and former Vice President Al Gore dared architects to rise to the challenge presented at a unique moment in history, a moment when the gifts and training of the profession can play a leading role in healing our only home, the planet Earth. “Do no harm” has served the medical profession since Hippocrates first uttered those words. “Help heal the planet and serve its peoples” is a more assertive agenda, one uniquely within the grasp of the world’s architects and one that can and should be vested in all schools and programs of architecture.” (Andrejko, 2008).

The proposed strategy as shown in Figure 3 is being implemented in the architecture program of the School of Housing, Building & Planning, University of Science, Malaysia after the signing of a Memorandum of Understanding (MoU) (19 June 2009) between the University and the Malaysian Institute of Architects (MIA) to incorporate some form of a systematic infusion of sustainability content into the curriculum.

Sustainability related subjects normally involved the teaching of building physics or building sciences, but the way they were taught as a separate entity had little to do with the design process (Hagan, 2008). Many design tutors lack the technical know-how to connect these two elements (i.e. building physics and the building fabric design, because the physics element is intangible and not shown effectively in graphic presentation). How do you show the comfort zone in graphic representation? Comfort and energy savings are abstract expressions and can only be expressed with the play of words but not in architectural drawings. Too often what was observed in many higher institutions was that environmental subjects were taught as a separate entity and not as an integral part of architectural design, and this had to be rectified (Al-Hassan and Dudek, 2008). Detachment would mean a missing link exists and comprehension by students would be skewed. Students would not
be well equipped for environmentally friendly buildings and not confident in giving advisory service on the requirements of Green Building Index (GBI) for achieving Certified, Silver, Gold, or Platinum (www.greenbuildingindex.org, 2009). In the realm of practice, rectification or retrofitting to the new building would be costly.

Where previously the studio format has only two components, i.e. the Design Philosophy and Visualization, this time there is the Environment as an added component:

1. There is no change in the curriculum set for the first year. The basics of design should be emphasized as students need to know the graphical language in order to convey their ideas. This skill will gradually improve as the students scale up to advance years.

2. In the second year case studies of energy-efficient houses have been introduced to create awareness in the students of how energy-form relationship is possible. Students are to read about the philosophical context of the design of houses and be well-versed with the terminologies being used by the building referred to. Understanding the process is emphasized not the finished product.

3. In the third year computer-aided design software are introduced for designing three-dimensional renderings and also for animation. To add value to the design, it would be more realistic information added on the environmental performance data obtained from computer simulations, for example from Sketch-up, Ecotech, IES, etc. Simple programs like the Microsoft Excel can be utilized to calculate the Overall Thermal Transfer Value (OTTV) and for the Building Energy Intensity (BEI). These are required to obtain a GBI rating.

4. It is then expected that the students become familiar with this software and be able to do several permutations to find the best-suited design that meets the goal that they planned for, i.e. whether they are going for silver, gold, or platinum rating. This practice would hopefully give them a headstart in familiarization and the pertinent arguments regarding design for the bioclimate. In this fourth year they are then introduced to other sustainability issues apart from the specific design for energy efficiency, such as life-cycle analysis of construction materials, recycling programs, rainwater harvesting, industrialized building system, etc.

5. The fifth year comprises everything under the sun for designing a bioclimatic building project. It is a comprehensive project i.e. from understanding issues, design statement, brief requirements, application of statutory regulations, and design
proposals with inclination and emphasis on being green.

Some countries in Europe have experienced two alarming trends that resulted from this paradigm shift faced among building professionals. First, sustainability in architecture is reduced to quantitative measures such as energy efficiency by adhering to building regulations and standards (Wyckmans, 2008). In Malaysia there are several standards to be met, the most common being the Malaysian Green Building Index is the upgraded MS1525:2007. Some examples of criteria to be met are OTTV of less than 50, and Building Energy Indicator (BEI) at or below 200kWh/m²/yr. etc. Architects who feel that these are engineering problems for engineers to sort out thus feel less inclined to further delve into the nitty-gritty of the calculations involved. Architects would just rather bother with the passive design elements that engineers lack in visualizations.

Just like the GBI being introduced to rate buildings, it is proposed in this paper that in order to catalyze the teaching of the green curriculum in the field of architectural education nationwide, some form of compulsion is necessary. There are six criteria to be assessed: Energy Efficiency (EE), Indoor Environmental Quality (IEQ), Sustainable Site & Management (SSM), Materials & Resources (MR), Water Resources (WR) and Innovation (INN). The abbreviations form the codes as references and are followed by numbers to pinpoint specific requirements. Some of these codes would supplement the studio content depending on what the studio master wishes to introduce for that semester. A gradual approach of complexity would be encouraged and introduced from Third Year level onwards, with as many codes solved in any given project at the Fifth Year level. The staffs should be well-versed with the interpretation of the GBI requirements so that they are able to teach the students how to interpret the clauses into the designs that the students are to present. It is paramount that this is achieved because the need for GBI was because of the demand by the market and not enforced by the government. The market now determines the kind of service that it requires, and many foreign firms are competitive. By doing so, local architects will lose jobs to foreign companies.

**Conclusion**

The current climate change crisis triggers fundamental changes in building practice and our environmental inhabitation. It is no more a matter of providing equal efforts and opportunities for the three common sectors (economy, culture, and the environment) when discussing on the course content and emphasis for any discipline. At the Copenhagen 2009 conference on climate change, COP15, it was reported that the world climate temperature has risen to an average of 2°C--more than the usual average. A lot more effort by member countries needs to happen to bring down carbon emissions. This might result in overhauling economic sector priorities, resulting in indecisive and dismal conclusion of the summit.

One has to be aware that if the environment is down to its lowest ebb, the culture and economy will be fundamentally affected as well. The task now is to identify design methodologies that suit these new climatic scenarios by developing tools and techniques to mitigate local and global scale in human impacts. The Malaysian Green Building Index helps in re-conceptualizing the
architectural curriculum. In it there are sustainable criteria and points to strive for which makes it easy to measure and assess. Anything that can be measured is easily managed. Therefore it is not specifically for USM to create a niche in its architectural program but should be taken up by other IHLs.

Advancements in technology will be a major breakthrough toward sustainable building practices “The question may be: why haven’t we always been working with something that was compatible with Nature? Ironically, it often takes dramatic circumstances to become aware of the need to take responsibility of our own actions and to adopt all the possible solutions to wisely utilize our intellect and efficiently manage our resources so as to achieve well-being in our “habitats.” However, if we succeed in using our knowledge to support and celebrate the Earth’s intricate web of biological (and cultural) diversity, and we recognize nature as the very archetype of human creativity, the transition to an adaptive and carbon-free building design practice is achievable since we may already have all the know-how needed. The sustainability of our future depends on getting this right.” (Altomonte, 2008).

Figure 4 shows the path towards transforming the conventional course content to be more environmentally friendly than it is at present. It is not an option but a dire need to save the world. We need buildings that are efficient,
comfortable, adaptable, and durable, but this can also mean beautiful, exciting buildings, contributing to places that make sustainable living easy, affordable, and attractive (King, 2008). The mindsets of lecturers have to change. They should attend relevant seminars, do research, and from research findings present papers, write books, and submit articles, all pertaining to sustainability. Existing lecture materials need to be upgraded or overhauled to meet climate change demands and examinations to be geared towards green building. For many of the staff in the IHLs this meant retooling, retuning or even reeducating oneself to suit new goals in not only the subjects they teach, but to incorporate them in the studio teaching.

Future lecturers must have backgrounds in sustainability, specifically those with knowledge of Green Building Index where the Architecture course at the Universiti Sains Malaysia is concerned. Existing staff are required to attend classes on GBI so that when they impart knowledge, appropriate vocabularies are used, which changes concepts and priorities in future buildings. This may reduce the influence of the iconic images of much publicized works by Frank Gehry, Zaha Hadid, Santiago Calatrava, etc. because the sustainability approach often puts more emphasis on context and locality and pragmatic solutions to produce energy-efficient designs (Abdul Samad et.al 2009). It can sometimes be contradictory to the iconic portrayal of architecture. It is a task for educators to shift the students’ attention to emulate the work of sustainable architects who may not receive as much publicity or attention. The World Trade Centre of Bahrain is an exception. But once the momentum on sustainability in building designs catches on, buildings like the Bahrain WTC, though championing the green approach, would be slow to be emulated because good sustainable architecture can also mean deconstruction.

When the Malaysian Prime Minister pledged to the world that the country is going to reduce carbon dioxide by 40%, the academics must realize that it is not an option. Only in this way will there be conspicuous and tangible movement in influencing the minds of the students because the lecturers themselves are the prime movers. The architect cum lecturer can and must be at the heart of this process.

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