

APPROACH TO SUSTAINABLE DEVELOPMENT THROUGH ARCHITECTURAL EDUCATION: INSIGHT TO THE PERCEPTIONS OF SRI LANKAN STUDENTS

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ABSTRACT

Sustainable development is considered as a multi-dimensional problem for integration of economic, environmental, institutional, political, social and personal human problems. Therefore, interdisciplinary interaction will be essential to reach the ultimate goals of sustainability. Architecture, as a key profession in the construction sector, plays a significant role in promoting the interdisciplinary interaction and a holistic approach to sustainable development. This approach requires a high amount of knowledge, skills and attitude which could be obtained through architectural education.

The need of approaching sustainable development through education was accepted by the United Nations and has declared 2005 to 2014 as the decade of Education for Sustainable Development (ESD). Therefore, this paper intends to explore the relationship between the architectural education and sustainable design practice in the Sri Lankan context.

Architectural educational content on sustainable development has two folds, such as, the technical component and non-technical component. The technical components mainly focus on providing knowledge and skills, which are more applicable towards the latter parts of the design process (design detailing). Non-technical components not only provide knowledge and skills but also attitude and could be applied from the early stages of the design process (Concept development, brief interpretation, etc).

The methodology adopted is a survey (structured) research approach where data generated through a social survey and a literature survey would be analysed to reflect some thoughts. Social survey would be conducted through a structured questionnaire given to undergraduates and young practitioners of architecture from the two main schools of Architecture in Sri Lanka (City School of Architecture, Colombo and Department of Architecture, University of Moratuwa). Student perception on Sustainability would be explored through the parameters of personal interpretations, application frequency and satisfaction to non-satisfaction ratio. Reflections would include that the technical knowledge and skills need to be in equilibrium with the non-technical knowledge and attitudes given in architectural education to obtain a more holistic sustainable design approach.

Keywords: *Architectural Design; Architectural Education; Education for Sustainable Development (ESD); Sri Lankan Architecture Student Perception; Sustainable Development.*

1. INTRODUCTION

The Second World Summit on Sustainable Development (WSSD) convened in Johannesburg in 2002 recognised that education had the potential to play a major role in the future realisation of a 'vision of sustainability that links economic well-being with respect for cultural diversity, the Earth and its resources' (UNESCO, 2007, p. 6). Subsequently the United Nations General Assembly adopted Resolution 57/254 and declared the period 2005–2014 as the Decade for Education for Sustainable Development (DESD). The overall goal of the DESD, led by UNESCO, is to integrate values, activities and principles that are inherently linked to sustainable development into all forms of

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education and learning and help user in a change in attitudes, behaviours and values to ensure a more sustainable future in social, environmental and economic terms (UNESCO, 2007, p. 5).

In the light of the DESD, Architectural Education is also considered to be very important because Architecture, which is a key professional in the construction sector, has a direct impact on sustainability in all three spheres of social, environmental and economic contexts. Therefore, sustainable design is considered as a key skill in Architectural Education throughout the world and is taught as compulsory module at different levels of graduate studies. Though students are exposed to sustainable design theories and technologies through these modules, their interpretations, understandings and perceptions on sustainability differ in the practical applications. These perceptions on sustainability can initiate new trend (positive or negative) in sustainable design as these graduate students are the future practitioners of Architecture. Therefore it is very important to explore how students perceive the current architectural education on sustainable design that would influence the future built environment.

Therefore this paper intends to explore how Sri Lankan students of Architecture perceive sustainability during their graduate studies, and what their perceptions are towards the same. This would enable a reflective practice to develop “lessons learned” scenarios, where the results could be shared and any lessons learnt could be put into future practice. In order to move forward in a pertinent manner, it is of prime importance to reveal and confront the underlying conceptions shaping the construct “architectural and environmental education,” whether the perspective of sustainable development is fully adopted or is considered from a critical point of view.

2. IMPORTANCE OF THE EDUCATION FOR SUSTAINABLE DEVELOPMENT (ESD)

The notion of sustainable development entered the political centre stage of policy discourse over 20 years ago when the Brundtland Commission used it to connote a development strategy that, in a much quoted statement, ‘meets the needs of the present without compromising the ability of future generations to meet their own needs’ (WCED, 1987, p. 43).

Education is an essential tool for achieving sustainability. People around the world recognize that current economic development trends are not sustainable and that public awareness, education, and training are significant in moving society toward sustainability.

Education for Sustainable Development (ESD) is essentially a call for change in the way we educate our children and ourselves with the express purposes of ensuring a sustainable future. While countries and stakeholders are already interpreting this call in diverse ways UNESCO presents ESD as a development project with four objectives and four thrusts. The objectives are to;

- Facilitate networking, linkages, exchange and interaction among stakeholders in ESD.
 - Foster an increased quality of teaching and learning in education for sustainable development.
 - Help countries make progress towards and attain the Millennium Development Goals through ESD efforts.
 - Provide countries with new opportunities to incorporate ESD into education reform efforts
- (UNESCO, 2007, p.6).

The four thrusts of ESD are;

- Improving access to quality basic education,
- Reorienting existing education programmes,
- Developing public understanding and awareness and
- Providing training.

With its aim being to change the ways in which children and adults learn to think, value and act, ESD bears many similarities with earlier and parallel curriculum movements such as **environmental education**, peace education, population education, human rights education, citizenship education and

development education. While the curriculum and pedagogic approaches and boundaries between these 'subjects' or 'cross-curricula themes' are sometimes contested by the educators who promote them, they share a commitment to changes in educational content and delivery (Stables and Scott, 2002; McKeown and Hopkins, 2003; Jenkins and Jenkins, 2005). They vary most in terms of their intended reach (from school children to university students, corporate business and policymakers) and content and design (with some emphasizing the delivery of specific messages; others the development of skills of reasoning about and engagement with the wider world) (Scott and Gough (eds), 2004).

Implications of ESD are varied among different disciplines. Therefore it is important to identify particular issues in each discipline to educate in a sustainable manner.

According to Wijesundara and Gunarathna (2012), development sectors in current global context are so vivid that the need for sustainability education will also reflect this diversity. Table 1 below would reflect the different needs of ESD at different levels.

Table 1: Different Needs of ESD at Different Levels of Context/Society (Adopted from Wijesundara and Gunarathne, 2012)

Level in Context	Needs in ESD
1 Decision makers	make correct decisions that will ensure Sustainable development
2 Educators	integrate of ESD in every possible aspect in teaching
3 Professionals	Provide services within a framework that would not conflict with principles of sustainable development and to make use of appropriate knowledge and skills to make decisions and to take action.
4 Higher education students	Build knowledge , skills and attitudes to take actions towards Sustainable development
5 Primary and secondary education students	Build an attitude towards the sustainable development practices and to seek further knowledge when necessary
6 General public	Build an attitude for best sustainable development practices and to understand the implication if they are violated

Therefore it is important to understand the overall need as well as the specific needs of ESD in each level of society in initiating an ESD programme.

Further, education for sustainable development must promote “creative and effective use of human potential and all forms of capital to ensure rapid and more equitable economic growth, with minimal impact on the environment” (UNESCO, 1992, p.3).

The analytical framework provided by Yves Bertrand and Paul Valois (1992) is useful to critically examine this discourse surrounding education for sustainable development: “competitive needs,” “education for productivity,” “human capital,” etc. It can be observed that the socio-cultural industrial paradigm and its corresponding educational paradigm (rational paradigm) are predominant. Here, education is first and foremost perceived as a “central economic investment for the development of creativity, productivity, and competitiveness,” and as a transfer process where scientific and technical knowledge is favoured (UNESCO, 1992, p.14).

3. ARCHITECTURAL EDUCATION FOR SUSTAINABLE DEVELOPMENT

It is observed that ESD has grown very popular since the UNESCO declaration of the decade for ESD. According to Læssøe, Schnack, Breiting, & Rolls (2009), different countries have incorporated the ESD into unique areas that are appropriate to that country. ESD is most commonly integrated into environmental studies and climatic change and it is widely known as 'Environmental Education' (EE).

This Environmental Education for sustainable development framework refers to the paradigmatic conception of environment as a resource and to the conception of education as a technological information transfer process. Green buildings, energy efficiency, renewable energy, carbon footprints, environment impact assessments are the commonly taught areas in this field. Therefore, this is mainly education for the environment, aiming to support a certain economic conception of the quality of life. The development notion (adopted here as the basis for education for sustainable development) refers to the “techno-economic conception of development.” This very notion, according to Edgar Morin and Brigitte Kern (1993, p. 89), remains tragically under-developed as it “ignores issues of human identity, community, solidarity and culture...”

According to Wijesundara & Gunarathna (2012), identifying the correct Learning outcomes (LOs) is a key to success in any education program and Architectural Education for sustainable Development would find no exemption. Lozano-Garcia, & Rowe (2008), had proposed the following LOs that are also relevant to Architectural education for sustainable development. They are as follows:

Each student will be able to,

1. Define sustainability.
2. Explain how sustainability relates to their lives and their values, and how their actions impact issues of sustainability.
3. Utilize their knowledge of sustainability to change their daily habits and consumer mentality.
4. Explain how systems are interrelated.
5. Learn change agent skills.
6. Learn how to apply concepts of sustainability to their campus and community by engaging in the challenges and solutions of sustainability on their campus.
7. Learn how to apply concepts of sustainability globally by engaging in the challenges and the solutions of sustainability in a world context.

According to Bloom (1956), Educational activities in general have three domains such as;

- Cognitive: mental skills (*Knowledge*)
- Affective: growth in feelings or emotional areas (*Attitude or self*)
- Psychomotor: manual or physical skills (*Skills*)

It is observed that the above seven LOs had been developed in response to the Blooms domains in education. This is summarized in the Table 2 as below:

Table 2: Three Domains in Education and Learning Outcomes of Architectural Education for Sustainable Design

Domain	Learning Objectives	Nature of delivery
1. Knowledge	1. Define sustainability. 2. Explain how sustainability relates to their lives and their values, and how their actions impact issues of sustainability	Technical and non-technical
2. Attitude	3. Utilize their knowledge of sustainability to change their daily habits and consumer mentality. 4. Explain how systems are interrelated.	Non-Technical
3. Skills	5. Learn change agent skills. 6. Learn how to apply concepts of sustainability to their campus and community by engaging in the challenges and solutions of sustainability on their campus. 7. Learn how to apply concepts of sustainability globally by engaging in the challenges and the solutions of sustainability in a world context.	Technical

The above literature survey and the discussion, reveals that Architectural educational content on sustainable development has two sections, such as, the technical component and non-technical component. Architectural design is the main application of architectural education and its implementation may happen in phases. The combination of these phases could be called as the design process. These phases of the design process are;

- a. Concept formulation
- b. Brief interpretation
- c. Form making
- d. Shaping of the building

The technical components mainly focus on providing knowledge and skills, which are more applicable towards the latter parts of the design process (design detailing). Non-technical components not only provide knowledge and skills but also attitude and could be applied from the early stages of the design process (Concept development, brief interpretation, etc).

4. SURVEY: EXPLORE ARCHITECTURE STUDENTS' PERCEPTION ON SUSTAINABILITY

The two main schools of Architecture in Sri Lanka are the City School of Architecture (CSA), Colombo and Department of Architecture, University of Moratuwa. Both Schools have similar syllabuses with similar learning outcomes. Students are offered mandatory modules such as Environmental studies, Climate and comfort, Solar geometry and Green Architecture at Level 1,2 and 4 of the five year degree programme. Twenty number of CSA level 4 students and another ten number of students from level 5, department of architecture were used for this study. These students were given the similarly structured questionnaire, that explored the following parameters on their perception towards sustainable design;

- a. Personal interpretations on sustainability
- b. Application frequency of sustainable principles in design projects
- c. Reason for the application of sustainable design principles(SDP) in design
- d. Phase of design process where sustainable principles are applied
- e. Satisfaction level of the delivery of the subject sustainability in graduate studies
- f. Student recommendations

Thirty opinions for each of the above parameters were collected to explore student perception on sustainability.

5. ANALYSIS OF DATA

The thirty questionnaires mentioned in the section 4 above were analysed based on the said parameters to draw insights to student perception on sustainability. The data and information on the questionnaires were transferred in to concept maps, graphs and charts as shown below.

a) Personal interpretations on sustainability

Students were asked to define sustainability in their own terms. Their definitions had a variety of highlights where certain aspects of sustainability were given more emphasis. The highlighted aspects of sustainability were extracted from their personal definitions and put in to a concept map as shown in Figure 1 below.

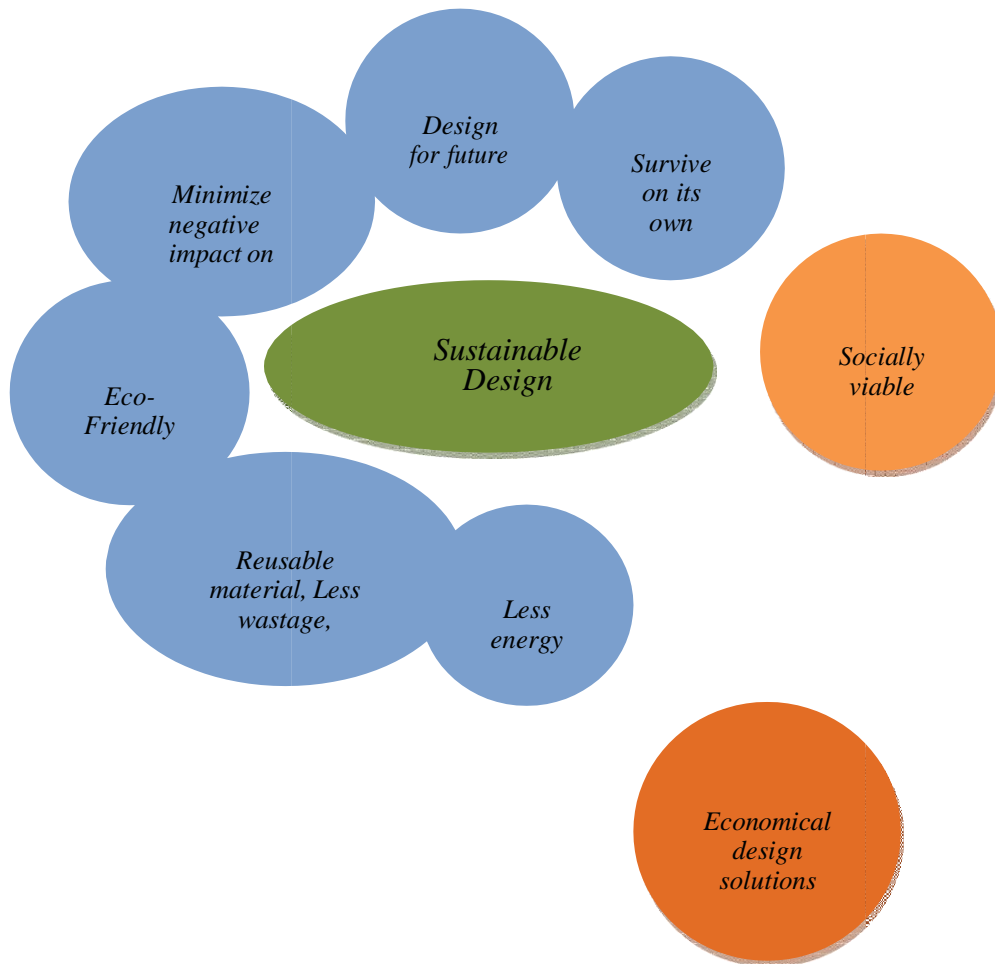


Figure 1: Concept Map: Student's (Architecture) Perceptions on Sustainable Design

Figure 1 show what architecture students consider important when it comes to sustainable design. Further, it also reflects a variety of ideas and that student's emphasis on environment related aspects are higher than socio-economic aspects. This could be further shown through a pie chart as per Figure 2 below. 80% of students perceived sustainability purely through environmental aspects and only 20% remembered the importance of social and economic aspects of sustainability. (Student's definitions were broadly categorized as environmental approach, economic approach & social approach and then counted, in order to get a numerical value)

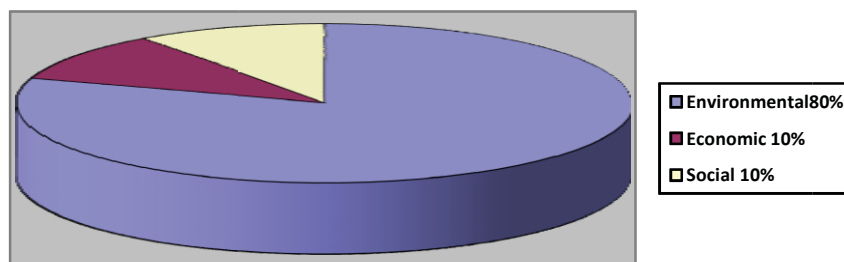


Figure 2: Pie-Chart: (Architecture) Student Emphasis on the Three Main Domains of Sustainable Design

Reflecting on the Figure 1 and 2 above, it could be said that students of Architectural studies perceive sustainability more through the Environmental domain and tend to neglect socio-economic domains which are vital in establishing sustainable developments.

This could be as a result of the imbalance nature of education given through more technically oriented such as environmental studies, climate and comfort, solar geometry where environmental issues are more addressed than socio-economic aspects. Section 3 above discuss on the learning outcomes that need to be obtained in all three domains of education such as Knowledge, Skills and Attitudes. If those learning out comes were achieved through education, students would be able to integrate environmental, economic and social aspects of sustainability.

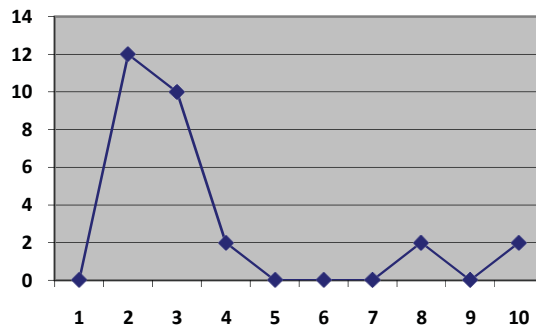
b) Application frequency of sustainable design principles (SDP) in design projects

In the questionnaire, students were asked about the number of projects (out of all the design project done up to their level of study-approximately 10 projects) they remember as where they applied sustainable theories. Student comments are put on to a table as below (table 1);

Table 3: Architecture Student's Use of Sustainable Principles on Design Projects

No of projects	0/10	1/10	2/10	3/10	4/10	5/10	6/10	7/10	8/10	9/10	10/10
No of students	2	0	12	10	2	0	0	0	2	0	2
% of students	6.6%	0%	40%	33.3%	6.6%	0%	0%	0%	6.6%	0%	6.6%

Number of students



Number of Design projects

Figure 3: Graph on Architecture Student's Use of Sustainable Principles on Design Projects

Figure 3 and Table 3 above indicate that majority of students (30-40%) have used sustainable design principles in only 2-3 design projects out of about 10 projects up to their level of study. Further, it is also important to note that 6.6% of students have never applied sustainable design principles (SDP) and another 6.6% had used these principles in all the given projects. Therefore, it is important to reflect on the fact that in spite of all the attention given to Sustainability by the whole world its application on the built environment could be less popular.

c) Reason for the application of SDP in design projects

Students were asked whether they applied the sustainable design principles in their projects as they really understood the value of it or as it is an examination requirement. Their comments are put in to the table 2 as below;

Reason for the use of SDPs	Number of students (30)
A. As the true value of Sustainability is understood	7 (23%)
B. As it is an examination requirement	8 (27%)
C. Both reasons	15 (50%)

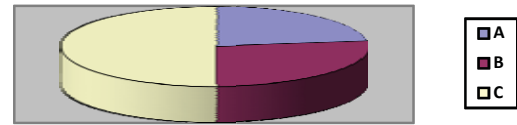


Table 4: Reason for the Application of SDPs in Design Projects

Figure 4: Pie Chart: Analysis of Table 2

Table 4 and Figure 4 above show that the majority students do understand the true value of applying SDPs in design projects; yet there is also a considerable amount of students who do not realise its value and apply them only if it is an examination requirement. These students are the future practitioners of the society and they may contribute less to sustainable developments in the near future. Therefore, it is salient to reduce the percentage of students who do not understand the value of SDPs by improving the education system.

d) Phase of the design process where sustainable design principles are applied

Design is the key module in Architectural studies. A design development can happen in phases and these phases in chronicle sequence are known as the design process. As mentioned in the section 3 above, these phases of the design process could be broadly identified as follow:

- a. Concept formulation
- b. Brief interpretation
- c. Form making
- d. Shaping of the building

The given questionnaire inquired students to identify the design phase in which they mainly initiate to apply the SDPs during their design projects. The data generated through the survey was put in to a graph as shown in the Figure 5 below;

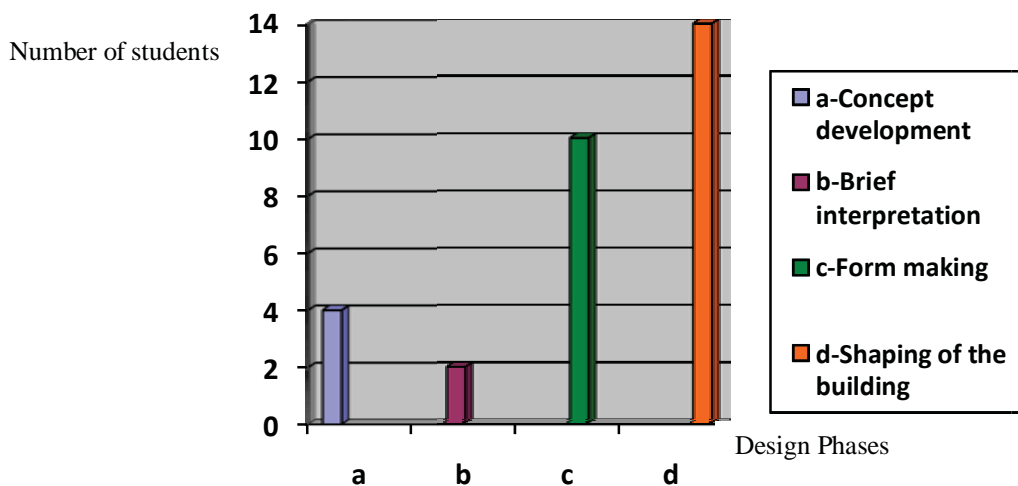


Figure 5: Phase of the Design Process where SDPs are Applied by Students

Figure 5 above reveals that majority of students apply SDPs towards the latter part of the design process. This means that most of the student designs are just wrapped up with SDPs without producing truly a homogeneously sustainable design. During the last two phases (c and d) of form making and shaping students tend to use more technical knowledge by incorporating green technologies such as the use of solar panels, sun shading devices, recycled materials, etc and call it as a sustainable design.

According to the theories discussed above, this alone is not truly sustainable and can be considered as an incomplete approach to sustainable development. First two phases of concept development and brief interpretation involves non-technical knowledge, skills and attitudes. Therefore it is acceptable to consider SDPs applied from early design phases are more complete in approaching sustainable development.

e) Satisfactory level of the delivery of the subject sustainability in graduate studies

Students were asked whether they were satisfied or not satisfied with the delivery of the modules related to SDPs during their education period and the data are transformed in to the graph shown in the Figure 6 below;

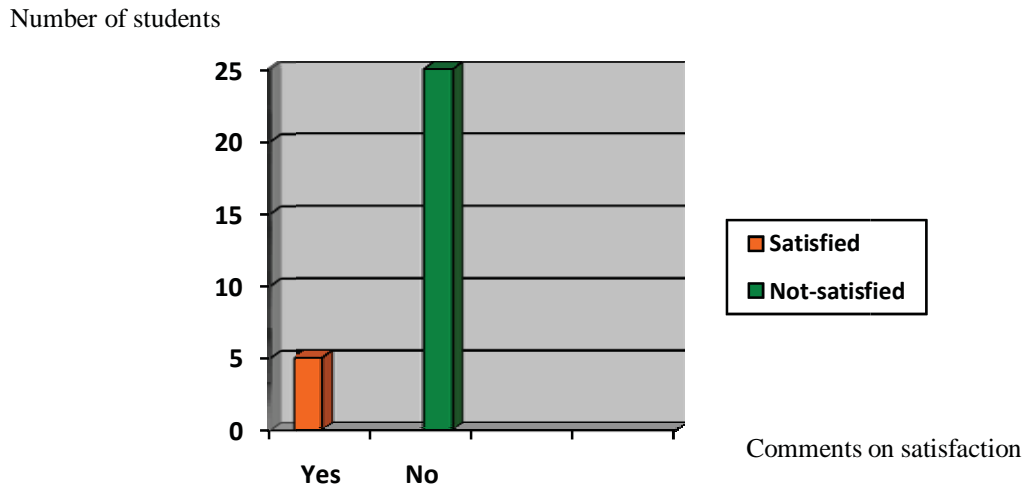


Figure 6: Graph Showing the Satisfactory Levels of Students on the Delivery of Sustainable Design Modules

Figure 6 reflects that the students were more unsatisfied about how they were exposed to modules relevant to sustainable design during their graduate studies. In one of the questionnaires, a student had said that “*Everybody talks about sustainability; but only in very far that it is really explained how to use sustainability in design. What we all do is using materials that are labelled as sustainable and incorporate to the design*”. This clearly shows that in the education system there is a gap between the theories taught and their application in design projects.

f) Student recommendations

Student recommendations on improving Architectural education on sustainable developments were extracted and summarized in to a concept map as shown in the figure 7 above. These recommendations are salient in improving education in response to sustainability.

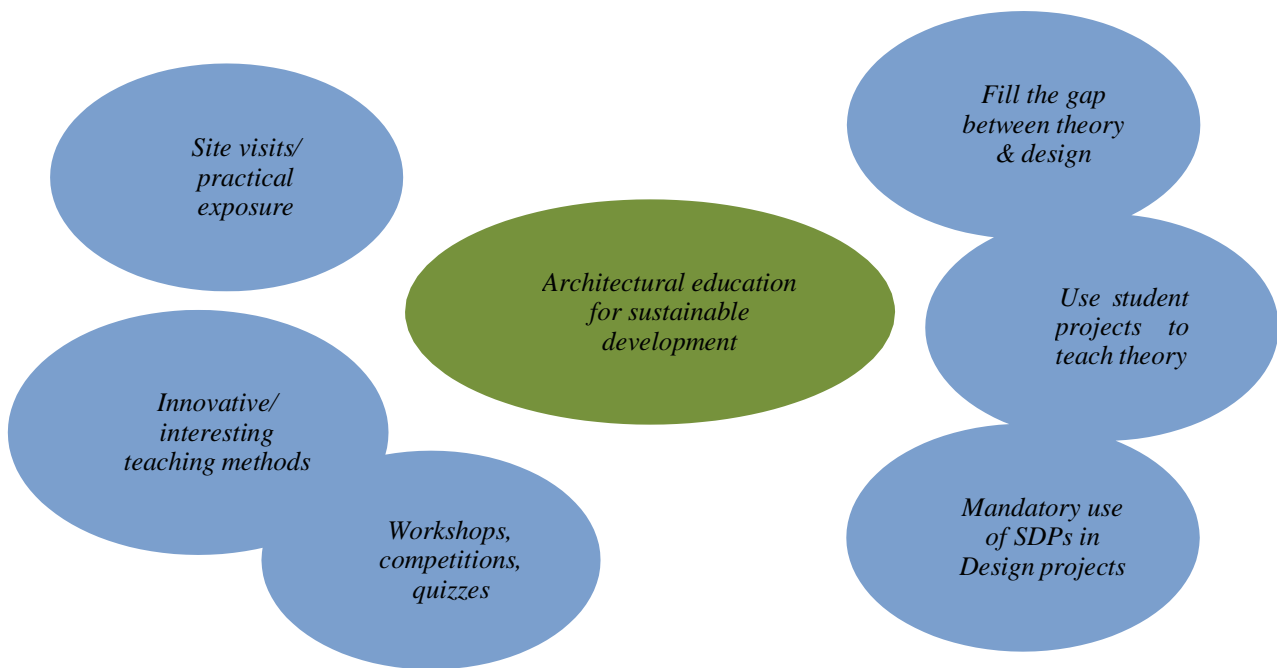


Figure 7: Concept Map: Student Recommendations to Improve Architectural Education for Sustainable Development

6. CONCLUSIONS (KEY FINDINGS & RECOMMENDATIONS)

Architecture is a salient profession in sustainable developments. Therefore, Education for Sustainable Development (ESD) is crucial in Architectural Education. Student perception on sustainable design could be considered as an indicator of the success of Architectural Education on Sustainable development. Therefore, this research paper looked in to perceptions on sustainability of Sri Lankan students from architectural studies through a questionnaire survey and following conclusions were derived;

- Students of Architectural studies perceive sustainability more through the Environmental domain and tend to neglect socio-economic domains which are vital in establishing sustainable developments.
- Use of Sustainable design principles(SDPs) in design projects are considerably less during graduation studies
- Considerable amount of students do not realise the value of sustainable design and apply SDPs only if it is an examination requirement.
- Majority of students apply SDPs towards the latter part of the design process (form making and shaping) and not at early stages such as the concept development and brief interpretation.
- Majority of students are not satisfied on how subjects related to sustainable design were delivered and students see a gap between theory and design.

Based on the above findings and student recommendations following suggestions could be made to improve Architectural education for sustainable development;

- Eliminate the gap between SDP theories and design projects by making SDPs as an essential assessment criteria in design projects, continuous monitoring of the application of SDPs in design projects, etc.

- Promote innovative and interesting teaching strategies such as workshops, competitions, quizzes, etc in delivering modules related to sustainable design
- Site visits and practical sessions to enhance a better understanding on the subject

The above study emphasised the need of improving Architectural education to achieve a holistic sustainable development that caters to all three spheres of environmental, economic and social aspects by balancing the technical and non-technical approaches in education.

7. FURTHER STUDIES

The above study was based on a survey done by using a general questionnaire. Further studies could be done by analysing a design project and explore the relationship between the design phases and sustainable design principles for the development of Architectural education for sustainable development.

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