AN EXPERIMENTAL SCHOOL prototype: ENGAGING CHILDREN’S SENSES IN 3R (REDUCE, REUSE & RECYCLE) LEARNING

S.Y. Kong 1*, Naziaty2, S.P.Rao3

1,2,3 Department of Architecture, University of Malaya, Malaysia
* Corresponding author: E-mail: k_sengyeap@siswa.um.edu.my, Tel: +60123010369

ABSTRACT: This paper presents an experimental school prototype (hereafter designated as “The Eco-Literacy School) for Malaysia. The study employed a qualitative method to develop a set of design strategies to engage children’s senses in 3Rs (Reduce, Reuse & Recycle) learning. Research team conducted an in-depth study involving a series of interviews and workshop discussions with a panel of professional architects as well as academic staff in the Faculty of Built Environment at University of Malaya to gather the relevant data. The findings suggested that the concept of ‘turning waste into educational space’ by integrating 3Rs program into the learning environment. Additionally, the findings explored innovative building materials and technology in school construction. A synthesis of the findings revealed that the potential use of learning environment to guide children towards pro-environmental behaviour. These findings offer significant contribution towards educational facilities reform in the tropics.

Keywords: Eco-Literacy School; senses; 3R; children; Malaysia

Introduction

Waste management is a daunting task in many developing countries. In Malaysia, the economic boom in recent years has led to rapid urbanisation and consumption-oriented lifestyle among its citizens [1]. Education of young children is a potential way of addressing this issue. The current 3R program in Malaysia is infused into the children’s daily learning subjects [2]. The-day to-day 3R learning happens through the abstract representation in a featureless classroom. Children are dependent upon reading as their primary source of learning without any real sensory experience. This is in contrast to Weston’s writings [3] who argued that the multisensory experience can help tremendously in molding the children’s pro-environmental behaviour. Baines [4] further explained that if children invoke more than one sense over a period of time, they can retain what they have learned for a longer period. However, multisensory learning can only be successful if careful thoughts are given to the learning environment.

Reggio Emilia’s education approach identifies three educators in a classroom at anytime, namely the teacher, the children and the environment [5]. Our surroundings can contribute to children’s learning if we treat the environment as an important element in children’s education [6]. This potential use of environment as “the third teacher” is not fully explored in Malaysian school system. In fact, the concept of “Factory Model” [7] prevails in public school design. These school buildings are designed to meet the budget and merely function as a shelter “for the act of teaching/learning to take place” [8]. It deprives our children of a creative, imaginative and multisensory learning space. How can we engage children’s senses in 3Rs learning? How do we translate 3Rs program into the learning environment? This research is addressed to these questions by examining the innovative alternations to the current prevailing school system in Malaysia.
Material and Methods

Qualitative Methodology
The qualitative method involves a series of interviews and workshop discussions with a panel of professional architects and academic staffs in the Faculty of Built Environment at University of Malaya. It is conducted as an experimental project with a primary school prototype as the research outcome. The qualitative research explores various design strategies and options in search of new architectural ideas for a primary school.

Data Collection and Analysis
A design brief stating the focus of the research was established to investigate the use of sensory architecture in supporting 3Rs education. Open and semi-structured interviews were conducted with academic staffs in the Faculty of Built Environment to develop design concept and ideas through a series of conceptual sketches. These sketches were then turned into 2D/3D drawings and cardboard study model. The school prototype design was continually developed and refined through a series of workshop discussion with a panel of experts consisting of senior lecturers and practicing architects. The panel of experts reviewed the research project to give professional input on design, constructability, feasibility and practicality.

Researcher’s Relationship to the Data
The study was initiated and conducted by the Principal Investigator (PI). The PI spent a significant amount of time with the academic staffs in the Faculty of Built Environment, during which time and efforts were made to gain input for multisensory design. The medium of communication were idea sketches, 2D/3D drawings and study model. The PI is a qualified LEED Accredited Professional (LEED AP) with architectural background. The PI has worked on various conceptual design projects involving sensory architecture in both academic and professional field.

Results and Discussion
The Concept of “Turning Waste into Educational Space”
The research team identified the concept of “turning waste into educational space” for the proposed Eco-Literacy School in Malaysia. It is a unique way of designing and constructing by using reclaimed and salvaged materials that otherwise will end up in the landfill. The school buildings will serve as a “3D textbook” that reflects the lessons of Reduce, Reuse and Recycle. It promotes the integration of children’s senses in 3Rs education and encourages self-discovery and hands-on learning.

The 3Rs concept begins with the construction process that consists of two phases. The building professionals and contractor will design and construct the concrete frame as the main permanent structure or known as the ‘Skeleton’ in Phase I. Crushed concrete from nearby demolition projects provide a rich source of recycled aggregate for foundation and concrete work. The local community will then be involved in Phase II for landscaping and installation of wall cassettes as the “Skin” or infill. The shelf-like wall cassettes are specially designed to store recyclable materials like bottles and aluminium cans that students brought from their homes (Figure 3). In addition, the school is designed with the ‘kit-of-parts’ approach that facilitates deconstruction at the end of its life cycle. Most of the architectural components can be assembled and dissembled easily for reuse and
recycling purpose in the future. This would ensure that the materials are continuously in active service and diverted from the landfill.

**Reduce**

The Eco-Literacy School is designed to be different from the conventional buildings to assist learning about ‘Reduce’. Effective use of materials and spaces minimises waste of resources. Traditional roof only served as a shelter, but the roof garden in Eco-Literacy School is able to collect and filter rainwater for toilet flushing, improve the thermal insulation and provide extra opportunity for children to engage with nature. The sensory experience guides the children towards creative way of ‘doing more with less’. It promotes minimization of waste through resource efficiency.

![Figure 1](image-url) The classroom façade is composed of recyclable items and the soil bed in the roof garden helps to filter rainwater and improves the thermal insulation. In addition, in order to achieve efficiency in the usage of space, the Eco-Literacy School is also designed to be a community centre after school hours.

**Reuse**

The concept of ‘Reuse’ is reflected in the installation of second-hand windows and doors that have been salvaged from nearby demolition project. Children learn to appreciate or conserve resources and reuse things that others may regard as waste. Incorporating reclaimed materials in the school design is able to engage the sense of touch in children’s learning. Constant use and contact with these reclaimed architectural components encourages the children to be creative in finding new uses and applications for discarded items.
Recycle

The concept of ‘Recycle’ is guided by establishing the shelf-like wall cassette. Element of play is incorporated into the recycling lesson whereby the classroom wall serves as an ‘art board’ that stores bottles and aluminium cans temporarily before these recyclable items were sent to the recycling centre (Figure 3). Wall cassettes that are filled up with bottles will eventually become a ‘Bottle Wall’ that creates light and colour when sunlight passes through it. This hands-on multisensory approach is expected to be far more effective than the traditional classroom-based lecture that only involves learning through textbook.

Conclusions
This is an on-going research that suggests a conceptual framework from the architectural point of view on the methods to guide the local community towards an environmentally friendly waste management. The interest of the paper is not focused on the issue of architectural style, but it aims to explore innovative design that investigates the potential use of learning environment to guide children towards pro-environmental behaviour. These findings offer significant contribution towards educational facilities reform in the tropics. It serves as a catalyst for future research on the theoretical and practical use of architecture in environmental education. This paper does not include the testing of the proposed design strategies on real life students. Measuring the impact of the proposed sensory architecture on the school children’s environmental knowledge, attitudes and behaviour is a complicated process. The research team is currently working on the quantitative method to gather numerical information and figures with statistical support to strengthen the idea of Eco-Literacy School.

References