ABSTRACT

Children are very special and unique creatures as their emotional, intellectual and their physical developments are closely intertwined with their environment. With certainty, the children participatory design workshop was viewed as an appropriate platform in providing them an early appreciation on the values of their actions in order to enhance their sensitivity and concern regarding environmental issues. This paper intends to describe the significance of children participation in the design workshop on mitigating the effects of urban heat island. Selected students from one elementary school in Johor Bahru were invited to participate in this study that started October 2010 to September 2011. The strategy in mitigating the effect of UHIs through increased vegetation cover is set into motion by this study. Results of the series of children's workshops were analyzed using the GIS application and consequently translated as inputs in the development of a landscape design. The workshops have achieved UHI mitigating strategies such as the landscape design evaluation and tree planting activity. This study has revealed that children, given the chance to express freely and gain opportunities from grown-ups, have the capability to express their concerns as well as responsibilities on their surrounding environment. Succinctly, children's participation is considerably significant in sourcing out ideas and actions to mitigate UHIs effect. However, their involvement is rarely given due recognition in the planning process and design environment in Malaysia. Finally, a categorical support from local authorities and private sector would be an assurance that could facilitate successful implementation of this strategy.

Keywords: children participation, tree planting, urban heat island (UHIs) mitigation

1. INTRODUCTION

Urbanization is one of the leading challenges of the 21st century especially in the developing countries. Rapid population increase and economic growth are just some of the features that could be observed in Southeast Asian cities. The unabated expansion of the physiognomies of cities and towns, through unmanaged urban sprawl, leads to reckless conversion of forests and other rural land uses into impervious urban surfaces (Rusli, 2011), thus contributing to the deleterious consequence of urban heat islands (UHIs). UHI is defined as any man-made structure that contributes to the rise in temperature that result in a well-defined, distinct “warm island” among the “cool area” characterized by lower temperature of the proximate natural landscape (Voogt, 2002). Its far-reaching impact is not only experienced within the limited territorial confines of cities, but also to human beings including the ecosystem which are far distant from the cities. Thus, the effects of the these heat-emitting UHIs effect can be linked and can contribute to greenhouse effect and global warming. In response to this concern, there are two strategies which are proposed in mitigating the UHIs; (i) increase surface reflectivity, and (i) increase vegetation cover.

The focus of this paper is on the second strategy which is to increase vegetation cover through the involvement of children’s participation as an integral content of the environmental information and education approach. (Wilson, 1997) has emphasized that environmental education embedded at the early childhood stage has the potential for greatly enhancing the development of a young child. This approach in honing a child in the early stages of life according to Basile and White (2000), play a major role in the development of people’s lifelong attitudes and values, as well as their understanding of themselves and the world around them.

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2. METHODOLOGY

This paper is an ex-post study of the earlier project entitled “Developing a Participatory Workshop Method for Use with Children in UHI mitigation Strategies in Malaysia.” This project has afforded a series of workshops participated by school children with ages 11 to 12 years of age which was conducted on October and November 2010, and a culminating workshop was held on January 2011 (see Table 1).

Table 1: Workshop Purposes and Methods

<table>
<thead>
<tr>
<th>Workshop</th>
<th>Purpose</th>
<th>Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st Workshop: Town watching (Oct 2010)</td>
<td>To identify children’s favorite and dislike places</td>
<td>- Ten groups of five children - Visited their favorite/problem places in group, taking pictures - Discussed the reasons - Presentation and discussion</td>
</tr>
<tr>
<td>2nd Workshop: Air temperature recording (Nov 2010)</td>
<td>To enhance the children’s awareness towards the importance of green spaces</td>
<td>- Ten groups of five children - Visited the selected places and measured thermal conditions - Presentation and discussion - Lecture on thermal effects of green space.</td>
</tr>
<tr>
<td>3rd Workshop: Greening plan (Jan 2011)</td>
<td>To let the children design and propose a greening plan based on the previous measurement experiences.</td>
<td>- Ten groups of five children - Distributed the results of the previous WS - Designed a greening plan by making a simple model in group - Presentation and discussion</td>
</tr>
</tbody>
</table>

From these series of workshops, the results were reviewed and analyzed as preliminary information for purposes of designing process. Several on-site visitations were likewise conducted with the objective to assure that the scheme in the designing process is similar with the actual on-site conditions. At this instance, precise locations of existing trees were collected using GPS Trimble Geo-XM, and over 400 coordinated trees were consequently imported into ArcGIS application to update and integrate the newly-acquired information from the field with existing data gathered from the previous workshops.

The conduct of this process was significant to provide a holistic overview on the physical condition of the site before designing a scheme that would show the location of the trees. Moreover, through the aid of ArcGIS application, the planning and the designing process was enhanced and has shown more effectiveness and accuracy when the results from previous workshops were combined such as (i) student’s favorite place, (ii) air temperature, (iii) wind comfort level, (iv) thermal comfort level and (v) student’s designed trees. With the adoption of this process, the designer could easily facilitate the determination of suitable locations for planting of new trees to avoid redundancy of location with the existing trees on site.

With the design information provided by the GIS database, a preliminary decision was considered which led to the proposal of constructing a red boundary as the site for tree planting activities (see Figure 1). Consequently, the proposed tree planting area was presented before the steering committee for comments and improvements on 17th August 2011. During the presentation, a landscape architect from SP Setia Bhd Group has recommended to focus more on the right side (see Figure 2) of proposed area in order to take full advantage of the benefit that the trees would provide to people such as shades from the sweltering sun, and cool breeze of the wind, among others. Similarly, the committee has unanimously agreed by proposing that forest tree species are suitable to be planted in the proposed site.

Subsequently, in order to address the proposal of the committee, a reference study on Hutan Bandar Mutia Rini was conducted on 18th August 2011 to assess various forest species suitable as planting material on the proposed site, and to benchmark on the concept concerning the development of landscape design. After some discussions, a tropical garden concept was proposed as an appropriate landscape design for the conceived area (see figure 2). A second presentation was afforded showing the planned design to the steering committee on 25th August 2011 for further discussion and amendment. Finally, this tentative plan was presented before the students during a short workshop on 5th September 2011 for the final evaluation on the concept of landscape design. A short questionnaire was also distributed during the workshop.
Tengah Municipal Council (MPJBT) has sponsored 60 trees including the planting equipment and the provision of additional implements such as tents, chairs, audio system, etc. Similarly, the SP Setia Bhd Group has provided food, event t-shirts and offered various necessary technical assistance prior to the actual tree planting activities. Table 2 shows in brief the flow and timeline of this study.

Table 2: Research Activities

<table>
<thead>
<tr>
<th>Research activities</th>
<th>August 2011</th>
<th>Sept 2011</th>
</tr>
</thead>
<tbody>
<tr>
<td>Review and analyze previous workshop results</td>
<td>W1 W2 W3 W4</td>
<td>W1 W2 W3</td>
</tr>
<tr>
<td>GIS database design</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Site visit and feature confirmation in site</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Update GIS Database and produce design proposal</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Presentation and discussion with steering committee</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Presentation and discussion with children</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Final preparation for tree planting day and confirmation of design proposal</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tree Planting Day and Evaluation from participants</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Children Participation on Design Development

The landscape design proposal (Figure 2) was also presented to school children during a workshop for final evaluation and amendment. The workshop has two lecture sessions which were conducted on 5th September 2011 in Sekolah Kebangsaan Taman Bukit Indah with the participation of 44 school children having the age of 12 years old. The workshop intends to survey the students’ opinion and satisfaction level on the design development concept. During the workshop, the plan for the conduct of a comprehensive tree planting was proposed by the children. The workshop was started by a successive series of two lectures by Assoc. Prof. Dr. Ismail Said and Dr Mohd Hisyam Rasidi focusing on the importance of preserving nature including the presentation of program outline for tree planting activities. During the session, the preliminary design development of the tree planting plan also presented to the children, followed by some explanation and clarification of the designing process as well as the concept prior to the distribution of the questionnaires.

Tree Planting Activities

The designing process and school children participation continued with the implementation of the design during tree planting day. There were 38 students, seven teachers and 15 research assistants participated during the tree planting activities on 17th September 2011 from 7:00 AM until 12:30 PM which was held in Taman Bukit Indah Town Park. Other participants include the six members of the steering committee, who are the representatives from the...
3. QUESTIONNAIRE ANALYSIS AND DISCUSSIONS

In this section, the results of two sets of questionnaires are analyzed based on the following: (i) students’ degree of satisfaction on the landscape design development, and the (ii) students’ evaluation of the tree planting activities. The first set of questionnaires was distributed before the tree planting activities, while the second set of questionnaires was answered after tree planting activities.

Analysis on Children Satisfaction on Landscape Design Development

A total of 44 questionnaires were distributed to the students. In the early stage of questionnaire, the students were asked regarding their degree of satisfaction about the overall landscape design proposal that was shown and explained to them. An aggregate of 77.0% of the students sampled have responded ‘very satisfied’ with the design, 18.0% satisfied, 5.0% neutral, while 2.0% of those surveyed choose ‘not sure’ as their answers (see Figure 5).

Figure 5: Responses for satisfaction level

The results mini-survey showed that 98.0% of the school children have quite appreciated and gained understanding from the lectures given to them by way of expressing their opinions through the questionnaires. In a similar vein, it can be deduced that the lecture conducted by lecturers to the school children had a significant impact in getting their attention. For almost an hour of lecture session, it was observed that the children were keenly absorbed by the story telling method especially when their names are used as characters in the story. They pay more attention, happy and give positive responses to every question asked by the lecturers. The positive behavior of the children can only mean that they can easily understand the gist of the story and other information through a storytelling method. The story becomes more interesting to them.
when funny words, imaginations, facial expressions and non-static body language were used by the storyteller. Since children are usually visual, they have appreciated the graphic slides which were presented that they become more attentive to the lecture.

Providing the children with basic information in regard to protecting nature and landscape design was crucial to engage their young minds in understanding and their responses toward the design presented to them. (Hart, 1997) stated that the key success in participatory planning and design process lies in creative negotiation among the children. By using the appropriate approaches and materials, children can be involved from the start in the process of planning communities. He further stated that children’s experience with planning and design projects will mature to the point where they wish to walk alongside the adults. Therefore this process, as (Hester, 1984) emphasized should be the goal of any community rather than keeping children’s voices falsely segregated, as though children and adults lived in different communities.

The students were further asked on their opinion about the Tropical Garden concept that was proposed on the design which was earlier presented to them. In the overall, 43 students or 99.0% of the total have unanimously agreed with the concept, while one outlier felt ‘neutral’ regarding the suggested design. The responses clearly indicate that the lecture was well presented and all the information needed by children was delivered successfully. On the question regarding their understanding on the relationship between UHIs and the green environment, 40 students or 91.0% of the total have agreed that the proposed landscape design can reduce the effect UHI, one outlier was recorded whose answer was ‘neutral’ and three answered ‘not sure’ regarding this statement. The ‘not sure’ responses indicate that few of them did not have the full grasp on the issue despite the comprehensive explanation given to them during the previous workshop and was likewise practiced. The justification for this end result still needs to be explored although the percentage is insignificant.

Finally, the students were asked about their opinion, comments or suggestions on the proposed landscape design. This question was posed for the children to be able to create ‘that’ feeling of ‘control’ towards the design. (Sanoff, 2006) advocated that ‘control’ enables a person’s feeling of belongingness and responsibility necessary for an effective process. On this final question, 91.0% of the students answered the question while only 4 students or 9.0% have no answers. As theorized by (Wegerif, 2005), playing with words and ideas assumes a context of mutual trust and support, where each participant knows that what he or she says will be accepted. Of the answers, 61.0% of the students give one suggestion, 23.0% with two suggestions, 7.0% with three suggestions, while 9.0% has provided four suggestions (see Figure 5). It can be viewed from the number of responses that the willingness of the children to express their opinion, establishes an indicator that they have an important role and have that feeling of responsibleness in community building en route for a better environment.

On the other hand, the number of suggestions also contributes to the perception that the children truly understand the UHIs subject, some environmental issues and the presentation of the landscape design proposal. In a sense, they were able to manage in dishing out their ideas for the improvement of the existing conditions. Their ability to understand and their act of sharing their thoughts are necessarily significant in honing their young minds; and an important opportunity for them to increase their level of responsibility in environmental decision-making process and consequent actions, thus enhancing their competences. In this course of progression, the children find the occasions appropriate to develop confidence on their capabilities, and their ability to join others for collective action, as they follow issues of their own interests and concerns.

Their varied suggestions were analyzed and three similar opinions were also derived; these are (i) infrastructure (66.0%), (ii) educational (5.0%) and (iii)
Analyzing the results obtained from the questionnaire, it can be appropriately inferred that children should be involved in every stage of the designing process from goal setting, facility programming, site exploration, design and even in the construction of a space. It would be a significant exercise that would facilitate an important contribution to enhance educational curriculum in the schools. In addition, through the affirmative and constructive support from the teachers, parents, educational institution, the local authority and private sector, the functional participation of children would beneficially contribute to an inclusive and holistic approach in the designing process. Equally important is the concept that children have a right to take part in the decision-making process as active participants who should be considered as ‘equals’ with all of the participants, as well as with the people organizing the activity.

Table 3: Opinion among the Children

<table>
<thead>
<tr>
<th>Opinion</th>
<th>Details</th>
</tr>
</thead>
</table>
| Infrastructure | - I suggest to have a big playground  
- New public toilet  
- Built more pedestrian walk  
- Add signboard ‘Do not litter’  
- Provide lamp  
- Provide benches, table and huts  
- Provide telephone booth  
- Build more gazebos  
- Add windmills and solar panel to save energy  
- Waterfall  
- Food stall  
- Provide tennis and badminton court  
- Provide more dustbins |
| Educational | - Please put tag name for trees  
- Organize annual program such as walkathon in Bukit Indah |
| Environmental | - Plant more trees  
- Increase the pond’s size  
- Preserve birds  
- Take care of the pond  
- Preserve more flattened spaces  
- Put more fishes and animals in the lake |

Evaluation of Tree Planting Day

In the evaluation questionnaire, the students were asked on some demographic information such as their name, gender and grade level. The question that followed has nine components inquiring their personal feelings and opinions about the tree planting activity. The set of nine questions has four multiple score responses from one (1) to four (4) where each numerical scale was respectively indicated with ‘agree’, ‘neutral’, ‘disagree’ and ‘don’t know’ labels of description.

Question 2
2.1- Did you communicate with others nicely?  
2.2- Did you express your opinion?  
2.3- Did you find new things about your neighborhood?  
2.5- Do you agree that this activity is what you anticipated during the last workshop?  
2.6- Do you feel satisfy after you have planted the tree sapling?  
2.7- Will you tell the experience to your friends and family?  
2.9- Would you call your friends to join you in planting more trees?

In reference to the results, a minimum of 23.0% and a maximum of 97.0% of the number students answered ‘agree’ to all of the questions. In question 2.4, the answers were assorted when they were asked about what they have found in the park (see Table 3). From the point of view of the researchers, most of them seem to be happy and excited as they found new biological life on the planting site such as tadpoles, worms, mosquitoes, flies and other insects during planting activity. The new life forms were found in the tree holes that were filled with water since it rained in Taman Bukit Indah the night before the planting event. The activity was one of the most valuable experiences in life for most of the children. They learn to plant trees, prepare the planting tools, know the appropriate tree species, and more importantly, how to take care of the trees. As mentioned by (Pyle, 2002), exposure to natural environment improves children’s cognitive development by improving their awareness, reasoning and observational skills; and sustained by (Cobb, 1977) and (Louv, 1991) who similarly stated that early experiences with the natural world have been positively linked with the development of imagination and the sense of wonder which is very important motivator for lifelong learning (Wilson, 1997).
Table 4: Answers for Question ‘What Did You Find?’

<table>
<thead>
<tr>
<th>Opinion</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Insects/Animal/Trees</td>
<td>- I found mosquitoes and flies</td>
</tr>
<tr>
<td></td>
<td>- Crickets, frog eggs</td>
</tr>
<tr>
<td></td>
<td>- Trees are greener</td>
</tr>
<tr>
<td></td>
<td>- Earth worm, cockroach</td>
</tr>
<tr>
<td></td>
<td>- Dog</td>
</tr>
<tr>
<td></td>
<td>- The park is filled with tree</td>
</tr>
<tr>
<td></td>
<td>- I find many trees</td>
</tr>
<tr>
<td></td>
<td>- Trees are more fertile</td>
</tr>
<tr>
<td></td>
<td>- New plants</td>
</tr>
<tr>
<td>Knowledge on planting tree</td>
<td>- How to plant tree</td>
</tr>
<tr>
<td></td>
<td>- Equipments and soil for planting</td>
</tr>
<tr>
<td>Friends</td>
<td>- Friends</td>
</tr>
<tr>
<td>Experience</td>
<td>- New experience</td>
</tr>
<tr>
<td></td>
<td>- A lot of interesting things</td>
</tr>
</tbody>
</table>

The researchers believe that tree planting activities are significant events in introducing the natural environment to the children. Numerous studies evidently show that an affinity to and love of nature, along with a positive environmental ethic, grow out of children’s regular contact with and play in the natural world (Chawla, 1988; Kals & Ittner, 2003; Phenice & Griffore, 2003; Schultz et al., 2004). On the contrary, the studies have also shown that children who losses regular contact with the natural environment can result in a biophobic generation who are not keen on preserving nature and its diversity. Indeed, children’s real exposure and close encounter with nature would naturally enhance their appreciation of the natural environment and eventually learn to love and preserve them.

In evaluating the different activities during the tree planting activity, students were asked whether or not they were satisfied with the following activities: (i) opening ceremony, (ii) the exhibit, (iii) tree planting activity, and (iv) the questionnaire session, which can be viewed in Figure 9 showing the frequency of responses. A minimum of 81.6% and a maximum of 94.7% of the students ‘agree’ with all the listed activities. Only 2.6% until 10.5% chose ‘neutral’ as their satisfaction level in all the activities while only 5.3% selected ‘disagree’ for the opening ceremony and the questionnaire session. One student stated that he was bored during the opening ceremony due to long speeches. It can be construed therefore that for activities where children are involved, speeches should be shortened and the launching session should be planned creatively to ensure active participation from the students.

Figure 9: Answers for questions 3

Afterwards, the students were asked about their future situational outlook of Taman Bukit Indah 20 years from the date of the tree planting activity. Several choices of responses were provided to them and the results are shown in Figure 10. Question 5 is focused on the students’ opinion and comments about the tree planting day and future activities that could be organized in Taman Bukit Indah. Of the total number of students who answered this question, 94.7% have registered their responses and consequently grouped into three categories: (i) green and environment, (ii) public awareness and (iii) providing infrastructure and amenities. Table 4 shows the details of their answers.

Answers for Question 4
4.1- The temperature of the park will be cooler than now
4.2- There will be many birds and small mammals inhabit this park
4.3- More people will use this park because of the shade and presence animals
4.4- There will be more chance for children to engage directly with birds and small mammals
4.5- This park will become small forest for Bukit Indah community
4.6- There will be few animals such as birds and small mammals
4.7- This park will become a place for children to camp and family to picnic
4.8- There will be lots of dried leaves littering the park
4.9- Many children would not play in the park when it turned like a small forest
4.10- I will see more animals here than at my home compound

Figure 10: Multiple answers for question 4

Table 5: Opinions Given By the Students

<table>
<thead>
<tr>
<th>Categories</th>
<th>Comments/Opinion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Green and environment</td>
<td>- Plant more trees&lt;br&gt; - Build a big pond for fish and tadpole&lt;br&gt; - Plant beautiful flowers&lt;br&gt; - Plant more trees outside the town park&lt;br&gt; - Put notice board&lt;br&gt; - Plant different types of tree&lt;br&gt; - Plants fruits and vegetables&lt;br&gt; - Make a fountain&lt;br&gt; - Clean the river</td>
</tr>
<tr>
<td>Public awareness</td>
<td>- Multifunctional park&lt;br&gt; - Organise environmental awareness campaign annually&lt;br&gt; - Organise tree planting activities annually&lt;br&gt; - I will hold tree planting day to the children on future program&lt;br&gt; - Launching a program named “Keep Green”&lt;br&gt; - Organise more activities about planting plan</td>
</tr>
<tr>
<td>Infrastructure and amenities</td>
<td>- Provide camping site and picnic&lt;br&gt; - Provide single tracking path&lt;br&gt; - Big clock tower powered by solar panel&lt;br&gt; - Clean the toilet and provide water supply&lt;br&gt; - Put more playground&lt;br&gt; - Repair the existing playground&lt;br&gt; - Build lake, waterfall, solar panel and jogging track&lt;br&gt; * Mini zoo</td>
</tr>
</tbody>
</table>

4. CONCLUSION

This paper has presented a sequence of workshop methodology and processes which were employed through the participation of school children in mitigating UHIs strategy. Children’s participation and contribution through their ideas and actions in mitigating the effects of UHIs, is truly significant but are rarely given emphasis in the design and planning on environment in Malaysia. This study underscores that these children, young as they are, has the natural capability to appreciate the environment and can equally be responsible to take care of their surrounding environment given the chance to freely express it. Therefore, it is integral in this study that encourages and recommends that they should be given due involvement at every stage in the process of planning and designing; where their ideas and concerns should not be segregated by the planners. Finally, with the assurance that this method could facilitate successful implementation, it is justifiably necessary that local authorities as well as the private sector should come to the forefront to lend their unconditional support.

Acknowledgement

We would like to extend our gratitude to the Universiti Teknologi Malaysia for the financial grant through the Research Grant Universiti. We also would like to express our sincere thanks to Hiroshima University who supported this study; Mr. Khairul Hamri Hamdan (Officer from the Landscape Department MPJBT); Mr Suhilmi Ismail (Landscape Architect of SP Setia Bhd Group); Headmaster Mr Mohd Ali Syukor, his staff and students from Sek. Ren. Kebangsaan Tmn. Bukit Indah, Johor Bahru for their staunch support and outstanding cooperation in this research undertaking.

REFERENCES


