Knowledge attitude and practices on e-waste management Survey Report

Positive Behavioral Change on E- waste Management among the school children, related business communities and General public to minimize un protected E –waste deposals and safe utilization of E waste for fabricating energy saving equipment and units in Colombo (South) municipal council area of Sri Lanka

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### 1. Introduction

Environment pollution is one of the greatest problems that the world is facing today. The reason of environmental pollution is the density of industrial facilities and population of some regions and the extreme increase in consumption. To achieve the objective of sustainable development, it is imperative to conserve current resources and keep waste materials under control. Consumption trends change along with rapidly advancing technology and new types of waste materials emerge.

One of these new types of wastes is electrical or electronic wastes (EWaste). These electronic wastes include several metals such as copper, aluminum and gold and they also release poisonous metals such as lead, cadmium and mercury when they are reassembled, dismantled, burned or processed chemically for recycling or reuse (Kaya and Turan 2005). While the electronic appliances/items sector grows throughout the world and, the ratio of electronic wastes in garbage is increasing as well.

The United Nations estimates that up to 50 million tons of electronic waste are thrown away globally each year. According to estimates by the Environmental Protection Agency, around 40 million computers are discarded each year in the U.S alone. That's about 130,000 each day. Add that to the 100 million cell phones and countless other electronics that are thrown out annually, and it adds up to one giant pile of e-waste. It costs about $5.30 to dispose of one of these gadgets properly. But it costs less than half of that to stick it on a container ship to Africa.
Electronic wastes in developed countries constitute an average of 1% of all solid waste and this ratio is expected to grow twofold in the next 5 years. An increase of annual 5% to 8% is observed in electronic waste market in the world. The total electronic waste resources throughout the world are estimated to generate an annual 20-50 million tons electronic wastes according to United Nations Environmental Program.

For instance, 2012 data obtained in Turkey shows that a total of 539,000 tons electronic wastes is generated in one year which amounts to more than 7 kg electronic waste per person. This number is expected to increase in the coming years. Although several projects are implemented in countries with the highest level of electronic wastes such as USA, China, India and EU countries, no serious work is currently undertaken in Turkey in this regard (Aorora and Agarwal 2011).

Key information of E-waste:

- Recently, in Asian countries including India, e-waste generation is increasing due to economic development, and informal recycling of e-waste has been a major concern for environmental pollution and health damage.
- Globally, about 30 to 50 million metric tons of E-waste is disposed each year, which is 5% of all municipal solid waste.
- Based on the present growth rate it is expected that E-waste generation will reach 40 to 70 million tons per year by 2015.
- Contain hazardous substances such as lead, cadmium, mercury, Americium, sulphur, beryllium, or brominated flame retardants.
Elements found in trace amounts include americium, antimony, arsenic, barium, bismuth, boron, cobalt, europium, gallium, germanium, gold, indium, lithium, manganese, nickel, niobium, palladium, platinum, rhodium, ruthenium, selenium, silver, tantalum, terbium, thorium, titanium, vanadium, and yttrium.

Generally non hazardous components i.e. Tin, Aluminium, Iron, Germanium Gold etc.

Growing population, rising economies and advancements in technology, the consumer oriented growth is causing a rapid electronic product obsolescence.

Electronic industry is growing at a 25% compounded annual growth rate.

In India, business and individual households make approximately 1.38 million personal computers obsolete every year.

Need of environmental education for individuals and societies has emerged with the current increase in environmental problems in the world agenda. All efforts to conserve the environment, to prevent environmental pollution and to develop the environment stem from the need to provide individuals with comfortable, peaceful and healthy/safe environments (Eten 2003; Erdogan 2011). Environmental protection will be possible only through awareness of the community.

Therefore, environmental education should be provided extensively. The prioritized purpose of environmental education in various countries is the acquisition of positive attitudes and behaviors by individuals. Attitudes are developed based on feelings, knowledge and thoughts and on individual and social values and beliefs and they change from individual to individual. The attitude of an individual is the combination of what he thinks, what he believes in, how he feels
and how he acts (Sakalli 2001). It is identified through research that lack of environmental awareness and the extent of environmental damage is caused by lack of environmental education (Ogunbiyi and Ajiboye 2009). Although many researchers emphasize that environmental education should be an interdisciplinary course (Cobb 1998; Davis 2000), it is observed that environmental education is provided as a part of science classes (Rickinson 2001; Erdogan and Ozsoy 2007; Sadik and Cakan 2010). It can be mentioned that environmental education is recently more prioritized in Turkey along with the currently revised primary school programs.

For instance, science teaching program of year 2000 included less environmental topics (MEB 2002) compared to science and technology teaching program prepared in 2004 which includes more topics with more quality related to environment, as a parallel to national and international environmental policies (Kose et al. 2011). Today it is known that raising awareness in environmental issues is possible through environmental education. Therefore, interest and attitudes are crucial in environmental education (Erten 2004). In their study, Poortinga et al. (2004) emphasize that in addition to knowledge, interest and attitudes are also effective in individuals’ behavior towards the environment. Several studies that examined the attitudes of primary school students to environment have been undertaken in Turkey (Tuncer et al. 2006; Alp et al. 2006; Gokce et al. 2008; Aslan et al. 2008; Sagir et al. 2008; Ozpinar 2009; Aslanyolu 2010; Bas 2010; Aydin and Cepni Cepni 2010).

Lack of effective environmental education opportunities negatively affect the measures that will be taken in environmental conservation and solution of environmental problems. Acquisition of positive attitudes towards the environment is closely related to environmental awareness.
Knowledge, skills and values acquired in primary school form the basis for higher levels of learning. The importance of primary schools in environmental education is also noteworthy since a large number of individuals do no continue with further education.

Therefore, the current study aims to investigate the knowledge of school students on electronic wastes awareness and environmental attitudes. It is believed that the findings of the study will lead in the identification of attitudes of school students towards the environment and will provide information as to whether topics in science and technology classes related to environmental issues generate environmental awareness or not.

The reason for selecting school students as the target group is related to the importance of forming a foundation for environmental education during the childhood years. Environmental education practices at school will contribute to the development of responsible behavioral patterns towards the environment (Ay 2010).
**How can children help?**

- Start or encourage students to join an environmental club.
- Collect and sort materials by type.
- Monitor recycling bins to reduce contamination.
- Participate in school assemblies to increase enthusiasm for the waste reduction program.
- Enter school wide contests to name the program or design a poster or other educational materials.
- Write articles for the school, school district, or community newspaper about the program or the importance of waste reduction.
- Manage parts of the school’s waste reduction program.

**Studies based on students:**

- Focuses on the contemporary issue of electronic waste.
- Students will examine the increasing volume of e-waste in consumer societies and the extensive exportation of obsolete electronic equipment to developing countries.
- They will consider the socioeconomic forces and consumer behaviors contributing to this phenomenon.
- Through the analysis of authentic materials, students will gain a broader perspective on the social, health and environmental impact of e-waste on different communities around the globe.
Objectives

1. Investigation of the knowledge of school students regarding e-waste.
2. Identification of notions and concepts of people of different communities regarding e-waste.
3. To study the cycling of electronic items within different communities.
4. Evaluation of the enthusiasm of school student on learning about e-waste.
5. To evaluate the importance of e-waste based researches.
6. Investigation of feed backs of students on methods of separating e-waste from garbage.
2. Methodology

2.1 Student based surveys
A questionnaire was distributed through school students to collect information regarding their attitudes and practices on e-waste management and disposal (Appendix 1)

2.2 Selection of sites

The study was carried out in five main schools of the Colombo district. Selection of schools was mainly based on following factors:

1. Levels of society
2. Community status
3. Ethnic groups
4. Usage of modern technological devices
5. Parents with different educational background

Based on the above factors following five schools were selected within the Colombo district.

- Thurstan college-Sinhala medium
- D.S.senanayake college-Sinhala medium
- D.S.senanayake college-Tamil medium
- Muslim ladies college
- Hindu ladies college
- Hindu gents college

2.3 Analysis of data

Data analysis was done using the answers provided by students regarding the questions in the questionnaire. Questions based on electronic items and e-waste were taken into major consideration.

3. Results
A. Thurstian college- Sinhala medium

The survey from Thurstan college, Sinhala medium students revealed that only 27% of students were aware of differences between electronic and electrical equipments and 73% of them were unaware. The students further reported that electrical items such as CRT Tv, LCD Tv, LED TV, Mobile phones, Fridge, AC, Digital camera, Normal Camera, Electronic games items, Laptop, Desktop, Tab and Table fans were used by them.

Furthermore, according to the data recived mobile phones, CRT Tvs and Laptops cause high threats when mixed with ordinary wastes. Interestingly Samsung, Abans and Apple are the most popular electronic item suppliers among the community.

65% of students are unaware of the fact that e-wastes particles can reach our body. Though, 79% students are willing to learn about e waste. Student from this school are aware of e waste collectors such as iron and old paper collectors, Divisional secretary, waste collectors and recyclers.

Interestingly 64 % of the students urge the importance of a conference on e- waste and 48% of them think that they can gain a good knowledge about recycling of e waste.
B. D.S.Senanayake College- Sinhala medium

38.54% of students of D.S.Senanayake college, Sinhala medium were aware of e-waste. Mobile phone, refrigerators and CRT tVs are the most popular electronic items used among them and 48% of them believe that mobile phones and batteries effect on environmental pollution. 47.2% of the students believe that e waste pollutes water than other compartments like land and air. 47.9% of students have an idea of after effects or threats caused due to the presence of e- waste in the environment. According to their views cancers, kidney disease and other health issues can be caused due to pollution by e-waste.

24% of students say that damaged items should be kept in home for future while 19% students say damaged items are valuable. The results also suggest that mobile phones, refrigerators and CRT tVs are the popular broken items in their homes and they are used to repair the broken products and reuse them while 13% of them dispose the broken items.

The students were unaware of e waste collectors and this idea seems to be a preliminary attitude to them and 38% of them considered that they would go for it if they are informed of collecting stations. Moreover, only 21.87% of the students were aware of 3R.

Interestingly 88% of the students urge the importance of e waste based research and majority of them have mentioned about the importance of separating e-waste from garbage.
C. D.S.Senanayake college- Tamil medium

The survey from D.S.Senanayake college, tamil medium revealed that only 7.9% of students were aware of differences between electronic and electrical equipments and only 35% of them were aware of e-waste. The students further reported that electrical items such as TV, Mobile phones, Fridge, Laptop, Desktop, Table fans were the popular home appliances. Among all the items mobile phones are mostly used. Mobile phones covered 29.85 % of all the electrical items and mobile phone also covers 29.63% of broken products at their homes. Interestingly 41.18% of students believe that mobile phones and batteries will harm the environment than any other equipment. The students also reported that Samsung, Panasonic and toshiba were the most popular electronic item sellers among them.

According to the survey, it is recorded that most of them think that broken products should be handed over to e-waste collectors but as they are not directed to such a collector they tend to throw the broken products ar use them again and again after repair.

71.43 % of the students have emphasized on the importance of conferences on e-waste and they are willing to know about this concept.
D. Muslim Ladies College

The survey from Muslim ladies college revealed that only 30% of students were aware of differences between electronic and electrical equipments and 70% of them were unaware. The students further reported that electrical items such as CRT Tv, LCD Tv, LED TV, Mobile phones, Fridge, AC, Digital camera, Normal Camera, Electronic games items, Laptop, Desktop, Tab and Table fans were used by them. Anyway only, 4% of the students were knowing about e-waste. However, the results suggest that the remaining 96% were eager to know about this concept.

Furthermore, according to the data received mobile phones are the most extensively used electronic item in their homes and more than 43% of students believe mobile phones and batteries can the most harmful items. Interestingly Singer and Samsung are the most popular electronic item suppliers among the community.

The students also have reported that they do not practice separation of e-waste from their garbage during disposal and their answers suggest that they have neglected the importance of proper e-waste disposal. However, there is an enthusiasm and positive scope among students on this aspect as 39% of them believe that conducting research in this area is important.

The students further recommend that contributing for proper garbage disposal is essential and separating of e-waste from rest of the disposal waste will be useful.
E. Hindu College

The survey from Hindu college revealed that only 23.36% of students were aware of differences between electronic and electrical equipments and only 15% of them were aware of e-waste. The students further reported that electrical items such as TV, Mobile phones, Fridge, Laptop, Desktop, Table fans were the popular home appliances. Among all the items mobile phones are mostly used. Mobile phones covered 17% of all the electrical items and mobile phone also covers 24% of broken products at their homes and desktops comes secondly (31%). Interestingly 49.64% of students believe that mobile phones and batteries will harm the environment than any other equipment. The students also reported that Abans and Singer are the most popular electronic item sellers among them.

According to the survey, it is recorded that most of them think that broken products should be handed over to e-waste collectors but as they are not directed to such a collector they tend to throw the broken products and use them again and again after repair.

44% of the students have emphasized on the importance of conferences on e-waste and they are willing to know about this concept.
F. Hindu Ladies College

39.82% of students of Hindu ladies college were aware of e-waste. Mobile phone, refrigerators and tablets are the most popular electronic items used among them and 68.92% of them believe that mobile phones and batteries effect on environmental pollution. 65% of the students believe that e waste pollutes land than other compartments like water and air. 43% of students have an idea of after effects or threats caused due to the presence of e- waste in the environment. According to their views skin disease, sickness and contagious disease can be caused due to pollution by e-waste.

The students were unaware of e waste collectors and this idea seems to be a preliminary attitude to them and 38% of them considered that they would go for it if they are informed of collecting stations. Moreover, only 37% of the students were aware of 3R.

The results also suggests that mobile phones, table fans and LCD tvs are the popular broken items in their homes and they are used to repair the broken products and reuse them while 13% of them dispose the broken items. Interestingly 77% of the students urge the importance of a conference on e- waste and they think that they can gain a good knowledge about recycling of e waste.
Conclusions and Recommendations

1. Most of the students are willing to get educated on e-waste and their knowledge is limited. Thus having awareness programmes in schools is highly recommended.

2. Most of the sinhala medium students have mentioned Lankadeepa as the paper they read while tamil medium students read veerakesari. Therefore publishing articles through most popular printed media will be beneficial.

3. Sirasa and rupavahini are popular television medias in sinhala mediums while shakthi tv is popular among tamil students. Thus we can use these electronic medias to spread the message.

4. Both students and their parents should be informed about e waste collectors.

5. Establishing e waste collecting centers in schools and appointment of centre leaders at each school will also be a fruitful act.
References


