GREEN COMPUTING

A new awakening for Campus

Prof. Nikhita Mangaonkar
Master of Computer Application
V.E.S.I.T
Mumbai, India.

Prof. Sudarshan Sirsat
Master of Computer Application
T.I.M.S.C.D.R
Mumbai, India.

Prof. Sunny Nahar
Master of Computer Application
L.B.H.S.S.T.'s
Mumbai, India

Abstract: Today, the functional changes in how effectively we live our lives have been made possible by the constantly evolving technologies. However, there has to be a degree of sustainability to this evolution as the energy resources are depleting day by day. This has brought the attention of many scientists to Green Computing. This paradigm must be accepted and started at the ground level of our schools and college campuses as they are the future. This paper discusses how Green Computing can be brought in effect at the campus.

Keywords: Green Computing, Economical Labs, Moore's Law, Think Green.

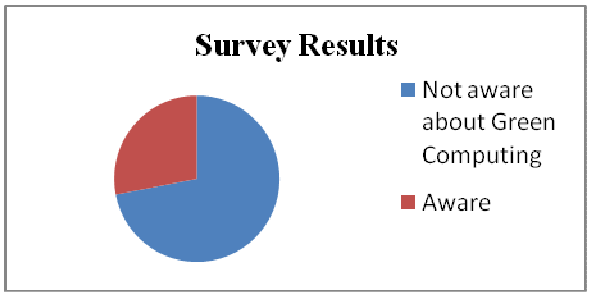
1. **Introduction**:

In today's world, technology is at a riding pace. It implies the use of mobile phones by every individual irrespective of the economic power he is holding; small children are able to operate cell phones and computers, e.t.c. Day by day, technological inventions are making the world - faster, closer and smaller.

The technology is made available to the students of schools and colleges by the use of computers. It brings abundant knowledge to the students; it gives them information, the facts, interactive experience e.t.c. The technology demands the use of computers, cell phones, ipad, notepad, e.t.c which uses a certain amount of electrical energy. The energy used comes from a common source. This source is on its way of depletion as the producer-consumer cycle is imbalanced in nature; there are more numbers of consumers than the producers. This is the foremost reason why the world has to think about the use of resources in an efficient manner. Although the computers are taking the world to a new era, it's becoming imperative for us to realize that this has a greater impact on the environmental issues. The students in schools and colleges are using the computers and its resources for their betterment but they have to realize that in this process they are sacrificing nature and environment to an extent, which may cause haphazard's to the future of the world!

Students in schools and colleges are tomorrow's future of every nation, so it is important to start with them and spread the awareness of what is Green computing, and educate them on what contribution can be made by them so as to protect their future environment.

The main motivation for this paper is been taken by conducting a small survey in schools and colleges as how much of the students population be it in schools or colleges are actually aware of the terminology "Green Computing". The survey conducted had questions such as: Are you aware about green computing? For how long do use your computer machine? How many times have you switched off the monitor or unplugged the cables when not in use? e.t.c. This survey was conducted at different technical schools and colleges in Mumbai, which makes use of maximum computers for a large amount of time. The conclusion of the survey that not more than 35% of students were aware about the term and no such practices were been done by them to save energy.



In this paper, we will be dealing with;

(1) The methods to spread awareness about green computing among the students of schools and colleges.

(2) How students can contribute to this revolution.

(3) What can be done by the students so that computers can be manufactured in an eco-friendly manner?

2. **Green Computing:**

It has been defined as an approach which studies and models the consumption of energy through computers and how it can be saved. Green computing is the environmentally responsible and eco-friendly use of computers and their resources. In broader terms, it is also defined as the study of designing, manufacturing/engineering, using and disposing of computing devices in a way that reduces their environmental impact.[Definition:techopedia].It is also referred as Green Information Technology.

Source: http://www.k3as.com/

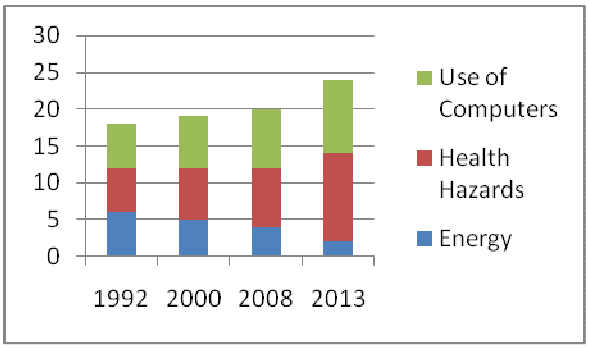
2.1 **Motivation of Green Computing:**

The nation's strength is known by its Energy. This energy is getting depleted for various reasons. How is it possible that the technology which has made the world faster and in a way successful is soon becoming the reason to deplete a nation's own energy resource?

The reason has been stated back in 1992 by a voluntary labeling program called "Energy Star" (now an international standard) for utilization of energy in an efficient manner in consumer products. It began with labels for computer and printer products to see how a product consumes less energy and in a most efficient manner. It was much later realized by Government agencies that the computer machines along with the resources are using up a lot of energy.

The main reason on why the concept of Green Computing got recognition was due to the statistics revealed by the Energy Star about the consumption of energy by computers. On an average, A computer when in use, the CPU consumes 120 Watts, while a CRT consumes 150 Watts. If been used for 8 hours, 5 days a week it would use up to 562 Watts. It is important to notice that the computer's processing power doubles roughly after a two years as stated by Gordon Moore, in Moore's Law, co-founder of Intel. This implies that high processing power leads to higher energy consumption. Imagine the amount of energy been consumed by it on daily basis all over the world.

Also, it is necessary to understand the health hazards caused by computers. The Central Processing Unit has lead, hexavalent chromium, beryllium into it. Lead, consumed at low level is harmful for children mental development. For adults it causes damage to kidney and reproductive system. Chromium damages lungs, a reason for bronchitis, liver. Mercury, damages fetus, harms brain. Brominates flames are a reason for thyroid. Beryllium, a long exposure to it causes lung disease. Cadmium causes damage to bones.. The computers when not in use are normally destroyed and considered as a scrap, and are burnt leading to a toxic substance in the environment.



Dig: Health hazards caused by use of computers, resulting into depletion of energy.

We need to do something about it, and to do something about it we must start at a grass root level. Many of the offices like IT companies, trading market, e.t.c would required to use the systems for their business .But, In places like schools and colleges were computers are used can be a part of green computing.

2.2. **Methods of awareness among students:**

It took almost a decade to realize the importance of Green Computing. Till now, this awareness has not been brought down in certain countries. The level, one should start working for, is to target the schools and colleges, who will be holding the future of the nation after 20 years. the responsible to design coming tomorrow. Here's how the basic awareness must be created;

1. By conducting seminars about the Green Computing in schools and colleges.
2. By making them understand by using live Demonstration.
3. To create an interest, by introducing it in the academic course
4. The academics initiator i.e. the teachers and trainers should themselves be aware of this so they actually teach the students about it.
5. Social Networking is a strong medium through which all can be informed.
6. Emailing, Newsletter, Magazines in Campus can be used to spread awareness.
7. Make information available on college websites.
8. As the student is about to complete his task a message should be displayed on his screen to shut the monitor until not in use, this will make them habitual.
9. Students should be motivated to publish articles which should be included in their academic annual booklet.
10. Green Computing is the Need of time to secure our future; word of mouth publicity should be done by the students themselves.
11. Conduct workshops for students to explain importance of Green computing.
12. University wide campaigns should be held to promote it in big campus colleges.
13. All the educational websites should create pop-ups so that will work as a motivator for the students.
14. Separate programs for Green Computing must be labeled and branded for schools and colleges so as to give recognition for practicing it successfully.
15. Promote and encourage initiatives that support Green Computing and use the college festivals as a platform to showcase and spread awareness by demonstration (play) of the current programs.
16. During Lunch hour's college and school staff must practice these measures as well so the students will be aware.

2.3 **Contribution by Students to Green Computing:**

Second important issue is that how the students will contribute to implement Green Computing at the campus level .The key revolves around the green computing is how to save the energy. This will also make Labs economical.

1. Monitors: If the monitor or the computer screen is not been used, then put it off. The screen, pixels uses a lot of energy.
2. Method for using Printers or scanners: When not in use, they can be

simply put off. Also possibly try to take print on double sides if need arises.

3. Use of Internet: Whenever possible, try to avoid the use of printer if the process of work does not demand a hardcopy. Try and imbibe the habit of emailing it to person. This causes lot of Carbon to be saved. Along with, heat generated by the printer.
4. Online Learning: use of e-learning techniques, such as video conferencing can bring down the traditional method of classroom teaching decreasing travel cost and carbon dioxide emission.
5. Power Management Settings: keep system, monitor into a sleep mode of 15 minutes so in absence of person the system is not been used up thus saving the energy.
6. Select your computer hardware system by being an environment conscious person: When you select a computer hardware system for your campus, make sure the vendor is selling you a product for longevity.
7. Use laptops instead desktop machines. When they have to be discarded it will be less scrap.
8. Place a small plant in your school and college computer laboratories which will consume the toxic substances and keeps a fresh atmosphere.

Thus, by implementing these awareness and measures we can make Economical Labs by consuming less energy resulting into less power bills.

This brings our attention to the process of manufacturing the systems. The way the systems are manufactured should be eco-friendly. Green computing can always start with the green manufacturing, i.e. as a technical student we have to design and manufacture such devices which will emit less radiation to the environment.

So before continuing with green computing we have to "***Think Green".*** Think green is thinking of human is being for saving energy and optimal utilization of computing resources according to need.

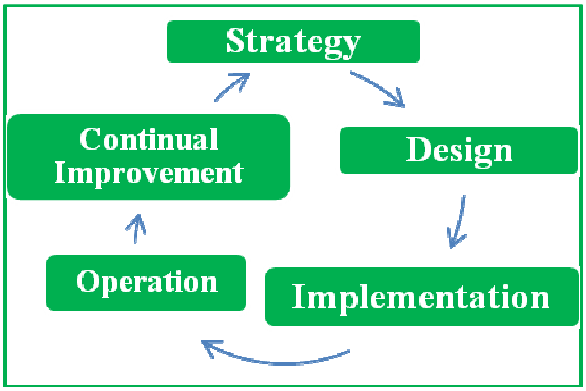


Fig. Green Computing Life Cycle

Strategy: Green computing strategy is plan to conserve and optimal utilization of computing resources

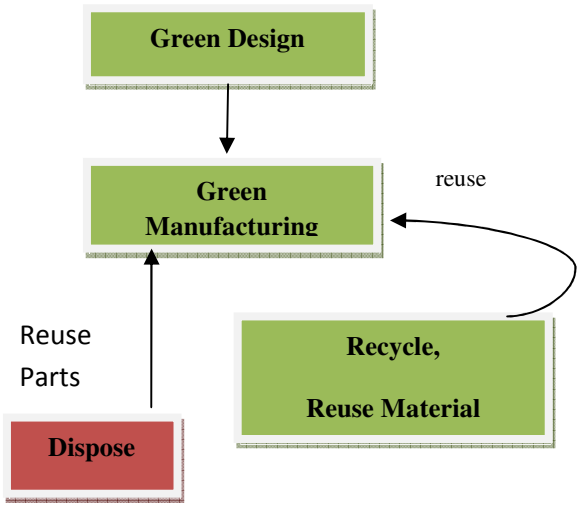
Design*:* This phase includes the designs of resources that will implement green computing strategy.

Implementation*:* here actual use of green computing use will take place and making people habitual of *"Think Green policy"*.

Operation*:* this will include different logic which will help manufacturer building automatic energy conservation devices and to make them think green with the help of artificial network.

Continual Improvement*:* Green computing ought to improve its green level of operation and strategies which will sustain consistently damaging eco-system.

Our green computing strategy must follow the options which are most favored to our ecosystem needs, like prevention of energy, minimization of radiations and reuse of resources. Whereas recycled use of resources, energy recovery and disposal of trash resources should be avoided as they can cause harm to the ecosystem. Green manufacturing is always depends on green designs and design includes the best utilization of the resources , so it will be so important for the manufacturer and authorized bodies to check that manufacture is using eco-friendly, easily recycled and reprocessed resources in designing of green computers and peripherals.



Dig: Flow for reused material in Green Computing

3. Conclusion & Future Work:

Incorporating the above mentioned measures that are aimed to towards increasing awareness and implementing Green Computing methods will help in reduction of energy consumption and wastage through computer and related devices. This in turn will have an immediate impact on the environment and eventually help better our tomorrow.

It won't stop here as technology will eventually find a way to enhance and not limit the very nature, the environment that we so depend on for our daily survival and well being.

This being said, let us also hope that by sowing the seeds of a Green Computing mindset in these young minds today, these students, who are the implementers of Green Computing concept will eventually be able to contribute new ideas and innovate technology directed towards creating a better, safer and green environment of tomorrow – the awareness, action and ability to fulfill this need, starts today.

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