

Education for Sustainable Development: Development of ICT for Youth Empowerment Towards Efficient Energy Management

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ABSTRACT

Education for sustainable development is a dynamic concept that utilizes all aspects of public awareness, education, training and capacity building to create or enhance an understanding of the linkages among the issues of sustainable development [1]. Education with Information communication and technology (ICT) towards efficient use of resources such as energy will guide us on our journey towards the goal of Sustainable Development and combating Climate Change. It is important that more and more of our citizens become aware about the available choices and the impact of each of these choices on our environment and fellow human beings. To target adolescents is to target a majority with core values of revolution and influence; it is an affective direction to reach maximum masses with minimum input, future generations, future policies, and ultimately our future developmental direction will be influenced.

The present paper brings out the prevalent knowledge and skills of adolescents towards energy conservation and efficiency. The paper also discusses the strategy used for developing a capacity building program to generate awareness and skills amongst adolescents regarding energy conservation. The sample constitutes students from Public school, Government and students from colleges of selected Universities in Delhi.

Keywords: *Adolescents, Energy Management, Capacity Building, Climate Change, Sustainable Development*

1. INTRODUCTION

The key role of Education and Communication has been recognized as more than the dissemination of knowledge through the influence of Agenda 21 and the World Summit on Sustainable Development. Sustainability is the ability to maintain balance of a certain process or state in any system. Resources such as water, energy, forests, mineral etc. are backbone of every economy and

provide two basic functions – raw materials for production of goods and services, and environment services [2]. Effective energy education will improve energy literacy by improving students' broad, citizenship-based understanding of energy that includes content knowledge as well as energy-related attitudes and behaviors [3]. Knowledge and being informed about an issue are important precursors to caring, which then may serve as an impetus to take action [4,5]. Energy is central to sustainable development and poverty reduction efforts. It affects all aspects of development -- social, economic, and environmental -- including livelihoods, access to water, agricultural productivity, health, population levels, education, and gender-related issues [6]. The Integrated Energy Policy of government of India lays emphasis on energy conservation and efficiency; particularly through demand side management and estimates 15% saving of energy is possible by such interventions [7]. In India residential sector, at 39% of final energy consumption, is the second largest contributor to demand and possibly the largest contributor to peak demands in the system. According to study a on electrical energy conservation potential in India, domestic sector emerged as second after agriculture with energy conservation potential of nearly 25% [8]

Adolescents are the main stakeholders, future policy makers and a major resource group playing an important role in taking up responsibilities, revolutionizing the other stakeholders, acting as a catalyst for bringing about change [1]. The participation of youth in environmental protection can be sought at levels and locations ranging from grass-roots activism and participation in conservation projects to policy-making bodies and NGOs.

For building momentum towards energy management movement, it thus becomes imperative to build capacity of masses so that they are capable of making decision and taking appropriate steps towards the implementation of suitable energy efficiency measures. According to the Population Council in India, (2012), "India is a young nation with 30% of the country's population being adolescents" [9]. High proportion of a young population, could work in India's favour of emerging as one of the four major economies of the world by the year 2020. Their energy and enthusiasm must be guided into productive work. Their ideas and innovations should be tapped for the betterment of the society [10]. Building capacity of adolescents may help to reach next four generation, the message to conserve and protect the nature.

2. OBJECTIVES

- To understand the inclusion of information on energy management in school curriculum.
- To assess the knowledge of youth towards energy management
- To develop a validated capacity building programme towards energy management for youth

3. METHODOLOGY

The sample constitutes students from Public school, Government and students from colleges of selected Universities in Delhi. Delhi being a metropolitan city is the educational capital of the country and houses a number of private and government universities attended by students with myriads of background, coming from all over the country and even nationals of other countries and cultures. The knowledge-testing questionnaire was administered to the students to understand their knowledge level. The tool covered the knowledge testing of respondents regarding the following concepts; sustainable development, climate change, energy conservation and energy audit. The data procured was coded, scored and tabulated in accordance with a pre-decided pattern; this was done to calculate scores and comparative data to lead to results and conclusions. The data was analyzed using Microsoft Excel Software. Mean and standard deviation were also used to support the analysis. Pie Charts and Graphs were used to represent the study findings.

4. ANALYSIS & INTERPRETATION

4.1 Knowledge level of participants:

It was observed that respondents had fairly good idea of the term energy conservation (82%) of the respondents could identify the correct meaning of energy conservation. The participants were asked to classify the given actions in to energy conservation and energy efficiency. It was seen, in pre test 88.3% correct responses were obtained for 'Switching off lights when not in use' identifying it as energy conservation. For rest of the categories less than one third (33%) correct answers were obtained. It was observed although participants knew the meaning of energy efficiency and energy conservation; they could not differentiate between both the terms. In pre test percentage of correct response in each action was low

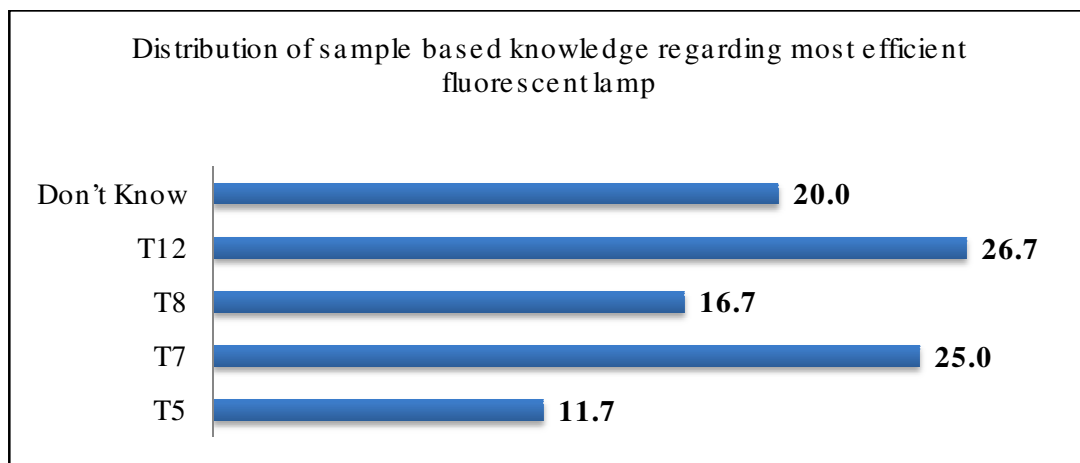


Figure 1: Distribution of sample based knowledge regarding most efficient fluorescent lamp

Respondents were asked to identify the most energy efficient fixture. In pilot testing single largest category (56.7%) opined CFL to be the most energy efficient. It was surprising to know that most of the students were not aware about LED. Some also opined that it was very expensive as compared to other lighting fixture.

The respondents were not aware about the tubular fluorescent lamp terminology. Most of them did know that commonly used tubelights in households is called T12. Pre-test revealed more than one fourth (26.7%) thought T12 to be the most energy efficient. One-fourth identified T7 to be most energy efficient and merely 11.7% could identify the correct answer. Also, 20% indicated that they did not know which was the most energy efficient fluorescent lamp as indicated by Fig 2.

In order to apprehend the application and understanding of participants, they were asked to identify what level of wattage of CFL can replace an incandescent bulb. In pre test it was seen that less than half (43%) could identify ‘lower wattage’. However 20% and 16% opined ‘higher wattage’ and ‘same wattage’ respectively. Another 20% indicated that they did not know the answer. The participants were also asked what level of wattage of LED could replace a CFL. In pre test largest category (63%) identified that a higher wattage of LED can replace CFL. Only a small section (21.7%) could identify the correct option. This was probably because most of the participant did not that LED is more energy efficient that CFL. In pre test largest category (71%) opined that automatic controls lead to reduction in automatic controls. However when they asked to identify some types of automatic controls, merely 10 % could name adjustable task lighting and another small section 5% and 8.3% indicated dimmers and daylight sensors respectively. Majority (76.7%) did not answer the question and indicated they did not know the answer as indicated Table 1. This suggests that even if the sample was aware of the fact that automatic controls help in reducing energy consumption, but they could not ascertain what were these automatic controls. In pretest largest category (36.7%) identified one kilowatt to be the unit of electricity. Another section (28.3%) knew the correct answer and a considerable section (21.7%) indicated they did not know the answer

Table 1: Distribution of sample based on knowledge regarding automatic controls in lighting system

Options	Percentage
Dimmers	5.0
Occupancy sensors	0.0
Daylight sensors	8.3
Adjustable task lighting	10.0
Don't know	76.7

It was seen respondents were not very much aware about the electricity rates in the city. Nearly one third (35%) of the respondents identified Rs. 1.5 to be the current minimum rate of electricity and another section (20%) indicated Rs. 3.8. However only a small section (16.7%) could ascertain the correct minimum price of electricity in Delhi. Similarly for maximum rate only 13.3% could ascertain the correct answer in pre test. It is seen that largest category (61.7%) indicated Rs. 6 to be the maximum price.

Pre-test revealed large section (58.3%) of respondents could identify 'Bureau of Energy Efficiency' as the organization that gives star rating to appliances. Although a large category (51.7%) expressed that they had star rated appliance at home, but some of them said that they had never read the labels properly and did not know which organization gives the star rating. It is observed that nearly cent percent (90% and 91.7%) of the respondents knew that star rated refrigerators and AC are available in market respectively. Also,

respondents seemed to have less awareness regarding star rated television in pre test with 36.7% responses. The respondents also had fairly good knowledge about star rate AC and star rated geyser with 70% and 61.7% responses in pretest. Large number of responses (75%) were obtained for star rated microwaves, however star rates microwaves are not available in market. The students expressed that microwaves should be star rated since they bid energy guzzlers in a home.

Fig 2 indicates, in pre test largest category (38.3%) of the respondents scored very low on the knowledge test and another section of respondents (23.7%) scored low. It was seen a small section (16.7%) scored average on the knowledge test. Only three participants scored high score in the test.

4.2 Training Programme

Intervention will be a capacity building programme, consisting of awareness raising training modules, which will be assisted with comprehensive tools. The training programme developed is discussed with respect to its content design strategy and delivery.

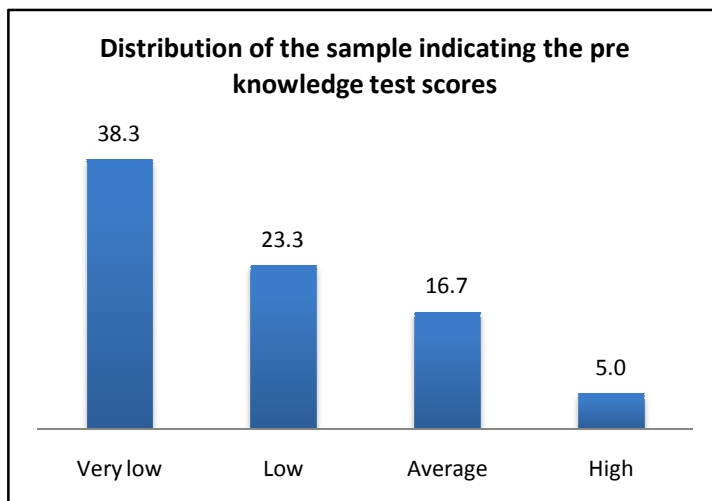


Fig 2: Distribution of the sample indicating the pre knowledge test scores

4.2.1 Design Strategy

Based on the pre assessment results and review of literature the capacity programmes have helped the researcher to identify the following strategy.

The ADDIE model is a systematic instructional design model consisting of five phases: (1) Analysis, (2) Design, (3) Development, (4) Implementation, and (5) Evaluation.

- **Analysis:** During analysis the learning problem, the goals and objectives, the audience's needs, existing knowledge, and any other relevant characteristics will be identified. Analysis will also considers the learning environment, any constraints, the delivery options, and the timeline for the project.
- **Design:** Detailed prototypes will be prepared and field-tested. Also, suggestions will be sought from experts on the same.
- **Development:** The actual creation (production) of the content and learning materials will be done in this phase
- **Implementation:** During implementation, the plan is put into action and a procedure for training the learner and trainer is developed. Materials are delivered or distributed to the student group. After delivery, the effectiveness of the training materials will be evaluated.
- **Evaluation:** Appraisal of the capacity building programme will be done.

4.2.2 Delivery of training programme

The training program will be framed into 3 elements.

- **Introduction** – The respondents were made familiar with the subject matter through informal discussions and presentations.
- **Content** – the subject matter was delivered using various tools which include
 - Presentations and videos
 - Session summary Handouts
 - Pamphlets
 - Training manual
- **Recapitulation** – Recapitulation was recognized an essential part of training programme. It was administered with purpose to help respondents to recapitulate the content at the end of each session. For this, recapitulation exercises were developed for each session.

5. CONCLUSION

The present study dealt with assessing the awareness amongst adolescents regarding energy conservation with a goal to design and validate the capacity building program, which can be used as a tool to train adolescents across the country. Adolescents are the winds of change, influential stakeholders, and future policy-makers as well as policy followers. India is a young nation and the adolescents of the country assumes many varied roles, to make decisions, to influence those who make decisions and assume responsibility for decisions made; therefore, adolescents is targeted to reach the maximum density of population and bring about desired change with minimum input.

The study involved designing and implementation a knowledge and skill questionnaire for adolescents targeting issues of paramount importance i.e., sustainable development, climate change, energy conservation and energy audit, the ultimate aim was to comprehend the knowledge and understanding of students towards energy conservation and energy auditing. The paper presents the prevalent awareness and application level of the sample, which was found to be inadequate, and is seen as the first roadblock to overcome as change in behavior can only be based on existing knowledge and understanding in the group. Based on this criteria capacity building and training programme can be developed to generate awareness not only among adolescents, but also other stakeholders. Energy Conservation both supply side and demand side is dependent on acceptability by the consumers and a adolescents base which is aware about the implications of the choices will act as an asset for reaching the goal of sustainable development through energy conservation; by increasing demand and affecting supply side conservation in the near future. There is need to incorporate energy conservation in the value system of the country and capacity building of adolescents towards energy conservation and related concepts will be a leap towards the right direction.

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