

Global Warming and Climate Change: How Responsive are we?

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Abstract— “Climate change is the single biggest threat to life, security and prosperity on Earth” – Patricia Espinosa, UN Climate Change Executive Secretary. In the present milieu, numerous factors have been contributing to global warming and climate changes. It has been mentioned time and again in all the major international and national conventions that concerted efforts need to be initiated for arresting global warming leading to harmful changes in the environment, however these initiatives have not proved to be sufficient in this direction. These efforts also point towards the fact that important organizations and members of academia are indeed aware of these factors such as industrialization, agricultural practices, burning of fossil fuels, etc. but this environmental deterioration and degradation process continues unabated.

A number of recent initiatives have been taken globally, recent ones include the Conference of the UNFCCC Parties (COP24) at Katowice, Poland in December 2018, 10th BRICS Summit at Johannesburg, South Africa in July 2018, and Global Climate Action Summit, 2018 at San Francisco, California, USA in September 2018. In view of the frequent numerous international conventions being organized globally, it becomes pertinent to conduct a research study on knowing the awareness level of the students of environmental studies towards these recent ongoing developments taking place at the global level. Therefore a research study was conceptualized to take feedback from the learners of Certificate of Environmental Studies (CES) program of Indira Gandhi National Open University (IGNOU) which has been offering quite a few programs on environment and sustainable development. The program in focus in the present paper is a basic certificate level program namely, “Certificate in Environmental Studies (CES)” which is a popular program amongst the youth.

The present study is an effort to make an assessment of the awareness amongst the enrolled students towards climate change and global warming. The program has been selected for the study in view of the importance of this subject and its implications on the life of people. This paper involves a primary study wherein an online survey has been undertaken and the questionnaire has been administered to around 250 learners to know their level of awareness towards importance of the factors contributing to global warming and climate changes and also to assess how updated these learners are towards the international and national initiatives being taken by the nations across the world in this field. On the basis of the responses so received, the researchers endeavour to highlight the concerted steps

that need to be taken by Government including the educational institutions for enhancing the knowhow amongst the present generation so as to effectively tackle this challenge.

1. INTRODUCTION

Since the dawn of 20th century, change in the climate has been observed by the scientists that cannot be attributed to the natural environmental processes and has been called as Global Warming which refers to the overall warming of the planet, based on average temperature over the entire surface of the Earth. This change in atmospheric temperature has been attributed to an increase in the concentration of greenhouse gases in the atmosphere since the beginning of industrial revolution during late 18th century. High concentration of greenhouse gases mainly carbon dioxide which absorb and re-emit thermal radiation has direct implication on retention of heat in the atmosphere which leads to an increase in the global average surface temperature. Other greenhouse gases whose concentrations are rising include methane and nitrous oxide. It has been reported in the World Meteorological Organizations’ Greenhouse Gas Bulletin, 2015 that global average levels of carbon dioxide had reached 400 ppm in 2015, that was 144 percent higher than the pre-industrial level, and the average level of methane and nitrous oxide reached at 256 percent and 121 percent of pre-industrial levels, respectively in 2015.

According to WMO Greenhouse Gas Bulletin, 2013, steady increase in carbon dioxide levels in the atmosphere over the past 200 years is due to enhanced use of fossil fuels as well as increase in deforestation, both of which release huge quantities of CO₂ in the atmosphere. Regarding the other main greenhouse gas i.e. methane and nitrous oxide, it has been reported by IPCC Fourth Assessment Report, 2007 and WMO Greenhouse Gas Bulletin, 2013 that 60 percent of methane comes from human activities i.e. cattle breeding, fossil fuel exploitation, landfills and biomass burning, and the primary anthropogenic sources of nitrous oxide are fertilizer production and use in agriculture and various industrial processes. The climate change taking place due to high

concentration has an impact on almost every aspect of human lives including ecosystems, human systems, urban systems, economic systems as well as social systems. It has been projected by IPCC, 2013 that global surface temperature change by the end of 21st century may exceed 1.5°C relative to pre-industrial levels and if average warming exceeds 1.5° to 2.5°C, approximately 20 to 30 percent of species will be at the risk of extinction and there may be a threat to food security as well as human health.

A number of initiatives have been taken globally for mitigation of climate change and recent ones include the Conference of the UNFCCC Parties (COP24) at Katowice, Poland in December 2018, 10th BRICS Summit at Johannesburg, South Africa in July 2018, and Global Climate Action Summit, 2018 at San Francisco, California, USA in September 2018. In view of the attention being paid to this environmental phenomenon by leading organizations of the world, the researchers conceptualized to make an assessment of the awareness level of the enrolled students of Certificate in Environmental Studies (CES) programme of Indira Gandhi National Open University (IGNOU) towards climate change and global warming.

2. ABOUT THE PROGRAMME: CERTIFICATE IN ENVIRONMENTAL STUDIES (CES)

CES is the programme which is of use to the general public, at every age and at all levels of formal and non-formal education. People from different walks of life and vocations including scientists, agriculture professionals, ecologists, hydrologists, foresters, landscape architects, administrator and planners, engineers, industrialists, agriculturists, among others can benefit from this programme. The environmental studies programme comprises of three courses (subjects), namely, Human Environment, Ecology, Environment and Tourism and Project work on Environmental Studies. The course on "Human Environment" has been developed with the aim of creating overall awareness and concern about environment, leading to a general comprehension of the principles of environmental conservation and development of a constructive approach towards environment and its conservation. It introduces the concept of Human Environment in a holistic manner, also describes the impact of anthropogenic activities such as over-exploitation of biological resources, mass deforestation and urbanization on environment and its quality. It further sensitizes the learners on the hazardous waste chemicals that pose a potential health hazard for all the living beings. The ill effects of this transformed environment on human health are also described along with their social and psychological aspects. The second course of the programme titled "Ecology, Environment and Tourism" aims to sensitize tourists and professionals in the tourism sector to the issues pertaining to the problems of ecology and environment. It also attempts to define the role of the visitor and his or her participation in the ecological conservation effort. In the third course, a learner has to work on a project on environmental

studies that enables the learner to imbibe and implement practically the concepts studied during the course of the programme.

3. METHODOLOGY

The present research study is based on a primary survey conducted using an online questionnaire based on various aspects of global warming and climate change. The online questionnaire was sent to 250 CES learners enrolled in various learner support centres under the jurisdiction of IGNOU Regional Centre NOIDA. There were 127 responding learners who participated in this online quest in which varied nature and kind of responses were received from them.

This subject area and programme was selected for research study in view of the important place it occupies in protecting the earth and its resources, in ensuring the sustainability of the planet, the criticality attached with the subject, and global efforts and initiatives that are being taken in the recent years to save the mother earth from further degradation. The questions were designed so as to test the general understanding and knowledge of the learners about the meaning of global warming, its causes and effects, recent initiatives taken at the national and international level, and interventions that may be implemented at individual level to curb the menace. In addition to these facets, questions on the effectiveness of the CES programme in enhancing their knowledge on the subject as well as their views to enhance practical knowledge were also posed to the responding learners. The questionnaire consisted of 14 questions in total, of which 13 were multiple choice questions and one was subjective question aiming to know the views and suggestions of the learners on way of making the programme more useful and practical oriented.

The questions in the questionnaire were of varied levels and criteria with the objective of getting a holistic insight of the understanding of the participating learners on this crucial subject area, wherein a question was designed to test the basic knowledge of the learners about the meaning of global warming; four questions aimed at testing the knowledge of learners about the causes of global warming and climate change, a question was dedicated to the impact of global warming on the environment, two questions focused on the measures to alleviate the problem, four questions focused on the recent initiatives undertaken at various levels to handle the issue and finally an objective question aimed at assessing the effectiveness of programme CES offered by Indira Gandhi National Open University in enhancing the awareness of learners on the major conventions and practices for prevention of global warming. The questionnaire culminated with a subjective open ended query to understand the views of learners about ways of improving the awareness level and making the CES program more practical oriented. A reliability analysis was carried out in order to examine the internal consistency of its questions.

4. RESULTS AND DISCUSSION

Based on the primary responses received during the data collection stage and the analysis thereof, the researchers have attempted in the following sections to highlight the outcome of the study which is being portrayed under distinct heads, “meaning of global warming”, “causes of global warming”, “impact of global warming”, “measures to alleviate the problem”, “recent initiatives on global warming”, “effectiveness of the programme”, and “ways of improving the awareness level and making the subject more practical oriented”.

4.1 Meaning of Global Warming

The first question aimed at knowing the basic understanding level of the learners about the meaning of global warming and the responses received have been recorded in Table 1 as given below. Under this question, four options were given i.e. emission of gases into the atmosphere, increase in temperature of earth due to greenhouse gases, increase in temperature of earth due to depletion of ozone layer and decrease in concentration of gases in atmosphere. Out of a total of 127 respondents, correct response was received from 94 learners i.e. 74.02 percent which indicates that most of the learners understand the meaning of global warming, however it is not encouraging that around 25 percent learners do not know the rudiments of global warming.

Table 1: Meaning of Global Warming

Q. No.	Question	Correct responses (in number)	Correct responses (in percent)
1.	What do you understand by global warming?	94	74.02

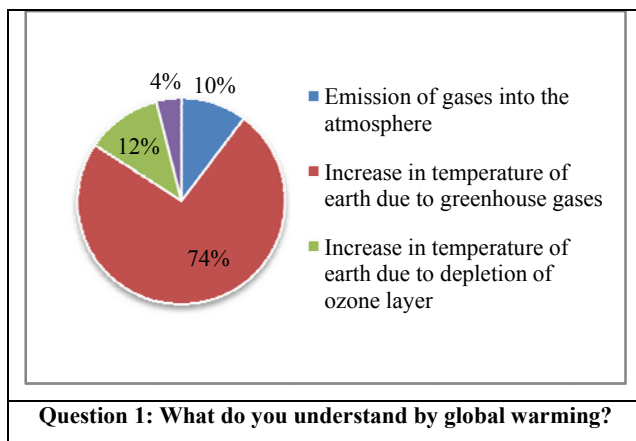


Figure 1

4.2 Causes of Global Warming

Four questions were incorporated in the questionnaire on the causes of global warming which included the processes

responsible for this phenomenon namely air pollution, main atmospheric gas responsible for climate change, anthropogenic factors contributing towards global warming i.e. deforestation, burning of fossil fuels and use of non-renewable sources of energy and the sources of energy that are being widely used and making contribution towards the accumulation of greenhouse gases in the atmosphere and thus rising the atmospheric temperature. It was considered important so as to ascertain the level of understanding of the responding learners on this yet another vital facet of environment science and protection therein. The questions asked and the number and percentage of correct answers received regarding the causes of global warming have been summarized in Table 2 and Figures 2 to 5. From these table and figures, it is evident that a significant number of learners possess the knowledge about the causes of global warming. Amongst the questions asked, the highest percentage of correct responses i.e. 84.25 percent has been received for the question on gas contributing most towards the greenhouse effect, followed by 64.57 percent learners responding correctly for the question on type of pollution responsible for this global phenomenon and 60.63 percent giving correct answer about the sources of energy that contribute towards global warming.

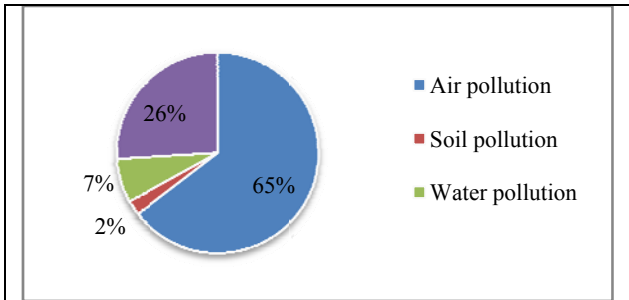
It was rather disturbing to find that only 40.94 percent of the learners could respond correctly for the process not having an impact on global warming. Since, the number of correct responses received for question number 4 is less than 50 percent of the total responses; it is important to discuss the probable reason for not getting the right answers from the learners. The question asked was “Which of the following processes does not contribute towards global warming?” and the options given were “Deforestation, Burning of fossil fuels, Using renewable energy resources and using non-renewable energy resources”. The option number 3 and 4 have received 41 percent and 34 percent responses respectively, the reason for the wrong choice of answers may be due to the confusion amongst the learners about the renewable and non-renewable sources of energy.

The results of the present study shows that more than half of the learners responded correctly for the all the questions on causes of global warming except one indicating that a significant number of learners are aware about the reasons responsible for this global phenomenon.

Table 2: Causes of Global Warming

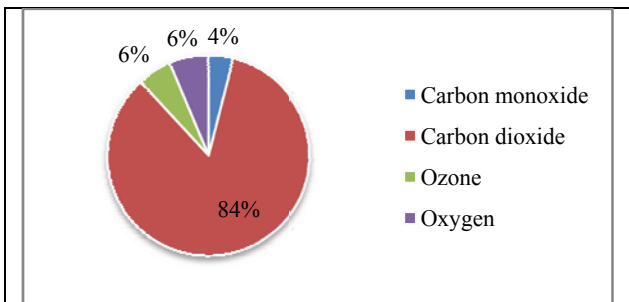
Q. No.	Question	Correct responses (in number)	Correct responses (in percent)
2.	Which of the following is mainly responsible for global warming?	82	64.57
3.	Which of the following gases contributes most towards greenhouse effect?	107	84.25
4.	Which of the following	52	40.94

	processes does not contribute towards global warming?		
5.	Which of the following sources of energy contributes towards global warming?	77	60.63



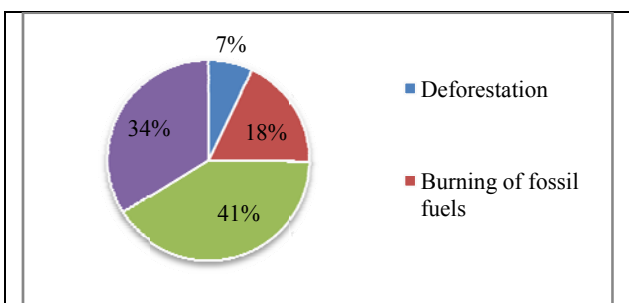
Question 2: Which of the following is mainly responsible for global warming?

Figure 2



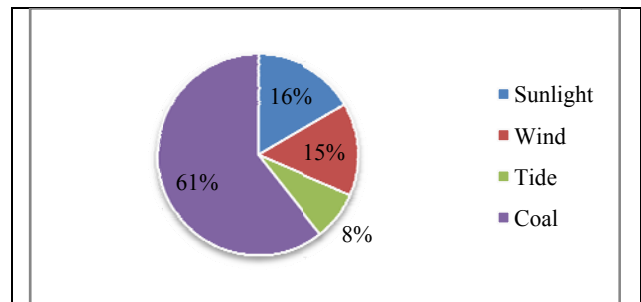
Question 3: Which of the following gases contributes most towards greenhouse effect?

Figure 3



Question 4: Which of the following processes does not contribute towards global warming?

Figure 4



Question 5: Which of the following sources of energy contributes towards global warming?

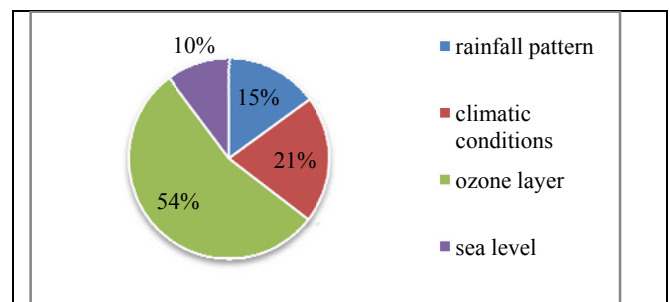
Figure 5

4.3 Impact of Global Warming

To get an insight into the level of knowledge of the learners about the impact of global warming, a question was framed as given in Table 3 i.e. the phenomenon not affected by global warming. The options included rainfall pattern, climatic conditions, ozone layer, and sea level. 69 learners i.e. 54.33 percent of the respondents marked the correct answer, and the lowest number of learners i.e. 10 percent marked the sea level as the option for not getting affected by global warming.

Table 3: Impact of Global Warming

Q. No.	Question	Correct responses (in number)	Correct responses (in percent)
6.	Which of the following phenomenon is not affected by global warming?	69	54.33



Question 6: Which of the following phenomenon is not affected by global warming?

Figure 6

4.4 Measures to Alleviate the Problem of Global Warming

Under the measures that can be adopted at various levels for curbing the menace of change in climatic conditions due to global warming, two questions were included in the questionnaire that are given in Table 4 and Figures 7 and 8. For the question no. 7 i.e. the practices that may not help in reducing the effects of global warming, 53.54 percent of the

respondents opted the correct answer which was “use of plastic bags”. It was encouraging to know that 77.95 marked the correct answer for the question asked for knowing the level of awareness of the steps that may be taken at an individual level for decreasing the contribution towards global warming i.e. decrease in consumption of electricity. This shows that the learners do possess the fundamental knowledge about the different methods that can be adopted by them for minimizing their involvement towards increase in global warming.

Table 4: Measures to Alleviate the Problem of Global Warming

Q. No.	Question	Correct responses (in number)	Correct responses (in percent)
7.	Which of the following practices may not help in reducing the effects of global warming?	68	53.54
8.	What can be done at an individual level to contribute towards decrease in global warming	99	77.95

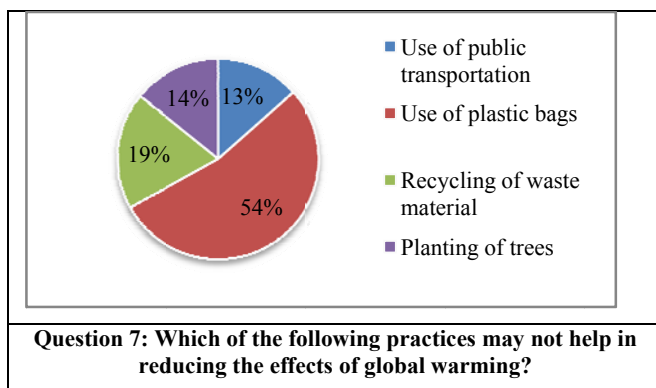


Figure 7

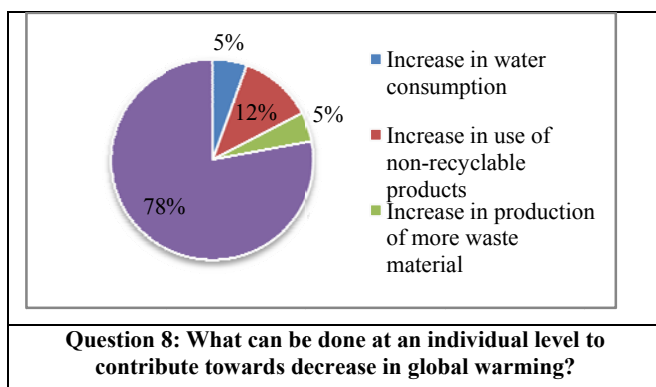


Figure 8

4.5 Recent Initiatives on Global Warming

Since a lot of efforts are being undertaken at the global and national level to effectively mitigate the problem of global warming, four questions were designed in order to know whether the learners are abreast about the recent developments taking place in this field or not. Under this section, there were two types of questions: A pair of questions was to assess the awareness of the students on the developments that have taken place during the initial years at the time when the global warming was realized to be an important phenomenon that needed the attention of government, researchers, environmentalists, policy makers, etc. and the other pair of questions aimed at assessing the awareness level of the learners about the recent initiatives that have been implemented. It was found that more than half of the respondents marked the correct responses for the first pair of questions i.e. 55.91 percent of the learners knew about the Earth Summit and 56.70 had the knowledge about the Kyoto Protocol, however it was discouraging that only around 25 percent of the learners had information about the National Action Plan of Climate Change and the latest UNFCCC Conference of Parties (COP 24) held at Katowice, Poland in December, 2018.

Table 5: Recent Initiatives at Varying Levels on Climate Change and Global Warming

Q. No.	Question	Correct responses (in number)	Correct responses (in percent)
9.	Where and when was Earth Summit organized?	71	55.91
10.	Where was UNFCCC Conference of Parties organized in 2018?	32	25.20
11.	Which of the following aims at controlling the emission of greenhouse gases?	72	56.70
12.	Which of the following is not a part of the National Action Plan of Climate Change launched by Government of India?	31	24.41

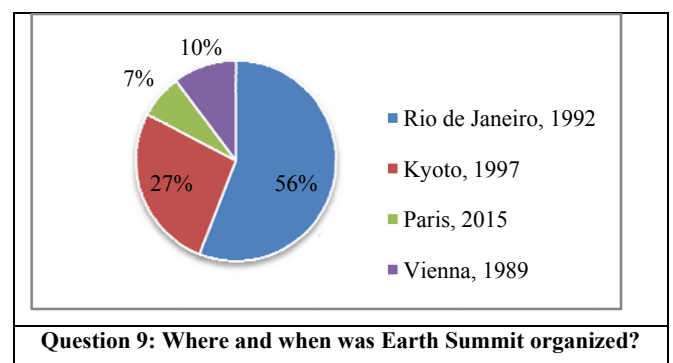


Figure 9

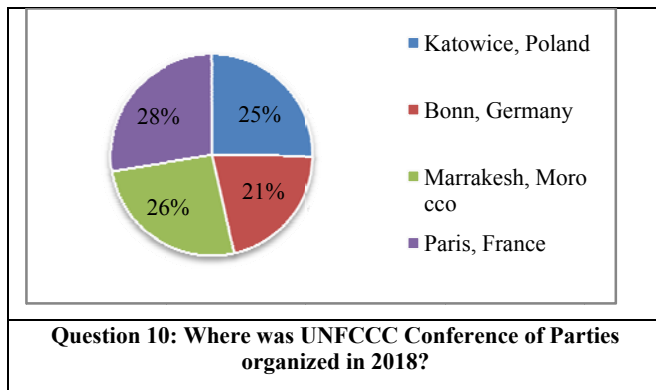


Figure 10

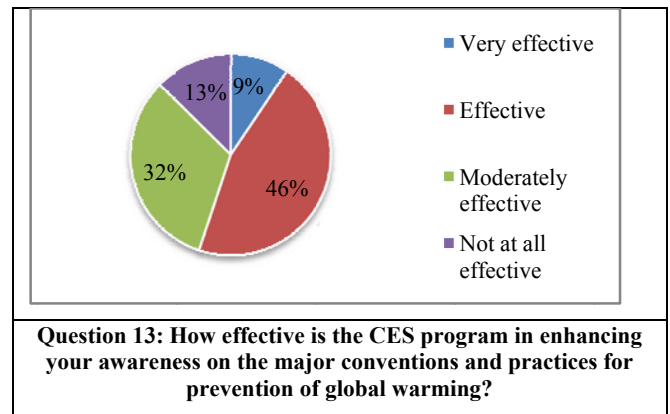


Figure 13

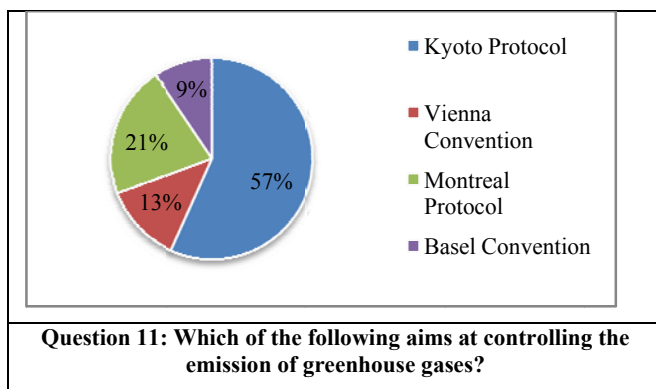


Figure 11

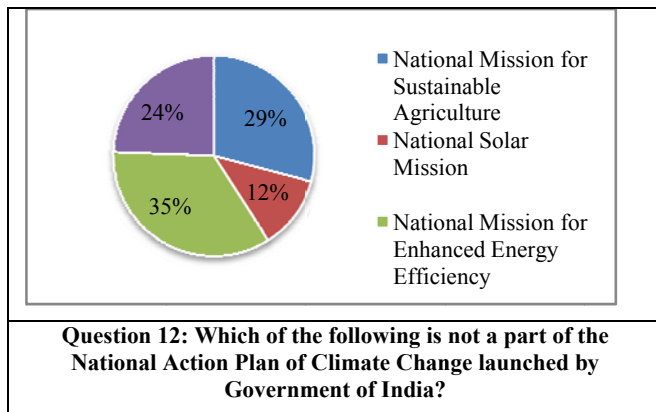


Figure 12

4.6 Effectiveness of CES

The learners were administered a question so as to get the feedback about the effectiveness of the CES programme in enhancing their awareness on major conventions and practices for prevention of global warming. The programme was responded to be very effective, effective, moderately effective and not at all effective by 9 percent, 46 percent, 32 percent and 13 percent of the learners, respectively (Figure 13). It is worth highlighting that the programme has been mentioned to be effective for creating awareness by maximum number of the learners.

4.7 Ways for Improving the Awareness Level and Making the Subject more Practical Oriented

From the research study and responses received from the participating student respondents, it is clear that global warming and climate change is indeed an area of interest amongst the students of present generation. However, the mixed responses received are indicative of the fact that although the people are aware of these aspects, yet they feel that there is a need for translating the theoretical aspects learnt during the programmes of study into practical action. The suggestions received by way of open-ended question indicate that there is a need for incorporating more practice oriented modules in the educational programmes focusing on environmental studies. The students opined that seminars, workshops, symposia, industry visits and interactions with specialists from research organizations would help them to further concretize their level of learning and make it more application oriented. They also viewed that such measures would aid them in further disseminating the knowledge and implementing measures at the household level for containing global warming and climate change.

5. CONCLUSION

On the basis of the present study, it may be concluded that a significant number of the learners of the Certificate of Environmental Studies programme offered by Indira Gandhi National Open University possess good basic knowledge about the phenomenon of global warming, its causes and impacts as well as their responsibilities as an individual to minimize their contribution towards the detrimental elements causing climate change. They were also found to be well aware of the developments that have taken place in past that are recorded and quoted at all the forums dealing with global warming i.e. Earth Summit and Kyoto Protocol, however their level of awareness about the recent initiatives has been found to be quite dismal. There may be a number of factors contributing to this rather moderate level of awareness such as the prevailing education system, the curriculum designed, role of media in highlighting such initiatives, lack of government

sponsored awareness programmes, etc. Therefore, there is a need for strategic governmental intervention at mass level so that the people may be made well equipped with the information about the developments taking place at different platforms in order to assuage the problem of global warming.

Additionally, there is a need to periodically revise the curriculum so as to incorporate information on latest developments in this subject area. This would motivate the target group to keep themselves abreast about not just the past but also the developments taking place presently at the global and national level.

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