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Climate Change and Sustainable Development

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Abstract: ***Global climate change is a burning issue for all over the world. It caused by greenhouse gases and ozone layer depletion. Both are two key space environmental issues of the present decade. All over the world there is growing concern about the far reaching consequences of the continuing build-up of greenhouse gases in the atmosphere and depletion of ozone layer in the stratospheric region of the atmosphere. Climate change in our environment is generated by several causes such as- population growth, pollution from industrialization, urbanization, carbon dioxide from rotting trees, the burning of coal, ozone layer depletion, natural gases and fossil fuels lead to methane travelling into the Earth's atmosphere any transportation vehicles, water vapor, and many other little things which contribute to make global climate change even worse. The average global temperature rose by 0.74 ^{0}C during last century. This is the largest and fastest warming trend in the history of the Earth that scientists have been able to discern. Current projections show that trend will continue and will accelerate. The best estimate indicates that the Earth could warm by 3 ^{0}C during the 21st century. Therefore, science and technology education is need of 21st century for better work to safeguard environmental, social and economic wellbeing for both in the present and for future generation. Scientists are now certain that most of the change is due to human activities that emit greenhouse gases. Greenhouse gases, of CO_2 are the most important, trap heat in the Earth's atmosphere, leading to the overall rise of global temperatures, which are liable to disrupt natural climate patterns. Climate change is already having significant impacts in all over the world, particularly in developing countries, and on most ecosystems. This is based on evidence of increases in global average air and ocean temperatures, widespread melting of snow and ice, and rising global average sea level. The challenge now is to develop a fairer and more effective global response to address this global problem. This requires concerted efforts by all countries, especially industrialized countries and major emerging economies, to significantly reduce the amounts of greenhouse gas emissions. Since climate change is already negatively affecting people in many areas, it is necessary to develop methods that will allow people and communities to adapt to the realities imposed by global climate change. So we can turn the graph back to normal. The start of the 21st century has found biotechnology emerging as a key enabling technology for sustainable development. Therefore, science and technology education must be need for social, environmental, economic benefits and go hand-in-hand to contribute towards sustainable development.***

Keywords: Climate change, greenhouse gases, deforestation, atmosphere, fossil fuel, coal, industrialization, urbanization and environmental pollution, science and technology and sustainable development

1. Introduction

Creation and destruction is a continuous natural process of evolution. Sustainable development is an inbuilt phenomenon of the nature. These natural development processes are so perfect that in such course of action the nature does not yield any waste and every component of the product is recyclable and usable. These phenomena are so designed that they do not cause any depletion of natural resource and thus maintaining all ecological balances (Vellinga P, 2002) . Modern technological advancement in every field of our life as brought out by our scientist and technologist is also indebted and inspired by the nature. But the science and technology which we are doing now-a-days for development of our industrial growth to benefit society is in true sense any way close to the bio- technology and sustainable or not? We should certainly pay attention to it so that it should not be too late to cause imbalance in nature or global climate change. In fact, most of the problem, which every one of us facing today, like health hazards due to environmental, soil and water pollution, natural disasters viz., earth quake, flood, drought, landslides and greenhouse effect etc., are our own creation due to our life style and imbalanced industrial development. The irony is that we have even spoiled the two most essential gifts i.e., water and air, given by nature free of cost with inbuilt sustainable mechanism, on the name of development. We are crying for the energy, which has also been gifted abundantly in the form of sun by the nature (United Nations, 2002) . But the fact is that it is only the human being who is responsible for these problems. No other living being on earth has ever created natural imbalance and is living with natural cycle yet they are also sufferer because of our deeds. So, we have to use our knowledge in a proper scientific manner with all in built element of technology to make sure that neither presents generation nor future generation should face any problem for their survival and livelihood.

Our predecessors have taken due care for such imbalance and time to time preached the society for its protection. Yajnavalkya Smriti, a historic Indian text on state craft and jurisprudence, suggested to have been written before 5th century AD, prohibited the cutting of trees and Kautalyas Arthashastra, written in Mauryan period, emphasized the need for forest administration. Ashoka went further, and his Pillar Edicts expressed his view about the welfare of environment and biodiversity. So, we have to be very cautious to generate and use our knowledge of science education and technology which should not cause any depletion of natural resources, ecological imbalances and pollution which responcible for global climate change. Therefore, science and technology education as we have come to understand in school largely relates to the facts and explanation of everyday life and sustainable development. In addition to this, there is a need to examine what constitutes science as a process, the discipline of doing science for sustainable development. To achieve this, science teaching-learning in schools must allow students and build skills in students for them to be able to-

1) Observe and understand phenomena and explain and propose solutions related to global climate change and sustainable development.

2) Explore, think creatively and engage with problems around us with a questioning mind, with a scientific temper and make rational decisions.
3) Understand, appreciate the nature around and work to conserve nature.
4) Apply their knowledge to problems and challenges of everyday life and build solutions through systematic thinking and effort.
5) Think innovatively and engage in research related to global climate change and sustainable development.
6) Build their skills and a productive and healthy life without polluting our natural resources.

Therefore, science and technology education in schools must address the problems of environment and social equity and not continue dominance of one form of knowledge or representation.

2. Science and Technology Education for Sustainable Development

Science and technology education for sustainable development is the process of equipping students with knowledge and understanding, skills and attributes needed to work and live in a way that safeguards environmental, social and economic wellbeing, both in the present and for future generations(Ahmed , A and Stein, J. A. ,2004) . Sustainable development is development that meets the need of the present without compromising the ability of future generation to meet their own needs. It can be completed using science and technology transaction in classroom. The term sustainable development is subject to many different interpretations (Kates R. W. and T. M. Parris, 2003). The concept of three pillars of sustainability - the economic, social and environmental factors that need to be taken into consideration and their cultural context. There is increasing recognition that these three factors are interconnected, overlapping and interdependent. So, science education (science and technology) for sustainable development means working with students to encourage them to:

1) Consider what the concept of global citizenship means in the context of their own discipline and in their future professional and personal lives.
2) Think about issues of social justice, ethics and wellbeing, and how these relate to ecological and economic factors.
3) Develop a future - facing outlook, learning to think about the consequences of actions, and how systems and societies can be adapted to ensure sustainable future.

These core themes form the basis of a framework for the knowledge, understanding, skills and attributes fostered through learning for and about global climate change sustainability. Students may already be familiar with science and technology for sustainable development through school and further education, though not necessarily having encountered it by the name. Science education for sustainable development encourages different disciplines to enter into dialogue, make connections, share knowledge, and work together on emergent areas. It aims to develop student's ability to understand and evaluate connections between big issues, such as inequality, public health, global consumption, biodiversity loss and the limits of natural systems(Rauch ,F. ,2004) .

Learning science and technology for sustainable development aims to prepare students to be able to contribute to, stimulate and lead the debate on complex issues such as global citizenship and good governance, sustainable resource use, and the determination of ecological limits. In future - facing in the sense that students are encouraged to think about current and emergent and future situations relevant to their studies, and so doing gain a wider socioeconomic and environmental perspective on the relevance of their work (Glenn,J. C. ,2006) . The present guidance is not prescriptive about how science education for sustainable development should be delivered, because it recognizes that educators will have their own ideas, will be working with in distinct local, national and international contexts, and will be influenced in most cases by broader institutional strategies. While the guidance is focused on curricular activities, it recognizes that students may also learn through extracurricular activities, both on and off campus, such as volunteering or participation in community-based project(UN, 2002a). It encourages students to develop critical thinking and to take a wide-ranging, systematic and reflective approach, adapting to novel situations that can arise from complexity. In addition, participatory learning approaches, peer learning and collaboration within and beyond the classroom should be encouraged, allowing students to be exposed to multiple perspectives and enabling creative response to emerge, related to sustainable development (Desai, P.N., 1997).

Learning for and about sustainable development while in school education through science and technology should not be limited to the formal curriculum, wherever, possible teaching-learning and assessment should take into account informal and campus learning opportunities at school levels. There are a number of teaching-learning methods that are likely to be particularly effective depending upon the sustainability challenge to be addressed, such as-

(1) Case studies
(2) Stimulus activities
(3) Simulation
(4) Experiential project work
(5) Problem-based learning.

Experiential, interactive, or participatory activities (science and technology) engage the students for sustainability issues at numerous levels, not only in relation to their discipline, but also in terms of reflecting on their own values, attitudes and accepted socials norms. Place –based learning can also be used effectively to embed sustainability in the curriculum. In place-based science learning related to sustainable environment development (global warming and climate change, ozone layer depletion, hazardous waste, industrial waste and waste water, water pollution, air pollution and soil pollution), student work in collaboration with local communities, public sector bodies, businesses and shakeholders' to define a problem together, using local knowledge, and jointly devising and implementing solutions that will be locally and culturally acceptable (Ahmed, A., 2004) . Place-based learning might include, for example, students working in partnership with a local community

group on a 'real-world' teaching-learning (science) and project, such as community wellbeing where students can help to improve the physical environment, enhance biodiversity, implement local growing schemes, develop healthy eating programme or design local transport plan to encourage physical activity (Stein, J.A. ,2002) . This is a particularly useful approach for an interdisciplinary programme, since the expertise of students from different disciplines can be brought on to the problem or issue identified related to sustainable development through science education. Problem - based learning approaches can be effective for sustainability. This approach is equally suitable for both single and multidiscipline teaching-learning. Problem identification is also an important skill that can be developed through this route. In problem-based learning scenarios, students are usually given an area of interest and are expected to define various aspects of the problem related to sustainable development through science, identify where they can gain further information, to the problem posed. This leads to the development of more democratic classroom environments. Problem-based learning approaches can also lead to deep and transformative learning on the part of students and develop a wide range of skills for sustainable development through science and technology education.

3. Conclusion

Science and technology education all over the world for proper sustainable development is need of 21st century for better future generation. To achieve this, science teaching-learning in schools must allow students and build skills in students for them to be able to- (1) Observe and understand phenomena and explain and propose solutions related to climate change sustainable development. (2) Explore, think creatively and engage with problems around us with a questioning mind, with a scientific temper and make rational decisions. (3) Understand, appreciate the nature around and work to conserve nature. (4) Apply their knowledge to problems and challenges of everyday life and build solutions through systematic thinking and effort. (5) Think innovatively and engage in research related to climate change and sustainable development. (6) Build their skills and a productive and healthy life without polluting our natural resources. Therefore, science and technology education in schools must address the problems of environment and social equity and not continue dominance of one form of knowledge or representation.

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