SCIENCE EDUCATION FOR SUSTAINABLE DEVELOPMENT: A THEORETICAL FRAMEWORK

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Sustainable development is an emerging need of present times. Sustainable development is the development that meets the needs of present without compromising the ability of future generations to meet their own needs. Man is always curious about the world surrounding him and science helps in this domain of knowledge. Science is a dynamic body of knowledge which involves many interconnected steps to solve any problem. Science is knowledge and knowledge is power; power is essential for sustainable development, so science education and sustainable development are interrelated with each other. Science helps people to acquire values, skills and knowledge necessary to build sustainable development. We can say that education for sustainable development is to renew education, teaching and learning and it also provides comfortable life to us. Science education can develop positive attitude towards science as a major factor in the society which leads to the path of sustainable development. For sustainable development there should be a balance between science and humanity, ecology, economy and prosperity and peace. This paper is intended to stimulate discussion about science education and its role in sustainable development. It also elaborates the science education in relation with sustainable development which helps to achieve the Millennium Development Goals (MDGs). It also discusses the challenges for sustainable development.

Key words: *Sustainable development, science education, science teaching.*

Introduction

Science is derived from the Latin word *scientia* which means what is to know, what a fact is—truth or certainty. Science is the bedrock upon which any nation can be built. This means that no country can be globally recognised without talking about its scientific advancements. According to Pember and Humbe (2009), science education is a process of teaching or training, especially in school, to improve one's knowledge about environment and to develop one's skill of systematic inquiry as well as natural attitudinal characteristics. Generally, science education has been recognised as a pre-requisite in technological development across the world. Science education consists of in-depth study of science and by means of which educational knowledge and concepts are learnt and verified. A country can never be globally recognised without giving due importance to its scientific advancements.

Science education identifies not only natural phenomena appropriate to child interest and skills but also equips teachers, learners and the society with knowledge, skills, equipment along with freedom to perform noble task useful for improving socio-economic standard. In addition to this Pember and Humbe elucidate that science education courses are designed to produce capable scientists who contribute meaningfully to academic excellence of the society which in turn can raise the economic level of nations. Sustainable development is directly related to science education as science education is the need of the hour and quite essential for the process of modernisation. It is an issue of

concern that generally the people who are not from science background do not understand it in its pure scientific terms but still they use science in their daily life directly or indirectly.

Sustainable development has been defined in many ways but the most familiar definition is given in the Brundtland Commission's report, Our Common Future (WCED, 1987): "sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs." Sustainable development takes different forms in different societies and environments and is the process whereby societies realise that state of dynamic equilibrium termed sustainability (Reid, 1995).

The Millennium Development Goals (MDGs) were established following the Millennium Summit of the United Nations in 2000. The MDGs are eight international development goals for the year 2015 that follows the adoption of the United Nations Millennium Declaration. All 189 United Nations member states of that time and at least 22 international organisations, committed to help achieve the following MDGs by 2015:

1. Eradicate extreme poverty and hunger.
2. Achieve universal primary education.
3. Promote gender equality and empower women.
4. Reduce child mortality.
5. Improve Maternal Health.
6. Combat HIV/AIDS, malaria, and other diseases.
7. Ensure environmental sustainability.
8. Develop a global partnership for development.

The Millennium Development Goals are the world's time-bound and quantified targets for addressing poverty which helps in its many dimensions such as income, poverty, hunger, disease, lack of adequate shelter, and exclusion in different areas which also promotes gender equality, education, and environmental sustainability. They are also the basic human rights which can be directly elucidated as the rights of each person on the planet to health, education, shelter, and security.

Classroom example: Rain water harvesting is a concept that the students learn in science and which has an important role in sustainable development as it will help in future to conserve water for future generations.

Objectives

The objectives related to the present research article may be formulated as under:

1. To explore the theoretical concepts of science education and sustainable development.
2. To suggest some possible recommendations for channelising science education so that the goal of sustainable education can be attained.

Science Teacher and Teaching

Science is a subject which is directly related with the creativity and scientific attitude of students. So, science teaching should be innovative and arouse interest in students. The main qualities of science teacher should be as follows:

S - Scientific Attitude	**T** - Torch Bearer
C - Creative	**E** - Eager
I - Innovative	**A** - Affectionate
E - Energetic	**C** - Content Expert
N - Noble	**H** - Honest
C - Critical Thinker	**E** - Efficient
E - Enthusiastic	**R** - Reliable

The role of science teachers should be:

- The teachers should teach their students how to think in scientific ways.
- They should actively involve students in teaching-learning process.
- They should help students to develop a conceptual framework as well as to develop problem solving skills.
- They should promote student discussion and group activities.
- They should help students experience science in varied, interesting, and enjoyable ways.
- They should assess student understanding at frequent intervals throughout the learning process.

Use of science education in achieving sustainable development: The science education can be used in achieving sustainable development and can be discussed in the following points:

1. *By inculcating responsibility in citizens:* When the students are educated and well informed they can become responsible citizens and science education can help them in it as they can understand the scientific processes easily and can also become enlightened consumers. Science education can also create diligence and a sense of caution in them while leading their daily life.
2. *By building a strong economy:* Students who have a solid knowledge base of science can help in inculcating ideas, technologies and businesses that can stimulate the economy of a country. Better skills and training of the individuals for the career development can also be enhanced by building a strong base of economy.
3. *By giving emphasis to health globally:* Science education has paved the way for better physical and mental health. Modern scientific inventions and discoveries have led to find out the cure of many diseases and have increased the life-span of humans.
4. *By taking fruitful decisions:* Science explains the interaction and interdependency of nature with humans. It helps them in fostering the fruitful decisions which can help to create better future life.
5. *By giving utmost importance to scientific research and advancements:* Science education also provides the students with knowledge about research, reviewing, reporting, analysis, etc., which can in turn help in new inventions, discoveries and research.

Challenges for sustainable development in science education: Science teachers face numerous challenges while imparting education among students. Sustainable education in science can help students in creating awareness about environmental and educational needs.

1. *Teaching methodology:* Teaching methods help the teachers in presenting their lessons in a more concrete way. In fact, it is the methodology which makes a teacher professional and helps him/her in imparting knowledge fruitfully among the students. In the changing times, it is necessary for a teacher to devise new teaching methodology and change it according to the learning pace of the students.
2. *Lack of instructional materials:* Instructional materials are materials, facilities and equipment that emphasise, illustrate and explain lesson to the students for better understanding of the students. Some abstract concepts of science need instructional materials for better explanation and understanding by the students.
3. *Large class size:* Teacher-pupil ratio is a very big challenge for science educators and poses to be a problem for them.The Teacher becomes incapcitated to handle many students, which further increases the gap in the interaction between students and teachers.
4. *Remuneration and improved work conditions of science teachers:* It is necessary for the government to rehabilitate and improve the working conditions of science teachers to boost up their moral and standards. This could also be done by enhancing teacher's packages and special allowances.
5. *Lack of funds:* Funding is one of the major aspects for the success of research in any field. Lack of funds pose a threat to advanced research and quality of education gets affected which also demoralises the students as they are unable to carry out innovative research.
6. *Political instability:* Democracy is the sole criteria to suppress political instability in the country. Sustaining the democracy of a country also helps in consolidating the market economy, sustaining the confidence of the international investors in the economy of the country and strengthening its position as an emerging economy.

Recommendations: After the above discussion, we can give the following recommendations through which science education can help in achieving sustainable development:

1. Easily accessible and quality science education should be made accessible to all.
2. Both government and private sectors should join hands in making efforts and providing resources for developing the science education.
3. Proper research equipment and facilities should be provided to the research institutes so that they do not face any problem while conducting their research work.
4. The teachers should be paid well so that they can elicit best results according to their capabilities.
5. Modern learning aids such as computers, overhead projectors,

internet, etc., should be provided to develop better understanding of the science concepts.

Conclusion

Science can play a truly liberating role in any progressive society. It works for poverty eradication, skill development, conservation of nature, etc., which are key features of sustainable development. Sustainable development works in four dimensions, i.e., environment protection and preservation, sustainable economic growth and conservation of natural resources, poverty alleviation and to strengthen mutual knowledge. In the MDGs many issues are given importance but the issues related to education and sustainable development are the burning issues of humans for the coming era. If we analyse these two Millenium Development Goals (i.e., to achieve universal primary education and to ensure environmental sustainability) then we can understand that the one (education) is the medium to achieve the other (sustainable development). As far as we are concerned about the sustainable development then we can interpret that among all the streams of education, science education is directly related to sustainable development because science and environment are inter-connected.

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