

SCIENCE TECHNOLOGY SOCIETY (STS) APPROACH IN SCIENCE EDUCATION

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Abstract

This conceptual paper attempts to provide an understanding of the importance of the Science Technology and Society (STS) Approach for teaching and learning Science. This curriculum approach has certain beliefs and assumptions about science pedagogy. STS emphasizes the interaction between science and technology, the impact of scientific and technological advancement on society, and vice versa. This approach is designed to make traditional concepts and processes found in typical science programmes more appropriate and relevant to the lives of learners. Acquiring knowledge, values, and ideas are the major goals of STS in Science Education. The major assumptions of the STS approach are, linking the student's knowledge, skills, values, and ideas in its natural environment, social environment, and technology-driven environment and it will improve students' understanding of the nature of science and attitude towards science.

Keywords: Knowledge, Science Education, Science Technology Society (STS), Skills, Values.

INTRODUCTION

Scientific development in recent decades has, and will continue to have, a significant influence on topics that have great importance for humanity, quality of life, the sustainable development of the planet, and peaceful coexistence among people. From the immediate basic essentials of life such as access to water, food and shelter, to important issues that affect us all (management of agricultural production, water resources, health, energy resources, biodiversity conservation, the environment, transport, communication), all have a strong science component to which everybody should have access to take part in local, regional, national and transnational decisions in a meaningful way (UNESCO, 2010). A paradigm shift in the field of science education is the Science Technology Society (STS) approach, which is based on the premise that science is not neutral and objective but is influenced by the social, cultural, and political

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context in which it takes place. Therefore, scientific knowledge and technology are not developed in isolation but are shaped by economic, ethical, and social considerations.

According to Ziman (1980) STS is a kind of curriculum approach mainly to make traditional concepts and processes found in typical science and social studies programmes more relevant to the lives of learners. Yager (1990) defined STS as an integrated approach to science teaching and learning, while Wraga and Hlebowitsh (1991) mentioned that, STS addresses a broad range of environmental, industrial, technological, social and political problems. STS is an instructional approach that incorporates appropriate STS knowledge, skills, attitudes, and values (Heath, 1992). In STS approach, the learners will be able to pierce in to the social, environmental, industrial and technological issues / problems and hence forth they are able to resolve the problems by developing scientific attitude. The curriculum planners should keep in mind the significance of STS instructional strategy for revitalizing the science education. Theoretically, the STS teaching approach is an issue oriented and inquiry-oriented teaching model based on constructivist theory (Lu, 1993). This theory maintains that the learning process begins with personal engagement with real-world problems about which learners are curious.

Despite the government's efforts to improve the equity, quality and access in higher education, it is realized that a wide gap exists in terms of what is anticipated of science education and the ground reality. Thus development of a curriculum based on the connections between science, technology and society so that education becomes an effective contributor to solving the nation's problems and enhancing the employability of our large population of youth may address this concern. Through science education one can get acquainted with the scientific and innovative pedagogic practices for the futuristic science education. Science education will be holistic, integrated, enjoyable and engaging as mentioned in National Policy on Education (NPE, 2020; P11). According to draft of KCF, (2022), the science classroom practices might have included the activities for developing the learners become critical and rational thinkers for the upliftment of Nation by holding democratic and social values.

The STS approach focuses on understanding the relationship between science and society, and how science can influence and be influenced by social and cultural factors. The STS approach in science education aims to provide students with the knowledge and skills required to critically analyze scientific information and its impact on society. It also emphasizes the importance of ethical considerations in scientific research, as well as the need for scientific communication and collaboration with the wider community.

BELIEFS AND ASSUMPTIONS ABOUT STS APPROACH

1. STS approach emphasizes the social and cultural contexts that shape science and technology.
2. It assumes that science and technology are not neutral or objective but are influenced by various factors such as values, politics, and interests.
3. STS assumes that science and technology have an impact on society and culture and vice versa.
4. It believes that science and technology should be studied in relation to their social and cultural implications.
5. It assumes that the understanding of science and technology requires a multidisciplinary approach that involves fields such as sociology, anthropology, history, philosophy, and science and technology studies.
6. It believes that science and technology should not be seen as separate from society but as deeply embedded in it.
7. STS approach assumes that science and technology do not exist in a vacuum, but are shaped by their historical and cultural contexts.
8. It believes that scientists and technologists are not solely responsible for the development and use of science and technology, but that other actors such as policymakers, industry, and the public also play a crucial role.
9. STS approach assumes that science and technology are subject to social and political conflicts, debates, and negotiations.
10. It believes that science and technology should be analyzed in terms of their potential benefits and harms, and their distributional effects across different social groups.

IMPORTANCE OF STS APPROACH IN SCIENCE EDUCATION

Science, Technology, and Society (STS), an interdisciplinary approach, that focuses on how scientific advancements impact the society and vice versa. The STS approach in science education emphasizes the integration of scientific knowledge with social, ethical, and cultural considerations. It encourages students to engage with real-world issues and understand how scientific theories and methods shape and are shaped by social and cultural values and practices.

Science education is the production of citizens who are creative, critical, analytical, and rational. According to Kolstoe (2001), science for citizenship is an important goal of science education. To do this, Price and Cross (1999) refer to science education should give pupils a

basis for understanding and for coping with their lives. They should be given applications and effects of science in their personal and social life.

Scientific and technological developments have positive side and negative or destructive science technology such as social issues, environmental issues – flood, global warming, technological issues, and industrial issues. Future generations should be aware of these issues. Curricular activities and practices should focus on rectifying the issues related to human lives. Present curriculum focusing on content, activity and application. Besides all these, the curriculum should be revitalized by infusing and integrating science and technology with the society in which they live. Eventhough, the present curriculum comprises of technological interventions to transact the knowledge system in a proper manner, lots of evidences and contexts to aware about social, environmental, technological and industrial issues / problems, the learners couldn't get appropriate pedagogical and instructional strategies that can help them to nurture their scientific aptitude, temper, attitude etc. STS learning approach emphasizes that students can think, assess, solve problems, and make decisions. The constructivist foundation of STS is an advantage that can equip students to face the challenges of competition in the 21st century. The STS learning approach requires that students be included in setting, planning, implementing, how to obtain information, and evaluation of learning. The principle of learning STS is a discussion of issues in society related to science and technology, so that issue in the community is the organizer in learning STS. The implementation of the STS learning approach is aimed at engaging students in the problem-solving activities they have identified. The following are some reasons why the STS approach is important in science education:

1. Develops critical thinking skills: The STS approach encourages students to analyze the complex interactions between science, technology, and society. It helps them develop critical thinking skills and become better equipped to evaluate scientific claims, understand the implications of scientific research, and make informed decisions.

2. Encourages ethical considerations: Science is not value-neutral, and the STS approach highlights the ethical considerations that come with scientific advancements. By incorporating ethical considerations into the study of science, students gain a deeper understanding of how scientific research affects society and learn to make informed decisions about the implications of scientific research.

3. Promotes social awareness: The STS approach helps students understand the social, cultural, and political dimensions of scientific research. By engaging with real-world issues,

students become aware of the social implications of scientific research and can develop their own perspectives on how scientific advances should be managed.

4. Supports interdisciplinary learning: The STS approach promotes interdisciplinary learning by integrating science, technology, and social sciences. This approach allows students to connect scientific principles with social and cultural issues, leading to a more comprehensive understanding of science.

CHALLENGES AND OPPORTUNITIES

Challenges:

1. Different interpretations: The STS Approach is interdisciplinary in nature that makes it difficult to have a single definition of a particular concept.
2. Complexity: The STS Approach deals with complex and contemporary issues related to science, technology, and society which require a wide range of knowledge and expertise.
3. Limited funding: STS research often suffers from limited funding, making it difficult to conduct comprehensive research and gather data and information.
4. Accessibility: STS research is often complex and technical, making it difficult for the general public to access and understand.

Opportunities:

1. Interdisciplinary collaboration: STS encourages interdisciplinary collaboration, bringing together experts from various fields, including science, technology, sociology, philosophy, and economics, to develop new insights on complex issues.
2. Policy Development: STS research helps government policymakers to identify the potential risks and benefits associated with technological and scientific advancements by providing a critical perspective on scientific and technological policies.
3. Public Engagement: STS research aims at generating more public engagement in scientific and technological advancement by offering a comprehensive understanding of its effects on society.
4. Sustainable development: STS approaches are an essential part of sustainable development that aims to integrate the social, environmental, and economic aspects of technological and scientific advancements.

The Science Technology Society (STS) approach acknowledges that science and technology have significant impacts on society and the environment. Therefore, science education must not only equip students with scientific knowledge and skills but also encourage an understanding of how science is applied in society and its ethical implications. STS approach reflects the contemporary view of science as a social institution that is shaped by cultural, political, economic, and historical factors. This perspective encourages students to view science as a human activity and not just a collection of facts or laws. Teaching-learning through STS approach has been found to promote critical thinking, problem-solving skills, and a more informed and engaged citizenry. It has also been recognized as a means of promoting equity and diversity in science education, where students from different socio-cultural backgrounds can contribute to the discourse on science and technology.

CONCLUSION

In conclusion, the STS approach has significant potential in science education to enhance the relevance and effectiveness of classroom learning. It offers a critical and reflective perspective that can inspire young people to engage in scientific inquiry responsibly and democratically. The STS approach is a vital aspect of science education. By exploring topics from an STS perspective, students develop critical thinking skills, ethical considerations, social awareness, and interdisciplinary learning. These are essential skills that help students become informed and responsible citizens in a world increasingly shaped by science and technology.

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