Reproductive and Sexual Health of Women in India: Addressing in Science Classroom

Pinkal Chaudhari[1*] and Anwesha Mahankudo[2]

[1]Assistant Professor, Department of Education, University of Delhi, Delhi, India*

[2]Ph.D. Scholar (JRF), Department of Education, University of Delhi, Delhi, India

Abstract: *One of the goals of science education is to combat social issues using scientific knowledge. Scientific literacy involves acquiring and applying scientific knowledge to solve problems in daily life. Addressing the reproductive and sexual health of women in a science classroom helps achieve scientific literacy. Teachers play a crucial role in science classrooms and should encourage discussions on these issues. The science teacher's role is to introduce these issues in the classroom and encourage participation using various teaching methodologies to nurture scientific and rational thinking in students. The Teaching and Learning Framework for Socio-Scientific Issues (SSI-TL) provides a way to address these issues in the classroom and promote functional scientific literacy among learners. In this study, the authors illustrate the integration of SSI using science curricular examples.*

Key words: *Socio-scientific issues, Reproductive and Sexual Health, scientific literacy*

1. Introduction

India is a democratic nation in which all citizens afford equal rights. The suffrage of women in India commenced with the country's independence from British rule. However, women are not immune to social customs and norms. Gender inequality is one of the most pervasive forms of discrimination that transcends classes, castes, and communities. It is a social construct that encompasses norms, values, customs, and practices that amplify and perpetuate biological differences in a much broader social system [7]. A complex social framework often takes shape from classical texts and is regulated by those who hold power in the present era. Patriarchal societies in South Asian countries have led to a binary gender divide between males and females. This system undermines women's rights to exist as human beings, and one of the most fundamental rights is women's right to control their own bodies. Unfortunately, few women in these countries are aware of their sexual and reproductive health. From infancy to adulthood, their lives are often controlled by others regardless of gender. Responsibility for a woman's sexual and reproductive health is frequently influenced by societal constraints rather than being determined by her own choices, well-being, and the right to self-determination. Women play a crucial role in national development and have the right to make decisions regarding their fertility [24]. It further underlined the significance of women's participation in shaping policies that affect their political, social, and economic well-being as well as their health.

True education has the power to liberate people, and some women receive the opportunity to break chains of social injustice. However, certain issues must be addressed to promote the sexual and reproductive health of women in India. "The aim of science education is to inculcate the critical perspectives on science and social justice concerns among people. In a progressive forward-looking society, science can play a truly liberating role, helping people escape from the vicious cycle of poverty, ignorance and superstition." [15]. Science teaching can be enriched by the inclusion of elements of the humanities and social sciences [11]. Science classrooms should socialize in such a way that learners can understand rationally and allow them to

freely inquire and interact democratically inside and outside the school. This knowledge constructed among learners will be able to make them concerned about the problems and find solutions to social issues [9]. The Indian education system shifts towards an holistic and integrated approach of contents [10]. This implies that there is a need to add science to societal issues.

2. Socio-Scientific Issues

Socio-scientific issues involve the application of modern science to various social dimensions, taking into account the ethical, moral, and cultural values of society. These issues play a crucial role in scientific literacy, which is often debated, and their advantages and disadvantages are discussed. Therefore, it is important to address these socio-scientific issues. Scientific knowledge flows outward through its application in technology, which is in turn received by society [17]. Scientific literacy endows learners with the ability to engage in inquiry and promotes curiosity and critical thinking. Fostering an interest in questions pertaining to everyday life encourages the exploration of socio-scientific issues in science classes. In this study, the researchers highlighted the importance of addressing gender issues with a specific focus on women's reproductive and sexual health in science classrooms.

3. Reproductive and sexual health of Women

Reproductive health is a state of complete physical, mental, and societal well-being, not merely the absence of disease or infirmity in all matters relating to the reproductive system and its functions and processes [1]. Reproductive rights are recognised as fundamental human rights [22, 24]. Reproductive Justice Theory defines reproductive health and self-determination as inherent human rights that require both legal rights and the resources necessary to achieve those rights [3]. Women's enslavement is a fundamental component of both feudal and capitalistic systems. Economic independence is crucial for women to prioritize their health and well-being. Women from disadvantaged backgrounds often encounter numerous challenges when attempting to take care of themselves. Unfortunately, women in several nations including India do not have equal access to reproductive rights. Various factors such as social class, sexual orientation, and ethnicity can influence the availability of these rights. "Without a common base of equality, there cannot be reproductive liberty." [6]. In India, various obstacles impede women's capacity to exercise autonomy on matters pertaining to their reproductive health, resulting in reproductive injustice. These barriers are rooted in India's patriarchal family system, insufficient public awareness, and commodification of scientific practices and knowledge. Following are significant concerns regarding the reproductive and sexual health of women in India:

3.1 Issues Related to the Use of Various Contraceptives:

Several contraceptive methods are currently available. In India, a significant disparity exists between the sterilization rates of males and females, with 68.5% of females opting for sterilization compared to just 0.5% of males [12]. The Supreme Court of India has emphasized the importance of informed consent and freedom from coercion when it comes to sterilization, stated that the freedom to exercise these reproductive rights would include the right to make a choice regarding sterilization on the basis of

informed consent and free from any form of coercion [21]. Despite this, there is a stark difference in the rates of male and female sterilization. The government of India currently offers free *ANTARA* injections to women between the ages of 15 and 45 every three months as a means of population control and pregnancy prevention. However, these schemes may not consider the potential impact on women's reproductive and mental health. *ANTARA*, a contraceptive injection containing Depot Medroxy Progesterone Acetate, is effective in preventing pregnancy but also has numerous side effects [13]. Changes in menstrual bleeding patterns, delay in the return of fertility, headaches, dizziness, decreased sex drive, abdominal bloating, and discomfort are some of the side effects experienced by women who use contraceptives, including injections, pills, and intrauterine devices (IUDs). Although condoms are available as temporary male contraceptives, there are no comparable options for males. *Asha workers*, who are female and appointed by the government, are tasked with raising awareness and distributing contraceptives to women in rural areas. They discuss various contraceptive options and their uses with the women in the village. Although parenting and reproduction are considered basic roles for both males and females, women are often burdened with these responsibilities to a greater extent. In rural areas, many women are unaware of menstrual hygiene and continue to use unhygienic clothing during their periods, which can lead to infection. There are many superstitions and rituals associated with menstruation in certain communities, and in some cases, girls are not allowed to attend school. These practices have contributed to the exclusion of women from education in these communities.

In some instances of married couples, infertility may arise, affecting either the male or female partner. This often leads to the female partner being a victim. Fortunately, contemporary science has made various solutions available, including in vitro fertilization (IVF) and surrogacy. However, these methods are often misused. For instance, owing to the preference for male offspring, women are often subjected to multiple pregnancies, which poses significant health risks. Women play a pivotal role in this process and their consent and preferences should always be respected. As human beings, women have the right to autonomy over their bodies. It is important to consider a woman's position with regard to her health rights, livelihoods, and personal choices. Approximate 67% of abortions in India are unsafe. Sadly, eight women lose their daily lives due to unsafe abortions, which are the third leading cause of maternal mortality in South Asia. The UNFPA report highlighted that adolescent girls between the ages of 15 and 19 years were at the greatest risk of dying from complications arising from an abortion [23]. The World Health Organization (WHO) states that the average maternal mortality rate is three times higher in countries with more restrictive abortion laws (223 maternal deaths per 100,000 live births) than in those with less restrictive laws (77 maternal deaths per 100,000 live births) [25]. According to Section 312 of the Indian Penal Code, "causing a miscarriage" is considered a criminal offense; hence, the MTP Act was introduced to protect doctors who provide abortions. MTP stands for Medical Termination of Pregnancy, which was legalized in 2017 by the Indian government with the aim of reducing the incidence of illegal abortions and the consequent maternal mortality and morbidity [21]. Another challenge faced by women is their geographical access. Approximately 66% of India's population resides in rural areas, where there is a severe shortage of obstetrician-gynecologists [14]. As a result, many abortions, which are considered unsafe, are performed by midwives, auxiliary nurses, or birth attendants. Only 20% of abortions occurred in public healthcare facilities, whereas 52% of abortions were conducted in

urban private clinics and hospitals [14]. Young women aged 15-19 years are at the highest risk of dying from abortion-related complications [18].

31,677 cases of rape were reported in 2021, and nearly 49 cases of crime against women were filed every hour. Whereas, the number of rape cases in 2020 was 28,046, whereas it was 32,033 in 2019 [16]. In several rural areas, it is a longstanding custom to compel a woman who has been sexually assaulted to marry the culprit. In certain cases, victims may opt to have an abortion without seeking medical assistance or may take their own lives to evade the stigma of society. It is essential to note that abortion is viewed as a moral transgression in many countries, including the United States. A woman has the right to undergo an abortion without seeking approval or permission from her partner, family member, or husband. A patriarchal society plays a significant role in this matter. Women are bound by patriarchal thinking as they are products of the same culture. They are coerced and fearful of disobeying these norms, believing that they will face punishment. These cultural practices play a major role in controlling women's personal choice. Women can exercise autonomy over their bodies and live a life of dignity and respect when the burden of their reproductive work is reduced [8]. Women's rights are non-negotiable, and it is the responsibility of both men and women to sensitize the issue and take appropriate steps.

3.1.1 Commercialization of Assisted reproductive technology (ART) and Medical Practices in India:

Assisted Reproductive Technology (ART) is a type of fertility treatment that involves influencing gametes such as eggs and sperm to increase the likelihood of fertilization. This treatment is typically an option for individuals who have not become pregnant after other infertility treatments or those who have not yet attempted treatment. There are several types of ART, including in-vitro fertilization (IVF), zygote intra fallopian transfer (ZIFT), gamete intra fallopian transfer (GIFT), and surrogacy. Surrogacy has become increasingly popular in India owing to several factors, including reproductive tourism, economic compulsions of individuals who cannot afford the procedure in other countries, and the growing number of medical professionals who see it as a profitable business. These factors have contributed to the exploitation of women who serve as surrogates, leading to the commodification of human life [4,5]. This issue raises ethical concerns and questions regarding the role of medical professionals in regulating and monitoring the use of ART.

3.1.2 Individual Needs vs. Women's Right

Individuals from diverse nations seeking to become parents travel to India. Although this pattern benefits a particular group of women, it also has negative consequences. Problems arising from this include a diminishing sex ratio, an increase in Caesarean deliveries, and an excessive number of medical interventions resulting in unnecessary procedures.

3.1.3 Commodification of Body Parts

Another issue that arises is the commodification of human body parts, including the illicit trade in the kidneys, placentas, and fetal tissue. It has been reported that young women are often exploited by being used to harvest their oocytes or eggs without fully informed consent on the risks and consequences of the procedure. Additionally, some clinics promote in vitro fertilization (IVF) without possessing the necessary technical resources and personnel, and specialists arrange surrogacy contracts for foreign clients without ensuring the safety and rights of surrogate

mothers or children [4,5]. Issues stemming from disparate ART industries, characterized by varying prices, protocols, and standards, have led to numerous challenges. Unfortunately, women often suffer the most from these irregularities. It is an injustice to utilize someone's body without their consent.

4. Socio scientific issues and scientific literacy

The integration of socio-scientific issues (SSIs) into school curricula is of utmost importance. Teaching science solely based on facts often fails to engage learners. By incorporating SSIs that are relevant to their daily lives, students can relate to their subject matter and develop scientific literacy. It is crucial to discuss both the facts and values of science simultaneously to synthesize scientific understanding and competencies. Introducing SSIs into the science classroom fosters scientific literacy in young learners by encouraging them to participate in scientific inquiry, analyze information, and engage in debates and discussions on controversial topics. This approach helps build their capacity to make informed decisions regarding these issues.

5. Role of teachers in addressing SSI in science classroom

The primary goal of science classroom processes is to foster scientific skepticism, rationality, and logic among learners. Teachers have a critical role to play in guiding students towards acquiring these skills, which requires them to have a nuanced understanding of socio-scientific issues. However, teachers and learners often come from different socio-economic backgrounds, which can lead to divergent beliefs, perceptions, and practices. Therefore, it is crucial that schools create a supportive environment for meaningful and healthy discussions on sensitive topics, such as sexuality and sex-related myths and truths among adolescents. This enables young people to understand the role of sexuality in their lives, encourage them to overcome feelings of shame, and help them develop confidence in expressing their opinions on the right and wrong [15]. Unfortunately, science teachers in India avoid discussing controversial socio-scientific issues in classrooms. Teachers can effectively introduce these topics through educational debates and discussions. It is essential to address as learners at this stage are in adolescence, a period of significant cognitive, emotional, and social development. Before discussing these sensitive scientific topics, teachers must be well informed and oriented toward these issues. Teachers play a pivotal role in the teaching-learning process both inside and outside the classroom. To achieve the desired learning outcomes, teachers can employ various pedagogical methodologies in the science classroom, such as problem-based, inquiry-based, and cooperative learning.

- **Project Work:**

Teachers can incorporate real-life socio-scientific issues into their classroom instruction and assign learners to conduct small-scale surveys or engage in discussions with community health workers, specifically *Asha workers and Anganwadi workers*, to explore the distribution methods and utilization of various contraceptives in the local village.

- **Discussion**

It is essential to adopt a discussion method that incorporates socio-scientific issues into science classrooms. The teacher must initiate a discussion by presenting the

students with a problem to solve. For example, after students interact with *Asha and Anganwadi workers,* they can engage in discussions about the information they have collected.

- **Logical Argumentation and debate**

The incorporation of small-scale interventions (SSIs) into classroom settings can be an effective method for fostering engagement and critical thinking among learners. Furthermore, facilitating discussions and debates on topics such as contraceptive use and their potential side effects on women's reproductive and sexual health can be a valuable educational tool. This approach allows students to exchange ideas, develop reasoning skills, and deepen their understanding of complex issues.

- **Engagement in Critical thinking**

By incorporating socio-scientific issues (SSIs) into science classroom debates and discussions, students can develop critical thinking skills, such as analysis, inference, interpretation, and self-regulation [2]. Specifically, students will be able to analyze the effects of contraceptives and understand their sexual and reproductive rights. It is important to connect these discussions to real-life examples in the classroom to bring about desirable social changes for learners. This will help prevent the creation of alternative conceptions in classroom discussions. The integration of biological topics using SSI Teaching and Learning Framework of Hancock et al. (2019) is recommended [20].
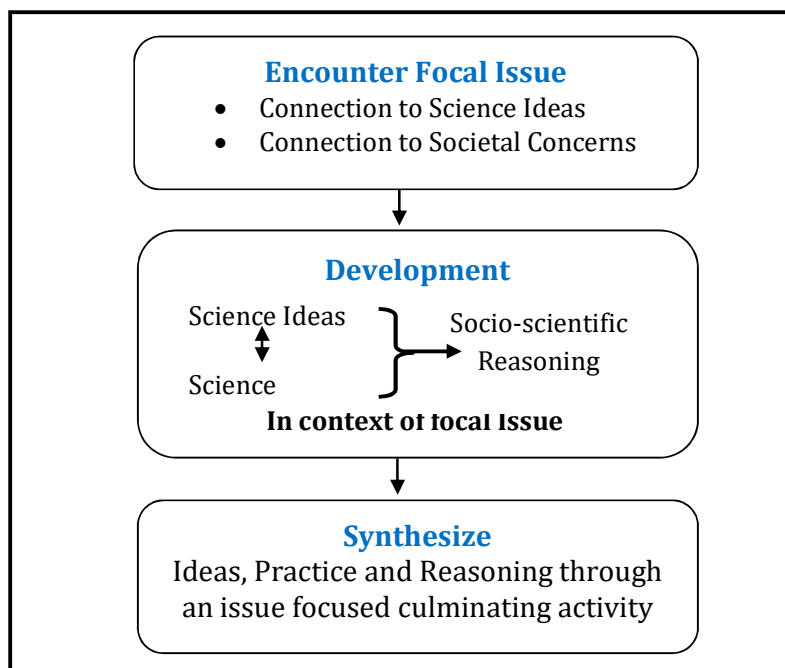
Source: Hancock et al. (201

Figure 1 SSI Teaching and Learning Framework (SSI-TL)

The socio-scientific teaching learning framework provides an outline of the three distinct phases within a science-based curriculum unit. The first phase, known as the focal issue phase, introduced students to the issues at hand. The primary focus is on societal issues linked to science, and students strive to relate the issue to their own

context. They explore fundamental science concepts and ideas, as well as their applications in society, as they pertain to the given issue. The integration of both facts and values of science enables the development of scientific literacy and identities that allow students to navigate and negotiate complex social issues with substantive connections to science. This also fosters socio-scientific reasoning among learners, which represents the critical thinking and reasoning skills students should be able to develop and apply to a variety of socio-scientific issues [19]. In the third phase, the curriculum units that are based on SSIs culminate in a concluding experience that presents an occasion for the students to integrate their thoughts, viewpoints, and research findings concerning the matter being investigated.

The SSI-TL framework involves the integration of science content with socio-scientific issues, promotion of critical thinking and inquiry, and fostering communication and collaboration among students. Using the SSI-TL framework, we can modify the way science is taught in secondary school textbooks to include a broader perspective on socio-scientific issues. This approach can help students develop critical thinking and inquiry skills, and promote collaboration and communication among them. In conclusion, the inclusion of socio-scientific issues in secondary school science and biology textbooks can provide students with a more comprehensive understanding of their subject matter. Using the SSI-TL framework, we can modify the way science is taught to include a broader perspective on socio-scientific issues and help students develop essential skills for the future.

Socio-scientific issues can be effectively addressed in the content of secondary school science and biology textbooks at higher secondary level prescribed by NCERT. Specifically, in the chapters on Reproduction in Animals and Reaching Adolescence in Class VIII, How do Organisms Reproduce? in Class X, and Human Reproduction and Reproductive Health in Class XII provide ample scope for addressing these issues from a gender perspective. Traditionally, science has been taught according to the guidelines provided in textbooks. Science teachers can incorporate the SSI Teaching and Learning Framework (SSI-TL) to address socio-scientific issues more effectively. For example, "The use of contraceptives and its side effects on women's reproductive and sexual health in teaching learning process of class 12th biology. First, the teacher has to introduce the issue of contraceptive use with some relevant data. The focus could be on contraceptive use. Students may name the various contraceptives introduced in their textbook. Later, they can also try to determine the chemical composition of contraceptive pills, their uses, and side effects on the user's body. In this exploratory phase, they can be introduced and attempted to link both the facts and practices of science. They can try to contextualize the issue by interacting with concerned citizens such as *Asha workers* and women who use such contraceptives. This could help to inculcate socio-scientific reasoning in the knowledge process. After collecting information, students can analyse data and try to critique the benefits and negative impacts of contraceptives through discussion, arguments, and debates in the classroom. In the third phase, the discussion concludes with a culminating experience that helps to provide an opportunity for students to synthesize their ideas, perspectives, and research related to the issue, and they can understand how the use of contraceptives is gender-biased and harmful to a particular gender is that of women. All these phases could happen in front of the teacher, where the teacher can act as a facilitator.

6. Conclusion

Issues and concerns of reproductive and sexual health of women in Indian are alarming. Science classrooms are appropriate place to address the socio-scientific issues. Engaging students in meaningful and healthy classroom discussions on these issues can help them understand the scientific aspects of society and dispel misconceptions and social dogma. By addressing women's issues through scientific literacy, the gap between science and society can be bridged. This scientific awareness can also help students become responsible citizens and become aware of their rights, such as the right to life and the right to choose with respect to human rights and reproductive justice. Thus, the role of science teachers in cultivation of socially awakened citizenry is need of an hour. The SSI Teaching and Learning Framework (SSI-TL) provides science teachers with strategies to address women's issues both inside and outside the classroom [19]. This can help achieve the broader aim of science education, while promoting functional scientific literacy.

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