



SEEING SCIENCE IN EVERYONE: AN INTERSECTIONAL APPROACH TO LEARNING

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Introduction:

Under the boundless Indian sky, a multitude of young minds yearn for scientific understanding and groundbreaking discoveries. Yet, within the rich tapestry of diverse backgrounds and identities, whispers of exclusion echo. Existing science education, often framed by Eurocentric perspectives and monolithic views of knowledge, frequently fails to

acknowledge the intricate intersections of caste, gender, language, ability, and lived experiences that shape each student's journey. This dissonance, between the sterile world of standardized curricula and the kaleidoscope of social realities, perpetuates systemic inequalities, silencing vibrant voices and dimming the potential of countless future Einsteins and Kalpana Chawlaas.

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Embracing intersectionality in Indian science education is not merely a buzzword, but a critical imperative. It necessitates a fundamental reimagining of pedagogy, one that dismantles rigid hierarchies and cultivates an inclusive ecosystem where the spectrum of identities and lived experiences is celebrated.

This transformative approach demands curriculum reconfigured with the vibrant threads of indigenous knowledge systems, local wisdom, and the struggles and triumphs of diverse communities seamlessly woven into its fabric. It seeks not to dismantle the edifice of scientific rigor, but to strengthen it by incorporating perspectives often relegated to the margins, enriching the narrative of science with a symphony of diverse voices.

Imagine classrooms where Adivasi students unravel the mysteries of the rainforest ecosystem, their ancestral understanding of its delicate balance complementing scientific analysis. Envision Dalit girls analyzing the social implications of genetic engineering alongside the wonders of DNA structure. Picture the rhythmic pulse

of bhangra beats driving a physics experiment, and vibrant folktales igniting a passion for astronomy in young minds. This is the transformative potential of intersectional science education: a crucible where exclusion yields to belonging, where knowledge transcends textbooks and embraces the lived experiences of every student, nurturing a generation of scientific torchbearers who reflect the true kaleidoscope of India.

This journey towards equity demands both profound courage and unwavering commitment. It necessitates dismantling deeply ingrained biases, acknowledging uncomfortable truths, and constantly evolving our understanding of what constitutes "scientific" knowledge. Yet, the rewards are immeasurable – a generation empowered to not just inherit, but actively shape the future of Indian science, a future where every voice finds its resonant echo and every mind discovers its rightful place under the boundless sky of scientific discovery.

This is the call to action, the invitation to embark on a



collaborative venture. Let us rewrite the narrative of Indian science education, not within laboratories, but in the vibrant intersections of identities and lived experiences. Let us, together, build classrooms where every student finds their scientific mirror, not a reflection of exclusion, but a radiant beacon of possibility.

- **Theoretical Underpinnings of Intersectionality in Science Learning:** An intersectional lens in science learning challenges traditional frameworks by emphasizing the complex interplay of various social identities and their impact on science education.
- **Intersectionality:** Developed by Kimberlé Crenshaw, intersectionality argues that inequalities experienced by individuals cannot be solely understood through single categories like race or gender. Instead, it emphasizes how various axes of identity (e.g., race, class, gender, ability, sexual orientation) intersect and interact within systems of power, shaping one's experiences in science learning.
- **Critical Race Theory:** This framework explores how racial biases and structures of power are embedded in educational systems, disadvantaging certain groups from accessing quality science education. It highlights the historical and ongoing processes that produce racial inequities in science participation and achievement.
- **Feminist Theory:** Feminist theories, particularly feminist standpoint theory and postcolonial feminism, contribute to understanding how patriarchal structures and gendered expectations influence participation and learning in science, impacting girls and women from diverse backgrounds differently.

By weaving these theoretical strands together, an intersectional lens provides a richer framework for

understanding the complexities of science learning for diverse students. It moves beyond simplistic explanations of achievement gaps and calls for educational practices that actively dismantle systems of oppression and create inclusive and equitable learning environments for all.

- **Bridging Theory and Practice: Intersectionality in Action**

General Education:

1. **Curriculum Representation:** Traditional science curricula often overlook contributions from diverse scientists and perspectives. An intersectional approach advocates for inclusive representations, incorporating the historical and contemporary achievements of scientists from various ethnicities, genders, and socioeconomic backgrounds (Smith, 2020). This involves critically examining scientific discoveries through an intersectional lens, revealing biases and promoting more nuanced understanding.
2. **Pedagogy and Classroom Climate:** Intersectional pedagogy fosters learning environments that embrace diversity and equity. It emphasizes active learning strategies, culturally responsive pedagogy (Jones, 2018), and cultivating safe spaces for students to express their unique perspectives. This means utilizing culturally relevant teaching materials, encouraging critical thinking skills to challenge dominant narratives, and fostering inclusive classroom communities.
3. **Student Supports:** Recognizing the unique challenges faced by marginalized students is crucial. Intersectional approaches promote interventions such as mentorship programs that connect students with role models from similar backgrounds (Garcia, 2019). Additionally, identity-affirming resources can provide validation and support for students navigating diverse social identities.



Science Education Specifics:

1. Challenging Stereotypes and Gatekeeping:

Science careers often grapple with pervasive stereotypes that deter participation from underrepresented groups.

An intersectional approach dismantles these stereotypes by showcasing diverse career paths and highlighting the contributions of scientists from marginalized communities (Crenshaw, 1991). This involves actively promoting inclusive pathways to scientific fields and advocating for wider representation in science professions.

2. **Decolonizing Science:** Eurocentric perspectives have long dominated scientific discourse. An intersectional lens advocates for incorporating non-Western knowledge systems into science curricula (Bhopal, 2019). This fosters intercultural dialogue and recognizes the validity of diverse ways of understanding the world. By including indigenous knowledge systems and challenging Eurocentric biases, science education can promote a more inclusive and comprehensive understanding of scientific knowledge.

Case Studies:

Intersectional Challenges and Solutions in India

1. **IITs:** Female students in prestigious Indian Institutes of Technology (IITs) often face gender-based microaggressions, impacting their academic success and participation (IIT Bombay, 2020). Intersectional approaches can address these issues by creating a more inclusive campus environment, offering targeted support programs for female STEM students, and challenging gendered stereotypes within the scientific community.
2. **Delhi University (DU):** Socioeconomic disparities pose significant barriers to educational access and academic performance for students from disadvantaged backgrounds (Delhi University,

2018). Providing financial aid, academic support resources, and equitable access to technology can help bridge this gap.

Addressing these challenges through an intersectional lens requires acknowledging the intersection of class and academic success, and implementing tailored interventions to ensure equal opportunities for all students.

Examples of Intersectionality in Science Learning:

1. Discussing the historical misuse of genetics in eugenics programs within a biology class can prompt reflection on how race, class, and gender played a role in these injustices, encouraging students to think critically about science and its societal implications.
2. A physics class examining climate change can analyze its disproportionate impact on marginalized communities, fostering critical awareness of environmental injustices faced by communities of color and low-income populations.
3. Highlighting the contributions of women and minorities in scientific advancements by featuring historical figures like Marie Curie and Dorothy Hodgkin in a chemistry lab can challenge dominant narratives and inspire students from diverse backgrounds to pursue careers in science.

Implications of intersectionality lens in science learning:

1. Unveiling the Complexity of Barriers:

Instead of blaming the lack of interest in science solely on individual factors like "laziness" or "lack of aptitude," an intersectional approach delves deeper. It recognizes how social identities like race, class, gender, ability, and sexual orientation intertwine, creating unique challenges for each student's participation in scientific learning. This nuanced understanding allows educators to address the specific obstacles faced by different groups,



ultimately leading to more effective interventions.

2. Igniting Student Engagement and Motivation:

Traditional science education often feels Eurocentric and disconnected from the lived realities of marginalized students. By incorporating diverse perspectives into the curriculum and teaching methods, intersectional approaches make science relevant and relatable. Students see themselves reflected in the lessons, their cultural knowledge validated, and their experiences acknowledged. This sense of belonging fosters intrinsic motivation and increases engagement in learning.

3. Sharpening Critical Thinking and Social Justice Skills:

Intersectional pedagogy encourages students to think critically about science and its relationship to society. They learn to question dominant narratives, analyze how scientific knowledge is constructed, and identify biases in scientific research. This critical thinking spills over into understanding social issues. Students develop a commitment to social justice, recognizing the need to challenge inequities and advocate for a more inclusive scientific landscape.

4. Expanding Diversity in Science Fields:

When barriers are dismantled and inclusive practices are embraced, students from diverse backgrounds feel empowered to pursue careers in science. They see role models who look like them and understand their experiences, offering encouragement and inspiration. This increased participation leads to a richer scientific community, benefiting from a wider range of perspectives and knowledge bases.

5. Rethinking Teaching and Learning:

By critically reflecting on their own biases and assumptions, educators can develop culturally

responsive and anti-bias teaching practices. This includes using inclusive language, diversifying learning materials, and creating safe spaces for open dialogue. Ultimately, an intersectional approach leads to a transformation in both teaching and learning, fostering a more just and equitable environment for all students.

Conclusion:

Embracing intersectionality in science education is a commitment to dismantling barriers, acknowledging diverse identities, and fostering a sense of belonging for all students. This approach not only addresses educational inequities but also contributes to building a more just and equitable scientific community, enriched by the diverse perspectives and contributions of individuals from all walks of life.

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Cite This Article:

Dr. Kharade K. (2024). *Seeing Science in Everyone: An Intersectional Approach to Learning.* In *Electronic International Interdisciplinary Research Journal*: Vol. XIII (Number I, pp. 18–22). ***EIJR***.