Masculinising Science: Gendered Representations of Scientists in Indian School Textbooks

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***Abstract*— School science textbooks play a crucial role in shaping students' understanding of science and scientists. Drawing on Michael Apple's concept of "official knowledge" and feminist critiques of science education, this paper examines how scientists are represented in Odisha state-prescribed school science textbooks in India. Using quantitative content analysis, the study analyses textbooks from Grades III to X to examine the gender, nationality, historical location, and frequency of scientist representations. The findings reveal that the textbooks overwhelmingly portray science as a masculine and Western enterprise dominated by European male scientists from the modern period. Female scientists are entirely absent, while Indian scientists receive minimal representation except for the limited inclusion of S. N. Bose. The paper argues that these curricular representations reproduce gendered and Eurocentric notions of scientific authority by legitimising certain scientific identities while marginalising others. Rather than functioning as neutral pedagogic tools, school textbooks operate as ideological sites that shape students' imagination of who can become a scientist. The study contributes to debates on gender, curriculum politics, and the decolonisation of science education in India.**

***Index Terms*— gender, science education, school textbooks, official knowledge, masculinity, curriculum studies**

I. INTRODUCTION

School textbooks occupy a central position in the organisation and dissemination of official knowledge within modern education systems. Beyond functioning as pedagogic tools for transmitting information, textbooks shape cultural meanings, social identities, and normative understandings of society (Apple, 2014). In science education, textbooks not only communicate scientific concepts and discoveries but also construct symbolic understandings of who produces scientific knowledge and who can legitimately participate in scientific practices. The representation of scientists within school curricula therefore carries significant sociological, pedagogic, and political implications.

Scholars in science education and sociology of curriculum have long argued that students develop stereotypical perceptions of scientists through schooling, media, and popular culture (Mead & Metraux, 1957; Chambers, 1983; Finson, 2002). Scientists are frequently imagined as male, white, intellectually gifted, socially isolated, and associated with laboratory-based modern science. These representations shape students' perceptions of scientific authority and influence their aspirations toward science-related careers (Newton & Newton, 1998). Research further demonstrates that the repetitive portrayal of scientists as Western men contributes to the masculinisation and Eurocentrism of science education (Christidou et al., 2012; Hite, 2021).

Feminist scholars and historians of science have critically interrogated the historical exclusion of women from mainstream scientific narratives. Rossiter (1982, 1998) argues that women scientists have frequently remained invisible despite making substantial contributions to scientific knowledge production. Harding (1991) similarly critiques the assumption of scientific neutrality by demonstrating how scientific institutions historically privilege masculine forms of knowledge and authority. Haraway (1988) further argues that scientific knowledge is socially situated rather than universally objective, highlighting how relations of power shape the production and legitimacy of knowledge. Such interventions have significantly influenced feminist

science and technology studies (STS), which examines how gender hierarchies become embedded within scientific institutions, practices, and representations.

Alongside feminist critiques, decolonial and postcolonial scholars have questioned the Eurocentric organisation of scientific history within educational curricula. Poskett (2022) demonstrates that modern science emerged through global exchanges involving Asia, Africa, and the Middle East rather than through Europe alone. However, school curricula across many countries continue to privilege European scientific figures while marginalising non-Western scientific traditions and knowledge systems. Studies conducted in Lebanon, Turkey, the United States, and India reveal that science textbooks predominantly celebrate Western male scientists while providing minimal visibility to women and scientists from the Global South (Kaur, 2015; Yacoubian et al., 2017; GÖKSU & İnaltekin, 2020; Murray et al., 2022).

Within the Indian context, textbooks remain one of the most influential instructional resources in classroom teaching. Although debates surrounding decolonisation, Indian knowledge systems, and contextualised science education have gained visibility in recent years, science textbooks continue to reproduce dominant narratives of Western scientific modernity. Kaur's (2015) analysis of NCERT science textbooks demonstrates the overwhelming dominance of male Western scientists and the near-total absence of Indian scientists except S. N. Bose. However, most existing studies focus on national textbooks, while regional state-prescribed textbooks remain significantly underexplored.

This paper examines the representation of scientists in Odisha state-prescribed school science textbooks from Grades III to X. Using quantitative content analysis, the study analyses the gender, nationality, historical location, and frequency of scientist representations across textbooks. Drawing upon Michael Apple's concept of "official knowledge" alongside feminist and decolonial critiques of science education, the paper argues that school science textbooks function as ideological sites where scientific legitimacy is selectively organised through processes of inclusion and exclusion. The study demonstrates how textbook representations reproduce masculinised and Eurocentric understandings of scientific authority while marginalising women scientists, Indian scientists, and non-Western scientific histories.

By examining the politics of representation within school science curricula, the paper contributes to broader debates on gender, curriculum politics, decolonising science education, and the sociology of textbook knowledge in India.

II. THEORETICAL FRAMEWORK

This paper draws upon the sociology of curriculum, feminist science studies, and decolonial critiques of science education to analyse the representation of scientists in school science textbooks. Central to the analysis is Michael Apple's concept of "official knowledge," which argues that school knowledge is not neutral or naturally given but socially constructed through relations of power, ideology, and cultural dominance (Apple, 2014). Textbooks function as institutional mechanisms through which states and dominant social groups define legitimate knowledge and regulate what becomes worthy of inclusion within school curricula.

Apple's framework is particularly useful in understanding how school science textbooks selectively construct scientific authority. The inclusion of particular scientists and the exclusion of others are not merely pedagogic decisions but ideological acts that shape students' understanding of who counts as a legitimate producer of scientific knowledge. Curriculum therefore becomes a site of symbolic power where scientific legitimacy is socially organised through representation and omission.

The paper also engages with feminist critiques of science that challenge the historical masculinisation of scientific knowledge. Feminist historians such as Rossiter (1982, 1998) demonstrate how women scientists have systematically remained invisible within mainstream histories of science despite their substantial contributions. Harding (1991) further critiques the universal claims of scientific objectivity by arguing that scientific institutions are shaped by gendered power relations that privilege masculine perspectives and experiences. Haraway's (1988) concept of "situated knowledges" similarly challenges the assumption of science as a disembodied and universal enterprise, emphasising instead that knowledge production is historically and socially located.

These feminist interventions are important for understanding how science textbooks reproduce

gendered representations of scientific authority. The absence of female scientists from curricula does not merely indicate omission but reflects broader structures of symbolic exclusion through which science is culturally associated with masculinity. School textbooks therefore contribute to the social reproduction of gender hierarchies within scientific education by normalising men as the legitimate representatives of scientific achievement.

The paper further draws on decolonial critiques of science education that question the Eurocentric organisation of scientific knowledge. Scholars have argued that modern science curricula often privilege European scientific traditions while marginalising knowledge systems and scientific contributions from Asia, Africa, Latin America, and indigenous societies (Aikenhead, 2006; Poskett, 2022). Such curricular structures construct science as a product of Western modernity and erase the global and interconnected histories through which scientific knowledge developed.

Within postcolonial societies such as India, the politics of curriculum becomes particularly significant because textbook knowledge shapes how students understand national identity, modernity, and scientific progress. The selective representation of scientists within school textbooks therefore reflects broader struggles over knowledge, legitimacy, and cultural authority. By examining which scientists are included, repeatedly celebrated, or excluded altogether, the paper analyses how school science textbooks reproduce masculinised and Eurocentric constructions of science while marginalising alternative scientific identities and histories.

III. METHODOLOGY

This study employs quantitative content analysis to examine the representation of scientists in Odisha state-prescribed school science textbooks. Content analysis is widely used in curriculum studies and sociology of education to investigate how school knowledge is organised, represented, and ideologically structured through textual materials (Apple, 2014). The method enables a systematic examination of patterns of inclusion, exclusion, frequency, and symbolic emphasis within curricular representations. In the context of science education, textbook analysis provides important insights into how scientific authority, legitimacy, and professional identities are socially constructed through pedagogic texts.

The study focuses on school science textbooks prescribed by the Department of School and Mass Education, Government of Odisha, for students from Grades III to X. Science as a school subject is introduced from the primary level in Odisha schools, although the organisation of scientific content varies across grades. In the primary grades, science is integrated within environmental studies, whereas from the upper primary and secondary levels it appears as an independent disciplinary subject. The analysis is restricted to Grade X because science remains a compulsory subject up to the secondary level in India, after which students are streamed into specialised academic disciplines.

A total of ten textbooks prescribed for government and government-aided schools in Odisha were selected for analysis. These include science textbooks from Grades III to VIII prepared by the Directorate of Teacher Education and State Council of Educational Research and Training (SCERT), Odisha, and Physical Science and Life Science textbooks for Grades IX and X prepared by the Board of Secondary Education (BSE), Odisha. The selected textbooks collectively contain 87 chapters spread across approximately 1135 pages. The textbooks analysed include the latest revised or reprinted editions available at the time of data collection.

The textbooks claim alignment with the National Curriculum Framework (NCF) 2005 and the State Curriculum Framework (SCF) of Odisha. These curricular frameworks advocate contextualised and child-centred science education while emphasising scientific temper, inclusivity, and critical understanding. However, the present study investigates how such curricular aspirations are reflected in the representation of scientists within textbook knowledge.

The unit of analysis in this study is the representation of individual scientists appearing within textbook narratives. Scientists mentioned in the main lesson text, additional information boxes, illustrations, “Do You Know” sections, and supplementary explanatory notes were included in the analysis. The study excluded references to professionals such as doctors, engineers, astronauts, and environmentalists unless

they were explicitly represented as scientists or scientific discoverers within the textbooks.

The analysis focused on four major dimensions:

1. Gender representation of scientists,
2. Nationality and geographical location,
3. Historical location of scientists (ancient, medieval, modern/contemporary),
4. Frequency and extent of representation.

Gender classification examined whether scientists represented in the textbooks were male or female. Nationality referred to the country or region associated with the scientist. In cases where nationality was not explicitly mentioned in the textbook, external biographical sources were consulted to identify the scientist's national background. Historical classification categorised scientists into ancient, medieval, and modern/contemporary periods based on their historical location and scientific activity.

The study also examined the frequency of scientist representations across chapters and grades. Repeated appearances of particular scientists were counted separately to understand patterns of curricular emphasis and symbolic prominence. For example, scientists such as Newton, Galileo, Einstein, and Faraday appeared multiple times across different lessons and grades, thereby receiving greater curricular visibility compared to others who were mentioned only briefly.

In addition to numerical frequency, the study analysed the extent of textual space allocated to individual scientists. Some scientists received detailed biographical descriptions, images, and contextual explanations, while others were confined to one-line references associated with a particular scientific discovery or invention. Examining the differential allocation of textual space enabled an understanding of how textbook narratives construct hierarchies of scientific significance and legitimacy.

The analysis revealed broader patterns in the curricular construction of scientific authority. The study did not merely examine the numerical presence or absence of scientists but interpreted textbook representations as ideological and symbolic processes shaped by curriculum politics, gendered visibility, and Eurocentric knowledge structures. The methodological approach therefore combines quantitative mapping of representations with sociological interpretation informed by the concepts of official knowledge, symbolic exclusion, and masculinisation of science.

The study acknowledges certain limitations. The analysis is restricted to state-prescribed textbooks in Odisha and does not include private publisher textbooks or classroom pedagogic practices. The paper also focuses primarily on textual and representational dimensions rather than student reception or teacher interpretation. Nevertheless, textbook representations remain important because textbooks continue to function as dominant pedagogic resources in Indian school education and significantly influence students' understanding of science and scientists.

Gender distributions of scientists in Odisha school science textbooks

	Feature Scientist	
Grades	Male	Female
III	0	0
IV	0	0
V	11	0
VI	0	0
VII	6	0
VIII	17	0
IX	31	0
X	36	0
Total	101	0

IV. RESULTS AND DISCUSSION

The analysis of Odisha school science textbooks reveals the systematic masculinisation of scientific knowledge through the exclusive representation of male scientists. Across the ten textbooks analysed from Grades III to X, scientists are represented entirely through male figures. No female scientist appears within the textbook narratives despite the inclusion of numerous scientific discoveries, inventions, and theories. This absence is sociologically significant because school textbooks function as important pedagogic spaces through which students develop understandings about who can legitimately participate in science.

The findings demonstrate that the textbooks repeatedly associate scientific authority with male identities. Scientists such as Isaac Newton, Albert Einstein, Galileo Galilei, Michael Faraday, Alessandro Volta, and Antoine Lavoisier dominate textbook discussions

across multiple lessons and grades. Newton appears repeatedly in lessons such as Force and Pressure (Class VIII), Force and Laws of Motion and Gravitation (Class IX Physical Science), and The Human Eye and the Colourful World (Class X Physical Science). Galileo similarly appears in Heat and Heat Conduction and Motion and Time in Class VII and again in Force and Laws of Motion in Class IX Physical Science. The repeated visibility of male scientists normalises masculinity as the dominant identity associated with scientific achievement and intellectual authority.

The textbooks further reinforce masculinisation through unequal symbolic visibility. Certain male scientists receive extensive textual space, images, and repeated references, thereby becoming central icons of scientific modernity. Newton, Einstein, Galileo, and Faraday are repeatedly celebrated as exemplary representatives of science, while other scientists receive only brief mentions associated with discoveries or inventions. Such selective representation contributes to the construction of a narrow and masculinised image of scientific excellence.

The absence of women scientists is one of the most striking findings of the study. Scientists such as Marie Curie, Rosalind Franklin, Janaki Ammal, Anna Mani, and Tessy Thomas remain completely invisible despite their internationally recognised scientific contributions. Feminist historians of science have argued that women's scientific achievements have historically been marginalised within dominant scientific narratives (Rossiter, 1982, 1998). The Odisha textbooks reproduce this exclusion by presenting scientific progress almost exclusively through masculine figures and identities.

From a sociological perspective, this invisibilisation reflects broader gendered structures embedded within curriculum and knowledge production. School textbooks do not merely communicate scientific information; they also construct cultural meanings associated with science. By excluding women scientists, the textbooks implicitly portray scientific rationality, innovation, and intellectual authority as masculine attributes. Science therefore appears as a gendered cultural field where men occupy the position of legitimate knowledge producers while women remain absent from the scientific imagination.

The masculinisation of science within textbooks has important pedagogic implications. Repeated exposure to exclusively male scientific figures may shape students' perceptions regarding who can become a scientist and who belongs within scientific institutions. Such representations may particularly affect girls' identification with science and contribute to the persistence of gender inequalities within STEM education and professions. The absence of female scientific role models limits the possibility of imagining science as an inclusive and socially diverse field.

The findings also indicate that the masculinisation of science intersects with broader structures of curricular power. Even the limited inclusion of Indian scientists remains male-dominated. Satyendra Nath Bose is the only Indian scientist represented within the textbooks, appearing in relation to Bose–Einstein Condensate theory in the Class IX Physical Science textbook (pp. 12–13). The absence of Indian women scientists further demonstrates how textbook knowledge reproduces both masculine and exclusionary representations of scientific authority.

Overall, the study demonstrates that school science textbooks function as ideological sites where scientific authority is constructed through gendered representation and symbolic exclusion. The curricular organisation of science within the textbooks normalises masculinity as the defining characteristic of scientific achievement while rendering women scientists invisible within the educational imagination. The paper therefore argues that the masculinisation of science within school curricula reflects broader social and cultural processes through which gender hierarchies are reproduced within education and knowledge systems.

V. CONCLUSION

The analysis demonstrates that Odisha school science textbooks construct science through a masculinised and Eurocentric curricular imagination. Scientific authority is overwhelmingly associated with Western male scientists from the modern period, while women scientists and Indian scientific traditions remain largely invisible. These representations reveal that textbooks function not merely as pedagogic tools but as ideological sites that selectively define legitimate scientific knowledge and identities.

The study argues that democratising science education requires moving beyond narrow representations of

scientific authority toward a more inclusive curriculum that acknowledges the contributions of women, Indian scientists, and non-Western scientific traditions. Such transformations are essential for challenging gendered and colonial hierarchies embedded within school science education.

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