Teaching Feminist Science Studies in India: An Experiment

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This paper is a documentation and reflection of teaching Feminist Science Studies (FSS) to Women's Studies students in India. The paper suggests three pedagogical dimensions of this first of its kind endeavour: one, the necessity to locate FSS within the domain of science studies; two, the desirability of occupying various midterrains especially that between anarchism and scientism, in classroom teaching and three, the richness of collaborating across disciplines and co-teaching.

Keywords: Feminist Science Studies, Science studies, Gender

Introduction: A Unique Experiment

Feminist Science Studies (FSS) could and must be taught to diverse sets of students and people. Yet, it was natural that this course began its formal pedagogical journey in a Women's Studies (WS) course. After being in the field of FSS for over a decade, in 2009, we were invited to design and teach, for the first time in India, a formal four credit course titled "*An Introduction to Feminist Science Studies*" for the newly instituted Masters in Women's Studies Programme by the Tata Institute of Social Sciences (TISS), a premier research and teaching institution in India.

The present paper is an attempt to document and reflect on our processes of doing this. We believe that this exercise can help in highlighting important issues in science education and also help us sharpen our own pedagogical understanding of FSS. The aim of writing this paper is to share, reflect and get feedback on a unique pedagogical experiment that we attempted.

At the outset, we would like to suggest that our experiment was significant, and perhaps unique, in three respects. One, we located the feminist science studies discourse within the larger discourse of science studies in the hope that the linkages and departures between the two could be foregrounded. Two, our uniqueness also lay in the fact that we sought to pit our course on the difficult midterrains of the discourses in the field which have emerged around the poles of a variety of axes, particularly on the theoretical axis of modernist and postmodernist positions in the field. Three, the fact that the course was taught by two people who bring in their own experiences of coming from fairly different but complementarily enmeshed academic backgrounds and political journeys, was also a unique aspect of our experiment. One of us from sociology, the other from physics, one as an activist in women's movements, but both with a commitment to politics and movements. What bound us together was a need to look at science critically, a position to which each one of us had arrived independently.

FSS in Women's Studies

Unlike many academic disciplines in the natural sciences and some in the social sciences too, Women's Studies, arguably is less of a canon and more of a continuous intellectual journey of those in it. Women's Studies as a discipline, has been shaped by two broad needs. One, the political need to address tricky issues of gender justice in patriarchal societies and two, the academic need to establish itself as credible scholarship. As a result, the subject of Women's Studies has emerged as an interdisciplinary and critical discourse, combining political ideology and academic temper.

While feminist scholars began critiquing the androcentricism of the social sciences fairly early, interrogation of the natural sciences and of science as knowledge making system entered Women's Studies much later. Over the years, FSS, which engages with the natural sciences - method and content - has developed as a subdiscipline which makes a very important contribution to our understanding of both science and feminism.

It is important to note that though the subdiscipline of FSS has grown in the last few years to encompass a robust critique as well as evolve a nascent feminist praxis of science, its pedagogy is still being evolved. In the last decade or so, there have been some efforts to take FSS to a varied set of classrooms. Some, like us, address issues in teaching FSS to Women's Studies students; others talk of experiments of teaching FSS to science students, yet others have taught a course in science and feminism to Women's Studies and biology students together (Mayberry, Subramaniam, & Weasel, 2001, p. 138-247).

We found that the aim of some of these attempts, as stated by Jones and Scantlebury, was "to present pedagogical and curricular ideas and innovations that are designed specifically to translate theories from FSS into new and different educational approaches that interrogate the cultural underpinnings of scientific knowledge through the examination of the intersections of nature and culture' (Jones & Scantelbury, 2001, p. 138).

In a way, we recognize, our aim was a similar one. Very specifically, we were trying to understand how feminist theories seeking to occupy ontological and epistemological midterrains between unmediated scientism and totally plastic relativism could be translated into research which can then be taught, with adequate tools, in the classroom. But more significantly our departure point from these approaches was that we consciously chose to locate the course in science studies. Therefore, in developing the methodological framework and assumptions of our course, we outlined the intersections and points of departure between science studies and FSS.

Framework: Developing Science Criticism

In our course rationale, we argued that in modern societies, the 'scientific method' or the 'method of science" has played a paradigmatic role in the epistemological validation of knowledge systems. Scientific knowledge of the universe-inorganic and organic has been accepted as the closest ontological approximation of an absolute 'truth' about the nature of the universe. Due to the domination of positivism across diverse disciplines, there has been an attempt to transport the canon of science, assuming it to be the most rational, objective and rigorous knowledge making system. Enmeshed within Western modernity and the Enlightenment philosophy, 'modern' science has, over the last two and a half centuries - with its promise of 'progress', established its hegemonic power across cultures displacing various modes of knowing across the world.

However, the last forty years have seen an increasing disenchantment with the promise of science. Expressed through social movements like the pacifist and the environmental movements, science has been implicated in the 'risk society' that we live in today. Moreover, the academia-particularly the social sciences have articulated the limitations of the scientific method and its use in their disciplines.

It is from these engagements, we know, that the discipline of science studies has emerged. Science Studies have undertaken the enterprise of critically examining science and challenging its epistemological and ontological supremacy. Drawing upon various disciplinary concerns and methods, science studies have aimed to, one; locate science within historical, social and cultural contexts and two, to examine how science reproduces existing social relations and cultural values through its language and its discourse.

Having thus set the terrain of Science Studies, our course rationale argues that while science studies critiqued science from various standpoints, it was the feminist studies of science that used the gender lens to examine the 'masculinisation' of science and its impact on women. The feminist studies of science highlighted the dual role played by science in women's lives i.e. emancipatory and yet oppressive. Starting from issues of visibilising women in science and raising issues of access and retention the critiques have-in recent years - gone beyond the issues of numbers. Feminist scholars have not only questioned and sought to redefine notions of the objectivity and value neutrality of the scientific method but also challenged the 'factual' status of scientific knowledge itself. Our aim in the course was to take the students through this entire gamut.

Drawing upon the feminist movements and their critiques of the impact of science in constructing women's bodies and lives, the feminist studies of science have argued for a more embodied and less invasive science. For instance, the feminist health movements and the feminist environment movements have pitched in, keeping the debate grounded and real. Though there is no single position in the feminist approaches to science, the diversity of theoretical positions and concerns make the feminist studies of science a rich area of engagement that needs to be brought into courses in women's studies. In fact, some interesting dimensions of feminist critiques have been developed through feminist women in science furthering criticisms and analysis from within their disciplines while trying to teach and do research in science differently.

We concluded that these combined analyses from feminist movements and feminist scholarship define the character of FSS. In fact, we felt that feminist science criticism can provide a new lens to all aspects of feminist studies, research and praxis and assist new scholars with a critical apparatus that will help them strike the much needed balance in writing and understanding feminist studies as a significant knowledge making system.

Once our rationale was clear, it became easier to design the course. We structured our course as a unit style course in order to mark the departures and linkages between science studies and FSS. While the dialogue between the units was played out through the readings, we introduced prologue and epilogue sessions, in order to ensure an open ended character to the course, where the students and we could bring in our own noncanonical voices and experiences.

Designing the Course

When we got down to the nuts and bolts of designing the course, we had to undertake some substantive themes for discussion which determined how we selected the readings

for every unit in the course. The first discussion between us was: how to pit interdisciplinarity. Should it be a little of everything? Or 'something more' of somethings? Since FSS, lies on the academic borderlands, it is naturally a critique of canons. But can one critique a canon without knowing it? To what extent does one have to know a canon? At least one should introduce the students to the grammar, we thought. We decided that we would select themes from our respective disciplines of sociology and physics to familiarise our students with the grammar of these before we launch the critique. We also decided at this stage itself that we would teach every topic together and participate actively in each other's sessions by raising questions and offering points of discussion and departure too.

Secondly, we found ourselves, given our need to occupy midterrains, wondering how to impart what we termed was not only 'the magic of science' but also the role it played as social criticism in history. We were clear that we did not want to take simplistic pro and anti science positions. We decided that we have to take up the challenge of tempering our critique with empathy.

Thirdly, given that we were located in India, it became imperative to bring in the discourses on the equations between science, development and progress. This was even more crucial because of our location within TISS where we were dealing with students with a keen interest in social work. In fact, this also helped us to balance the right amount of 'theory' with the right amount of what is often called 'the practical' component of our course design.

Keeping all this in mind we fleshed out the themes and the reading lists for the three units, one, introducing science studies, two, introducing FSS and three, applying FSS to research areas in science, besides the prologue and the epilogue sessions. Having our design ready did help us choose our teaching tools and styles but only to the extent any design can help. It was more our past experiences of teaching sociology and physics, our feminisms and our actual classroom engagements that informed our dilemmas, choices and decisions. Most importantly, we learnt in retrospect, that it was the uniqueness of our locations that mostly defined what happened to what we had set out to do.

Classroom Experiences: Navigating Polemics

After having broadly structured the content of the course we went into the more difficult task of how to operationalise it in the classroom. While we were clear that we would largely base the course in readings and discussions, we wanted to use other pedagogical tools for entry into some of the difficult themes. And arriving at them was not easy. For instance, around our prologue session, we toyed with the idea of using Brecht's play *The Life of Galileo* as a way to address the conflict between science and religion, the role of science as social criticism, the making of the modern male scientific genius etc. Our conversation, which is typical of many other conversations, went thus:

> *G: Should we start with reading excerpts of* The life of Galileo*? It will be nice to use a literary source to bring in the dramatis of the confrontation between religion and science...*
>
> *C: Won't they all know it already? Some of them may be Literature students.*
>
> *G: I doubt... so what if they are literature students also? It will be a good way to begin and introduce the beginnings of science in the critical traditions of modernity.*
>
> *C: But we must also indicate to them that this is Brechtian /Marxist reading of history of science. It is after all only one construction of the history of the times…and the moment. Will we be able to successfully indicate this to the class…? But we can try…*

The students loved reading and enacting parts of *The Life of Galileo*. In our prologue session, we also used a fairly common workshop technique of word association. We asked the class to respond to the word 'science'. A range of words emerged as words associated with science: "factual", "logical presentation", "absolute truth", "experiment", "monotheist", "laboratory", etc. From these sessions, we gleaned that one, the students had very little sense of the history of science; two, they were fairly disenchanted with science (found it boring or very difficult) and three, their exposure to science was more or less limited to their school experience. We found these to be very telling of the story of science education at the school level in India.

Further discussions with the students indicated that their attitudes to science in general lay on two extreme ends of the pole, one, highly critical of science and its project (these responses came from students of the humanities whose previous academic exposure included some exposure to postmodernism) and two, the belief in the unique ability of science to provide facts about the world and also in the supremacy of such facts (this came from someone with a keen interest in psychology and who saw the merits of adopting the scientific method in psychology). A third set of students (some of them with social work background) believed in the value of science as 'scientific temper'. It is interesting to note the fact that the two of us belonging to natural science and social science disciplines and hence perceived as belonging to pro-science and anti-science discourses added to their alignment on polarities. It forced us, consequently, to sharpen the effort of straddling the middle ground. There were times we had to demonstrate that we were taking apparently opposite positions from what we were supposed to take! In a sense, our experience is best captured by the following description:

> *"I am reminded of an old, now defunct television advertising campaign for Reese's peanut butter cups, where two people (one holding a jar of chocolate and one holding a jar of peanut butter) would accidentally bump into one another, and declare in shocked tones: "Hey! You got chocolate in my peanut butter!" and "You got peanut butter in my chocolate!" I always wonder how appropriate it would be to make a spoof commercial for science studies, where the shocked exclamations are instead: "Hey! You got culture in my nature!" and "You got nature in my culture!" (Baker, Shulman, & Tobin, 2001, p. 168).*

We could very well be the two people doing this all through the course. Only we kept exchanging jars!

Anyhow, taking into account the limited engagement of the students with actual science and our need to introduce the 'magic of science', we decided to use an educational slide show often used in science education called *Powers of Ten*. The idea was to familiarize them in some way to the expanse of the universe studied by science and also to impart some of the thrill and enchantment of doing research in science. A fairly representative response from the students was "if only we had been taught science like this at school!"

Teaching Science Studies

We began our Unit 1 with readings on themes in the philosophy of science, all the time highlighting the relationship between philosophy of science and science practice. Before we actually moved into the subfield of the sociology of science and the sociology of scientific knowledge, we briefly introduced the grammar of sociology to the class. An introduction to the sociological method, a basic understanding of three methodological positions in sociology–positivism, interpretivism and realism along with the challenge of postmodernism was provided. Students were familiarized with sociology's understanding of science from positivism to postmodernism through the basic arguments of Karl Manneheim, Robert Merton, Thomas Kuhn, David Bloor and Bruno Latour. We highlighted the emergence of the critique of the scientific method and science itself within sociology.

Since we believe that the new social movements, particularly the pacifist, environmental and the feminist, have a serious critique of science and its practice, we conducted sessions on these with first hand experiential sharing of the concerns, particularly from India. This helped us make the distinction between science as a body of knowledge and the emerging big science - a corporatized global power in the world. This is particularly so in the Indian context where due to the Nehruvian paradigm of development, it is conflated with the idea of nation, progress and development. We introduced this debate through short readings, mostly book introductions or articles by Ashish Nandy, Shiv Vishvanathan, Dhruv Raina, Zaheer Babar, Meera Nanda and Gita Chadha. We also used two popular films, *Naya Daur* and *Swades* to expose and critique populist notions of the relationship between science, development, progress and the nation. By the time we concluded Unit 1 four major themes were established in the classroom.

— There is a need and possibility of charting middle terrains in the poles of absolutism/scientism and relativism/anarchism,

— Multicentrism is crucial to science criticism but it is important to avoid the perils of cultural relativism and ethnoscience,

— Science played a major role in the making of risk society

— Gender was not a central theme to science studies despite the contribution of the women's movements and feminisms.

At this point we started addressing the need to move out of the classroom for a field trip. Following a discussion with the students and realising that they did not have any exposure to research institutes, we converged on the idea of taking them to Tata Institute of Fundamental Research (TIFR). But what would they see there? Both of us had different notions about it.

> *G: What do you want them to see there?*
>
> *C: I do not know. I in fact want to see their reaction to that structure, that space. I would like to see how they see the place and what they notice there.*
>
> *G: I would like them to see the architecture and locate it within the whole modernity project; it is highly insulating and individualistic...*
>
> *C: Are you sure that would work? Would it not be fun to take them to labs and see what they see in the lab?*
>
> *G: Are you sure that would work? No harm in trying... we can do both...*

The students were taken to TIFR on a Public Outreach Programme. They heard scientists from different fields on the subject of science and its relevance, its uniqueness and what it has to tell about the world around us. The students also visited two laboratories, one in physics and one in biology to get a feel and sense of the institution. They also interacted with the Chairperson of the Women's Cell at the TIFR. It was clear on this trip that the students had developed a critical eye they noticed and reacted to all the scientistic elements of the trip!

Feminist Science Studies

We were ready for Unit 2 and Unit 3; the latter visualized by us more on 'a reading course' style. We began with addressing the fundamental issues of women in science. For this we used

narratives of Evelyn Fox Keller, Evelyn Hammonds, Banu Subramaniam and Chayanika Shah. All of these spoke of the discrimination due to gender, race and coloniality. More importantly they shifted the focus of explanation from society to the structures and practices of the institution of science itself. The documentary film, *Asking Different Questions* by Gwynne Basen and Erna Buffie was also used for setting the contours of FSS.

At the end of these discussions we had collectively identified the multiple ways in which women from science engage with it – some who stay in science with no engagements with issues in it, others who raise issues of women in science while being part of it, yet others who try and also do their work a little differently informed by feminist understandings and finally some others who move out of formal research in science but engage with it to bring issues of feminism back to science research and education. The rest of the course concentrated on the critiques and reformulations by feminists from within and from outside the formal disciplines of science.

We initiated Unit 3 with readings on applying FSS to specific research areas in natural science. We put together clusters of readings in different subthemes. These reflected less of our choice and more the status of the field and so four out of five were from the biological sciences. The readings were varied.

Some dealt directly with everyday issues in the movements, be it the women's health movement and its critiques of the patriarchal biases in reproductive technology research or research on the premenstrual 'syndrome'. We used works of Sue Kessler on the medicalisation of the bodies of intersexed people. Ann Fausto Sterling's work which questions the scientific maintenance of the binary of gender was of great value. Other works that challenge the broader frameworks and paradigms within science were also introduced to the students. The well known works of Emily Martin on the gendered role assignation to the male and female gametes or Elizabeth Potter's work showing the socio-historical influence in the inanimate particular model for gases. These and more such readings helped in demonstrating not only how scientific research can be critiqued effectively but also in suggesting alternative ways of doing science. Students chose the theme of their interest from these clusters and worked on them as a self study group exercise. The choice of papers by the students, though not surprising is also revealing. Six students chose to take the cluster on social construction of sex (which we loosely termed the sex and gender cluster) perhaps because they felt that it was very close to what they were otherwise studying in a Women's Studies course; three took the one on reproduction and an equal number took the one on animal studies. The somewhat more abstract papers on cell biology were taken by two students and the last one on Physics and Geology was taken by only one student.

The readings of Unit 3 helped the students enter the theoretical issues and concerns of FSS, which were further dealt with in Unit 2. While the readings showed how the body, sex or even nature for that matter is a construct, they also indicated that it would be very incomplete to say that everything was mere construction through language or society. As Keller says,

> *Although we may now recognize that science neither does nor can "mirror" nature, to imply instead that it mirrors culture (or "interests") is not only to make a mockery of the commitment to the pursuit of reliable knowledge that constitutes the core of any working scientist's self-definition, but also to ignore the causal efficacy of that commitment (Keller, 2001, p. 141).*

We could draw out the uniqueness of feminist theory in resolving the impasse between what conventional social sciences compartmentalizes into two extreme choices, of total constructivism and relativism on the one hand, and positivism and realism on the other. We used Donna Haraway to emphasise this point,

> *...the alternative to relativism is not totalisation and single vision which is always finally the unmarked category whose power depends on systematic narrowing and obscuring. The alternative to relativism is partial, locatable critical knowledges sustaining the possibility of webs of connections called solidarity in politics and shared conversation in epistemology... it is precisely in the politics and epistemology of partial perspectives that the possibility of sustained rational objective enquiry rests (Haraway, 1996, p. 255-256).*

Having occupied the epistemological and ontological space that lies between the two poles, we found Sandra Harding's position useful. She argues that "the feminist ambivalence towards the choice between modernism and postmodernism" which is generally attributed to "a tentative, hesitant, reluctant" mindset has to be perceived as and transformed into a "principled ambivalence which … is self conscious and theoretically articulated." Harding's appeal for a "robust ambivalence" helped us to qualify the midterrain as not just a neutral, compromised place or strategy but a chosen act engaged with the politics of difference (Harding, 1990, p. 96).

We ended by asking the question "Can there be a feminist Science?" taking off from Longino's articulations on the same. Our students along with us at the end of the course more than trying to answer the question in a simplistic yes or no manner, grappled with defining the contours of what feminist practice of science would look like – epistemologically more reflexive and engaging with subjectivities and ontologically less essentialist and more shifting.

Conclusion

In conclusion, we would like to suggest that the processes of formulating and delivering the FSS course to Women's Studies

students in India were both difficult and rewarding. While we continuously encountered questions on the need and relevance of a course engaging with natural science and that too through a discourse largely framed within the social sciences, we found that once the interdisciplinary historical, political and social contexts of science were established, these anxieties abated. Moreover, we hope that pitting the debate closer to the midterrains, while doing full pedagogical justice to the poles, would have helped students realize that critiquing something does not lead to intellectual and emotional loss but leads to depth of understanding. The fact that two people, a physicist and a sociologist, were engaged in both dismantling and saving science in their classroom helped them to veer the debates for themselves. While the formal feedback taken at the end of the course indicated that the students had enjoyed the course, our classroom experience also suggested that some of the students had become alert to issues of gender and science in a critical yet empathetic manner. In fact, one of them has gone on to undertaking a study of women surgeons in India as her dissertation topic.

Finally we feel that in the present discussions around science education while there is almost a consensus on the teaching of nature of science, there are ongoing debates around what does one mean by "nature of science" and when and how to teach it. We believe that it is important to teach science at all levels with a critical, reflexive and empathetic approach inherent to WS in general and FSS in particular. In our opinion the framework within which we taught this course to WS students to enhance their understanding of both science and feminism, could be used to teach science students as well. And we hope to do so.

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