Mainstreaming Science Curricular Innovations
Lessons from the HSTP Experience

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What are the challenges of mainstreaming curricular innovations? Perhaps, the effort should not be to mainstream specific curricular innovations, but to enable wider circulation to the enabling discursive practices in which in-situ curricular innovations can happen. Such innovations will not only suit the context in which they are engendered, and will also be more easily appropriated by the teachers. Discursive practices that promote innovation are, in turn, critically dependent on a democratic, dialogic collaboration between different stakeholders that recognises the centrality of empowered, capable teachers in the instructional dynamic.

Bringing about change in education is difficult, more so when it involves changing the age-old structures, beliefs and practices regarding the key issue in education – what should the teachers teach and the students learn in schools. This is partly because the curriculum represents the knowledge, skills and practices that the older generation decides to pass on to the younger generations (Grumet, 1998), and thus serves as the cornerstone of social and cultural reproduction and transformation through schooling (Anyon, 1981; Collins, 2009). Further, our ideas about curriculum, and thus of what knowledge is most worth, also acquire stability on account of their deep imbrication with the role and status of teachers traditionally accorded in a society. But at the same time, curriculum as practised in the school is hardly a static entity. As any teacher will tell you, because of the improvisations and innovations by the teacher the curriculum-in-use is very different from the official or overt curriculum in any classroom. Some of these innovations are surely worthy of dissemination and mainstreaming, but many aren't. However, almost all of them are either short-lived or remained confined to a classroom or a school.

Of course, as is the norm in India, curricular innovations also originate from the top of the education system and percolate downwards.When the dominant discourse one education changes at the top on account of shifts in the composition of the political elite, these changes reverberate in the curriculum policy documents and lead to changes in the official curricula that can sometimes be called innovative in a positive sense. When such curricular 'innovations' reach the classroom, teachers 'glocalise' and adapt them

to suit their own beliefs, abilities and resources (Robertson, 1995; Sharma, 2008). One can say, then, that these top-down innovations do get 'mainstreamed', but rarely in ways that show fidelity to the intended spirit and objectives of curriculum innovators at the top. As a result, despite changes in the official curricula we find that the curricula-in-use in Indian classrooms today doesn't look that different from the one implemented a generation ago, and the challenge of mainstreaming curricular innovations in Indian classrooms remains largely unmet.

Some worthy attempts have indeed been made in India, and they did achieve varying degree of success in mainstreaming curricular innovations. In this paper, I draw on one such attempt – the Hoshangabad Science Teaching Programme (HSTP)-to conceptually analyse the issue of mainstreaming of science curricular innovations from a Bakhtinian dialogic perspective with the intention of indicating the likely parameters of any successful effort at mainstreaming of science curricular innovations that move beyond official documents to become a part of the daily curriculum-in-use at the classroom level.

This paper is an exercise in interpretive analysis of my own six year long experience with the programme, and a tentative attempt to draw lessons from a sample of N = 1. However, as qualitative interpretive research has convincingly shown, through naturalistic generalisations single case studies can yield valuable insights that help us understand similar phenomena in different sites (Melrose, 2010). It is my contention, therefore, that current and future attempts at science curriculum innovation and reform have much to learn from its experience, especially if they intend to influence the mainstream in any meaningful way. In fact, it is my belief that the lessons to be learnt from the HSTP experience can be extended to curricular reform in other disciplinary areas as well. I begin, therefore, by first summarising the nature and scope of science curricular innovations by the HSTP.

Science curricular innovations in HSTP

HSTP had a modest beginning in 1972 when two voluntary organisations in Hoshangabad, Kishore Bharati and Friends Rural Center, brought together teachers from 16 rural middle schools of the Hoshangabad district, a group of science teachers from the All India Science Teachers' Association (AISTA) and scientists from the Tata Institute of Fundamental Research, Mumbai to develop a programme for an inquiry oriented, environment-based science teaching in schools. The main objective then was to reimagine science learning as a critical input to social, cultural and economic transformation in local rural areas (Eklavya, 2005). Soon enough, however, it was apparent to the collaborators that HSTP could become a launching pad for a serious attempt at reform in science education at the state and even national level. As a result, beginning with the district level expansion of the programme in 1978 and until its

demise in 2002, continuous efforts were made by Eklavya, the organisation created to oversee the programme, to expand and mainstream the programme throughout Madhya Pradesh and in other states as well. Though they were often hurdles, the programme did achieve some measure of success in spreading its curricular and other innovations to regions beyond Hoshangabad. Between 1983 and 1990, the programme spread to some school clusters in twelve other districts of Madhya Pradesh. And from 1990 onwards, consistent efforts to mainstream the programme in the state, transplant its core ideas in other states and influence the policy discourse at the national level (Eklavya, 2005).

Before any discussion of curricular innovations by HSTP, it needs to be recalled that the programme was a holistic and integrated attempt at science education reform, and thus, encompassed innovative interventions in almost all major components of formal and nonformal science education, such as curriculum, in-service teacher professional development, academic and administrative structures, assessment, experimental kit production and distribution, academic support at school level, and extra-curricular inputs. Further, the programme became possible only because of a rare multi-party and multi-scale collaboration over a comparatively long period of time between all important stakeholders in public schooling. Within this innovation oriented ecosystem of science education reform, I have come to see the main curricular innovation of HSTP as the development of a science curriculum that:

(A) <u>Supports an inquiry oriented, environment based pedagogy:</u> Taking inspiration from some earlier science education reform attempts, such as the Nuffield Science Programme in UK, the HSTP built a science curriculum based on the widely accepted but rarely implemented principles of 'learning by discovery', 'learning through activity' and 'learning through environment'. This curriculum required and supported science teachers in practicing an inquiry oriented, locally environment based pedagogy in their classrooms.

(B) A<u>ims at the understanding of nature of science and development of scientific habits of mind rather than transmission of scientific knowledge and information:</u> The programme strove to develop a science curriculum that facilitates an understanding of the nature of science and inculcation of scientific habits of mind among the student. Students were expected to be like young scientists who would 'discover' scientific principles, concepts and ideas through experimentation, questioning and evidence-based reasoning.

(C) <u>Empowers science teachers and reimagines their role in science instruction:</u>Rather than basing instruction on a traditional looking textbook, teachers were given a book to implement the curriculum that looked more like a knowledge deficient workbook that had to be filled with science content generated through joint efforts of the teacher and the taught. As a result, the teacher acquired a greater freedom in making instructional decisions. Further, their role shifted from a more or less passive vehicle of transmission of pre-processed scientific knowledge, to a facilitator in an engaged collaborative process

of generation of scientific understanding and knowledge through carefully designed and conducted experiments and evidence-based reasoning.

(D) <u>Can be implemented even in resource deficient schools:</u> When the programme began, it used to be a conventional wisdom among policymakers and education bureaucracy that inquiry oriented science curriculum will perforce be resource intensive, and thus could be ill-afforded for public schools. It was a signal achievement of HSTP that it was able to refute this perception by developing a science curriculum in which students could learn science through experiments and activities that needed only a minimal investment that most schools could afford.

As mentioned earlier, for much of its existence the programme made a conscious and sustained effort to spread these curricular innovations beyond a few schools to the regional and national level. Though the programme has long ceased to exist, this effort still continues though in different and diminished ways. The success and failures of the HSTP in mainstreaming its innovations can be understood from multiple perspectives, and from the standpoints of different stakeholders, such as students, parents, teachers and education administration. Each of these perspectives and standpoints carry the potential of offering valuable insights that will be helpful to current and future science education reform efforts. Being hostage to my personal history of working in the programme and current vocation as an education researcher, I can't help but occupy the standpoint of an ex-insider and use one of the theoretical tools of my trade to retrospectively analyse the HSTP experience. Thus, in the remaining segment of the paper, I look back at the HSTP's success and failures in mainstreaming its innovations from a couple of mutually compatible theoretical perspectives, and draw some overall conclusions.

Factors critical for mainstreaming: The HSTP experience

Looking back at the successes and failures of the HSTP in mainstreaming its curricular innovations, it appears to me that three factors were critical in determining the fate of its efforts to spread its innovations: *what* was mainstreamed; *how* it was mainstreamed; and to *whom* it was mainstreamed. Let us examine each of these three factors.

(A) <u>Mainstreaming – *what?*</u>As mentioned earlier, curriculum development was just one among many components of the programme. Because the programme's mandate was to show that an alternate way of science teaching and learning can work on a sustainable at a reasonably large school within the government school system, and there were hardly any successful programmes of similar nature to learn from, innovation in all components of formal and nonformal science education was a necessity right from the beginning. That is, curricular innovation was never a one-off or a sporadic event, but existed as an integral discursive practice within a wider discourse of innovation animating the entire programme. Curricular innovations were encouraged at all levels of the programme and at all fora. If a teacher figured out a new way to do an activity or an experiment, it was

discussed and shared during teacher monthly meetings, written about in field reports and teacher journals, such as *Sandarbh,* perfected by other teachers, incorporated in annual in-service professional development workshops (the so-called 'HSTP summer teacher trainings'), and considered for inclusion in the next round of workbook revision.

In retrospect I find that while mainstreaming it mattered whether we were trying to spread the curricular innovations as off-the-shelf products or the discursive practice of innovation that led to such innovations. In the early stages of expansion of the programme, it appears to me that it was possible to spread the discursive practice of curricular innovation, and not just the curriculum as a finished product. This was largely because then we were able to disseminate all the components of the programme together as a total integrated package. Later on, the mainstreaming became piecemeal and it became harder to successfully transplant the discursive practices of innovation that characterised the programme in its home region of Hoshangabad. As a result, to schools and teachers in other areas curricular innovations were not able to serve as templates or exemplars for local curricular innovation, but came across largely as non-native products that were to be artificially grafted onto local educational contexts.

(B) Mainstreaming – *how?* Curricular ideas being textual in nature come embedded in a discourse that shape their representation and intention, give them an ideological orientation, influence their meaning and imbue them with a specific addressivity with respect to the audience. Mainstreaming of curricular innovations entails their appropriation by others who were hitherto not associated with the programme. However, one cannot assume this appropriation to be an easy process because as Bakhtin says, "Language is not a neutral medium that passes freely and easily into the private property of the speaker's intentions; it is populated – overpopulated – with the intentions of others. Expropriating it, forcing it to submit to one's own intentions and accents, is a difficult and complicated process." (1981; pp. 293-294). According to Bakhtinian perspective, discourses can be placed on a continuum between hard to appropriate a*uthoritative discourses* to easy to make one's *own internally-persuasive discourses.* As Bakhtin (1981) asserted, authoritative discourses are harder to appropriate because "It enters our verbal consciousness as a compact and indivisible mass; one must either totally affirm it, or totally reject it. … One cannot divide it up – agree with one part, accept but not completely another part, reject utterly a third part. … It is not free appropriation and assimilation of the word itself that authoritative discourse seeks to elicit from us; rather, it demands our unconditional allegiance" (p.343).

The discourse in which curricular ideas of traditional school science are embedded is a good example of an authoritative discourse. This is because its self-representation as an authoritative canon of truths about the world, its abstruse and ambiguous nominalised lexico-grammar that invites memorisation but not comprehension, its relegation of lived experiences of the world of students to the margins, and its lowered intertextuality that

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is inimical to differences in meanings can only invite allegiance but not an appreciative understanding and willing appropriation (Sharma and Anderson, 2009). An internally persuasive discourse, on the other hand, is much easier to make one's own because of its "semantic openness to us, its capacity for further creative life in the context of our ideological consciousness, its unfinishedness and the inexhaustibility of our further dialogic interaction with it. We have not yet learned from it all it might tell us; we can take it into new contexts, attach it to new material, put it in a new situation in order to wrest new answers from it, new insights into its meanings, and even wrest from it new words of its own" (Bakhtin, 1981; p. 346). Curricular ideas and innovations passed on from one teacher to another on a day-to-day basis often come embedded in such an internally persuasive discourse.

Of course, it is also possible for a discourse to be both authoritative and internally persuasive. As Bakhtin (1981) acknowledged, "Both the authority of discourse and its internal persuasiveness may be united in a single word – one that is simultaneously authoritative and internally persuasive." (p. 342). Scientific discourse that guides work in scientific research communities (much different from school science discourse) can be seen as an example of a discourse that is both authoritative and internally persuasive (Sharma and Anderson, 2009). My personal view is that HSTP also tried to spread its curricular innovations through such a discourse that aimed to be both internally persuasive as well as authoritative. Schools and school administration in other regions were encouraged to adapt it for their own contexts and dialogise it with their own ideas, resources and concerns. It was spread in a democratic manner through sustained interaction, dialogue and friendly persuasion. In that respect, HSTP discourse, in my view, was remarkably internally persuasive. In many cases, it was also authoritative because of the support of the administration and the strong backing of an influential segment of the scientific establishment in India.

Mainstreaming of curricular innovations was more successful when this was the case. Examples would be its expansion from a few schools in Hoshangabad to the entire district, and then after several years to selected school complexes in eleven other districts of Madhya Pradesh. Mainstreaming efforts began to falter when the programme lost its influence with the administration and policy makers, its authoritativeness weakened, such as after the closure of the programme in 2002, and the programme was left to rely on its internal persuasiveness alone. Curricular discourse can rely on its internal persuasiveness for dissemination and widespread adoption only when teachers are empowered enough to take curricular decisions affecting their classrooms. But, in the Indian context, that is unfortunately rarely the case. Thus, at least for the Indian government school system, it seems fair to conclude that unless the role and status of teachers change drastically mainstreaming of curricular innovations would need the

support of a curricular discourse that can achieve the rare distinction of being both internally persuasive and authoritative.

(C) Mainstreaming – *to whom?* Capability approach is a normative framework for understanding and assessing social justice policies and ideas about social change in society (Robeyns, 2005). Though there are several versions of this approach, broadly speaking it shows that people's well-being, protection of human rights and development not only requires creation of enabling conditions and availability of requisite means, but also development of their capabilities that will allow them to make the best use of supportive conditions and means made available to them. If we view mainstreaming of curricular innovations from this perspective, it is clear that the capabilities of the intended target teachers and the context in which they work will be a critical factor in deciding the fate of the mainstreaming effort. This is because any curriculum comes with implicit assumptions about the teacher, students and their educational context.

If these assumptions do not match with the reality, then it is hard to see how the teachers can appropriate and implement the innovative curriculum in meaningful ways that serve the interests of the teacher and the taught, while also maintaining a reasonable degree of fidelity to embedded educational objectives. Realising this truth, HSTP tried to offer professional development to science teachers, create scientific equipment and kit material supply chain, and create enabling administrative and academic structures in regions it tried to expand. However, this was not always possible. Thus, wherever capability enhancement could not be done, efforts to spread the curricular ideas could not succeed.

Conclusion:

HSTP was a unique experiment that happened in a context that may not be easy to replicate. However, some tentative ideas do emerge that may be helpful to keep in mind while taking on the challenge of mainstreaming curricular innovations. Perhaps, the effort should not be to mainstream specific curricular innovations, but to enable wider circulation to the enabling discursive practices in which in-situ curricular innovations can happen. Such innovations will not only suit the context in which they are engendered, and will also be more easily appropriated by the teachers. Discursive practices that promote innovation are, in turn, critically dependent on a democratic, dialogic collaboration between different stakeholders that recognises the centrality of empowered, capable teachers in the instructional dynamic. HSTP has shown that curricular innovations can happen in a government school system. The challenge then is to show that it can be done again and again in schools all over India.

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