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# After the Smoke Clears: Toward Education for Sustainable Development in Bhopal, India

RADHIKA IYENGAR AND MONISHA BAJAJ

This article examines approaches to environmental education in Bhopal, India. It is an attempt to understand how much environmental education as a topic has been incorporated into formal curricula. An analysis of state and national syllabi indicates a focus on conventional, natural sciences approaches to the environment, thus neglecting the social science aspects of education for sustainable development across all grade levels. Environmental disasters are given a very general treatment with no contextual link to incidents like the Bhopal gas tragedy of 1984. Social dimensions like environmental citizenship are also minimally mentioned. Finally, the article highlights the large gap between national educational policy frameworks and the actual incorporation of environmental education in state and national textbooks.

On the night of December 3, 1984, Bhopal became part of the global consciousness when a poisonous gas leaked out from the Union Carbide pesticide factory and formed a toxic cloud over the city. Among the 800,000 residents of the city, it is estimated that around 2,000 died instantaneously, with over 300,000 physically injured and up to 20,000 people dying in the aftermath (Dhara and Dhara 2002). So strong was the methyl isocyanate gas that passengers in trains passing through Bhopal died immediately. The panic-stricken city was still breathing the poisonous gas hours later, with all exit roads choked by piles of dead bodies, cars, and animals, making escape virtually impossible.

The aftermath of the tragic gas leak continues to be felt some 25 years later.<sup>1</sup> Studies have shown that survivors are either partially or fully blind;

We thank the school teachers from a school affiliated with the Madhya Pradesh Board of Secondary Education who assisted us in understanding the school-level practices regarding environmental education. The comments made by *CER*'s editors and the anonymous reviewers were also extremely helpful in the development of this article. We also thank Nancy Koh for reviewing earlier drafts of the paper and Susheila Ghosal for her assistance in gathering environmental education textbooks.

<sup>1</sup> To mark the twenty-fifth anniversary of the Bhopal gas tragedy on December 3, 2009, the state government of Madhya Pradesh decided to open the gates of the Union Carbide factory to the public but later reversed its decision because of public protest. Environmental activists noted that the site still has large amounts of toxic chemicals, such as mercury, lead, nickel, copper, chromium, and chlorobenzene, that have been collected by scientists from soil samples in and around the site (*Deccan Herald* 2009).

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have gastrointestinal disorders, impaired immune systems, and post-traumatic stress disorders; and are experiencing increasing numbers of spontaneous abortions, stillbirths, and offspring with genetic defects (Dhara and Dhara 2002). The Bhopal tragedy is identified as the worst industrial chemical disaster in history and is often called the “Hiroshima of the Chemical Industry” (Guillette 2008; Katz 2010).

Despite the severity of the disaster’s impact, compensation for victims has been minimal. Human rights groups call the government initiatives of rehabilitation and relief a “cruel joke” on the gas victims (Das 1985, 1680), and activists have staged multiple national and international protests against the government’s inadequate compensation to victims.<sup>2</sup> Multiple lawsuits have been filed over compensation amounts calculated according to the gas leak’s estimated damage. Complaints continue about inefficiencies in the distribution of compensation and the lack of comprehensive medical care for victims.

Over 25 years later, what lessons have been incorporated into what Indian children in the region are taught about the environment, chemical disasters, and their hazards? To what extent have children in Bhopal specifically, and India more broadly, cultivated an “ecological literacy” that may assist in future sustainable development efforts (Orr 2006)? This article presents an analysis of Madhya Pradesh (the capital of which is Bhopal) state syllabi with respect to environmental education (EE). The state trends are then compared with the National Board syllabi of the rest of India, using Central Board of Secondary Education (CBSE) materials.

In analyzing the syllabi, our findings resonate with other literature on EE: the Madhya Pradesh (MP) educational materials largely focus on the natural sciences and exclude most social science dimensions of EE. Thus, EE becomes a medium to make children knowledgeable about scientific facts rather than providing a holistic approach toward the environment, sustainable development, and the adverse impacts of natural, and human-caused, disasters. Our findings indicate that the national and state syllabi have made little to no effort to contextualize EE by using the Bhopal gas tragedy as a learning experience. This article presents a literature review on the emergence of EE in international policy discourse, a summary of the history of

<sup>2</sup> These protests have been led by international nongovernmental organizations (NGOs) such as Amnesty International, the Association for India’s Development, and Greenpeace International, among others. Local NGOs, such as the Bhopal Group for Information and Action, the International Campaign for Justice in Bhopal, and Sambhavna Trust, have worked in collaboration with international NGOs toward raising funds for the gas victims, spreading awareness about the cause, and providing medical assistance. Other organizations, such as Mahashakti Seva Kendra, provide employment to victims. The leadership of local NGOs working on the aftereffects of the gas tragedy is largely made up of survivors, and members are often involved in protests related to the government’s handling of compensation and justice. Most recent protests have centered on demanding the extradition of the former chairman of the Union Carbide group, Warren Anderson, to India to face trial (see <http://actions.bhopal.net/>).

EE in the Indian education system and its implementation in Madhya Pradesh schools, curricular analysis, and recommendations based on our findings.

### **Environmental Education: History, Definitions, Content, and Debates**

The meaning and use of EE has changed over time; this change can be characterized by a lack of consensus on a definition for EE despite frequent intergovernmental conferences and discussions. Today, the term “EE” has multiple meanings and rationales, allowing for very different curricular practices in different locales and classrooms (Jenkins 1994). Uncertainty and confusion remain concerning the key concepts and areas of overlap between the fields of EE and education for sustainable development (ESD) (Rose and Bridgewater 2003; Jickling and Wals 2007). As a result, we present some important events in the emergence of EE and ESD, followed by a discussion of the diverse definitions and content, as well as the debates that have ensued over the past 5 decades.

#### *History*

International concern for the environment gained momentum in the 1960s, with educational efforts becoming a primary strategy for activist movements (Palmer 1998; Spring 2004). Table 1 provides a timeline of key events.

In 1965, the International Union for the Conservation of Nature and Natural Resources (IUCN) called for EE at all levels of education and in training for the “land-linked professions,” such as civil engineers, foresters, and agricultural advisors (Spring 2004, 103). By the late 1960s, intergovernmental organizations such as UNESCO began working with the IUCN, holding the Biosphere Conference in Paris in September 1968 (Spring 2004). This collaboration resulted in the emergence of a broader definition of the phrase “environmental education” around 1970 (Spring 2004, 104). In 1972, the UN Conference on the Human Environment in Stockholm took up “environmental education” as one of its principal agenda items (Kassas 2002). The recommendations from this conference called on UNESCO and the United Nations Environment Program, as well as other international bodies, to establish an international program on EE.<sup>3</sup>

In subsequent years, and through regular intergovernmental meetings and initiatives, the link between the environment and education has been strengthened and expanded from simple conservation to issues of sustainable development, environmental justice, and the impact of natural and human-caused disasters. Significant documents in this progression toward a more expansive vision of EE include the World Commission on Environment and Development’s (WCED) 1987 report *Our Common Future* (Clover 2000; Rose

<sup>3</sup> These actions eventually resulted in the launch of the International Environmental Education Program (IEEP) in Tbilisi in 1997 (Kassas 2002).

TABLE 1  
TIMELINE OF KEY EVENTS IN ENVIRONMENTAL EDUCATION AND EDUCATION  
FOR SUSTAINABLE DEVELOPMENT

Timeline	Achievements/Progress
Mid 1960s	The International Union for the Conservation of Nature and Natural Resources (IUCN) called for “environmental education in schools in higher education, and in training for the land-linked professions” (Spring 2004, 103).
Late 1960s	The IUCN and UNESCO jointly organized the Biosphere Conference in Paris, which defined the term “environmental education” (Spring 2004).
Early 1970s	The UN Conference on Human Environment held in Stockholm in 1972 took up “environmental education” as one of its principal issues (Kassas 2002).
Late 1970s	An intergovernmental conference in Tbilisi in 1977 launched the International Environmental Education Program (IEEP; see Kassas 2002).
Late 1980s	The World Commission on Environment and Development (WCED) 1987 report <i>Our Common Future</i> highlighted the importance of education for sustainable development (Clover 2000; Rose and Bridgewater 2003).
Early 1990s	The Earth Summit (Rio de Janeiro conference in 1992) outlined <i>Agenda 21</i> , which included three principal programs for environmental education, reorienting education toward sustainable development, increasing public awareness, and promoting training (Kassas 2002; Rose and Bridgewater 2003).
Mid to late 1990s	Consecutive regional conferences shaped the current form of environmental education, including the Cairo Conference on Population (1994), the Copenhagen Conference on Social Development (1995), the Beijing Conference on Women (1995), the Istanbul Conference on Habitat (1996), the Thessaloniki Conference on Environment and Society (1997), and the Budapest Conference on Science (1999; see Rose and Bridgewater 2003).
Early 2000s	The World Summit on Sustainable Development (“Rio Plus 10”) was held in Johannesburg in August–September 2002 (Wals 2009). The United Nations General Assembly launched the United Nations Decade of Education for Sustainable Development (DESD; 2005–14) in December 2002 (Wals 2009).
Mid 2000s	In September 2005, an International Implementation Scheme was developed that integrated the DESD with existing UN-supported educational processes (EFA, Dakar Framework of Action; see Wals 2009).
Late 2000s	The thirty-fourth UNESCO General Conference in 2007 adopted a resolution on ESD that recognized that further substantial initiatives have to be taken by member states and by UNESCO to reorient teaching and learning toward sustainable development worldwide (Wals 2009). A middecade review was conducted in 2009 to measure achievements and determine strategies for the second half of the DESD (2009–14; see Wals 2009).

and Bridgewater 2003) and *Agenda 21*, the summary document of the 1992 Rio “Earth Summit.” Central to these declarations were three principles of EE: (1) the reorientation of education toward sustainable development, (2) increasing public awareness, and (3) promoting training (Kassas 2002; Rose and Bridgewater 2003). The cross-sectionality of the environment in UN and other international conferences also came to the fore in the 1990s, with topics related to the environment and sustainable development being discussed at the Cairo Conference on Population (1994), the Copenhagen Conference on Social Development (1995), the Beijing Conference on Women (1995), and the Istanbul Conference on Habitat (1996).

*Definitions*

While over the past 50 years the terms “environmental education” and “sustainable development” have become more frequent in international discourse, their definitions are not singular and shared. Most definitions of EE have a cognitive component (knowledge, awareness), an affective component (attitude, behavior), an action-oriented component (skills), and an impact component (sustainability, equity). Taken together, the definitions used by environmental educators identify the main objective of EE as the creation of culturally and socially aware citizens who are respectful of human rights and participate in the promotion of a well-balanced environment (Clarke 1993; Kassas 2002; Rose and Bridgewater 2003). Orlando Rose and Peter Bridgewater’s (2003, 265) definition of EE exemplifies these characteristics: “a lifelong teaching/learning approach that has the potential to strengthen people’s capacity to address environmental and development issues, to be more aware of and better understand such complexity; to develop knowledge, values and attitudes, life-skills and ethical behaviours consistent with sustainable development, as well as for effective participation in decision-making.” Therefore, EE is useful for understanding natural and social processes and their interlinkages (Aho 1984; Rose and Bridgewater 2003).

*Content*

The definition of EE in international discourse and local practice has broadened over the past 5 decades. Clover (2000) asserts that, more than any other subject in education, EE has since the 1970s undergone the greatest evolution, not only in terms of its goals, theory, and ethical dimensions but also in pedagogy. The Stockholm conference in 1972 recommended a program for an “inter-disciplinary environmental education” (Schleicher 1989). This effort was followed by the Belgrade conference in 1975, at which the phrase “think globally, act locally” became a mantra for EE efforts (Schleicher 1989). According to Klaus Schleicher (1989, 266), the idea that the “social sciences should co-ordinate the different environmental perspectives to avoid a one-sided factual-functional interpretation by the natural sciences” was the key focus of the 1976 Munich conference. After the Tbilisi conference in 1977, the integration of social sciences with natural sciences gained momentum “with the arguments that ethical, cultural and economic dimensions somehow determine the concepts for environmental interpretation and the attitudes toward environmental use” (266).

While the literature indicates that EE in its early conceptions was limited to “nature study” and “conservation,” common terms in the discourse included such diverse concepts as citizenship, environmental stewardship, ecological and environmental literacy, moral education, civic participation, and globalization (Jenkins 1994; Vargas 2000; Spring 2004). Peace education, human rights education, population education, and concerns about social

and economic justice have also emerged as integral components of the ever-broadening content of EE (Aho 1996; Spring 2004; Little and Green 2009). “Education for planetary citizenship,” for example, is akin to “education for sustainable development” (ESD) but emphasizes ethics, attitudes, and behaviors more than economics in securing a sustainable planet for future generations (Haigh 2008, 427).

In 1987, the intergovernmental report *Our Common Future* argued for a move away from reductionist, science-focused models that were devoid of social, cultural, and emotional aspects (Jenkins 1994). Discursive shifts in the conceptualization of EE and an increasingly interdisciplinary approach to content have suggested that curricula should be an amalgamation of science with values, civics, and ethics, and by the 1990s most environmental educators believed that science alone could not deliver “a transformative education predicated upon eco-responsiveness, democracy, equity, notions of global and plural citizenship, and sustainability” (Selby 1999, 135). The integration of these perspectives has occurred selectively, however, and, as in the case of Madhya Pradesh, often unsuccessfully. For example, Anna Gahl Cole (2007) draws from her environmental teaching experiences in New Mexico to explain that her students were unable to draw links from their prescribed environmental science curriculum to sociocultural issues such as race, justice, and gender, implying that EE did not make use of the cultural and social aspects of the immediate surroundings.

The broadening of the scope of EE is evidenced in the discursive and conceptual shift from EE to a larger and more comprehensive ESD in the early 1980s. In 1983, the Brundtland Commission proposed a framework for sustainable development that was subsequently reaffirmed by representatives from over a hundred countries at multiple conferences and summits (Clover 2000; Rose and Bridgewater 2003). Angela Little and Andy Green (2009, 172) define sustainable development as lying in three spheres: (1) environment (including water and waste), (2) society (including employment, human rights, gender equity, peace, and human security), and (3) economy (including poverty reduction and corporate responsibility and accountability).

#### *Debates*

An “ESDebate” (education for sustainable development debate) has emerged as EE has broadened to include a development component. These changes have met resistance, and there remain members of the EE community who do not accept this conceptual shift (Jickling and Wals 2007). Some experts suggested that EE was already well established and that such changes would “reduce the conceptual space for self-determination, autonomy, and alternative ways of thinking” (4). M. Kassas (2002) asserted that in *Agenda 21* the concept of sustainable development absorbed all environmental concerns, which turned EE into something else: education for sustain-

ability. This result caused EE to be widened to include both in-school and out-of-school activities along with public awareness and professional training (Kassas 2002).

The similarities and differences between EE and ESD depend on a country's EE tradition, historical pedagogical variations, national and regional agendas, and cultural differences. In his analysis of ESD and other "adjectival educations," including EE, Arjen Wals (2009, 28) argues that there is no complete convergence between ESD and EE. Rather, he presents three typologies to describe the relationship between ESD and EE. First, in countries where the EE tradition is deeply rooted in the formal education system, the tenets of ESD have built on existing EE structures and policies. Moreover, in such countries, the definition of EE itself is broad, taking into account socioeconomic and political concerns, which makes it very similar to ESD. Wals's second type of relationship between EE and ESD is one in which national governments see ESD as a more viable strategy to gain support from donors and the international community. In such cases, EE practices would remain largely the same while housed in a larger ESD framework with an expanded discursive vision of learning about the environment. His third type identifies countries that have historically defined EE narrowly, focusing on the hard sciences and environmental concerns such as protection, conservation, and resource management. However, in general, these definitions are constantly challenged by ESD principles (social, cultural, and political aspects), and as a result there exists some complementarity between the approaches, as well as some similar treatment of certain topics.

#### **Operationalizing Environmental Education in a School-Based Curricular Context**

Our approach to the analysis of EE curricula in Madhya Pradesh valorizes the importance of the broader ESD concept. To operationalize the dimensions of ESD in terms of curricular patterns comprehensively, David Orr's (2006, 175) conceptualization of "ecological literacy" is instrumental because it offers fundamental principles for teaching and learning about the environment. Orr defined conventional literacy as the ability to read, write, and count and quoted Garrett Hardin's definition of ecological literacy by asking the question "What then?" (175). Orr urged environmental educators to go beyond cognitive aspects of environmental learning (awareness and knowledge) toward broader dimensions of being environmentally conscious and developing aspects of critical thinking and responsible citizenry. Orr (178) argued that most educators treat environmental problems as "solvable" and not dilemmas, using analytic approaches of reductionist science resulting in "value-neutral technological remedies." He also suggested that these processes create top-down solutions that are transferred to a "passive citizenry" (178). Instead, an ecologically literate person should have "the knowledge necessary to comprehend interrelatedness, and an attitude of care and or stewardness"



in dealing with environmental issues (181). Orr's "ecological literacy" framework situates the primary question for our research: do the Madhya Pradesh Board syllabi adequately develop ecological literacy through curricula on the Bhopal disaster?

Orr (2006) noted that ecological literacy also requires a well-rounded understanding of how societies relate to each other and how they might do so sustainably. Interconnectedness is also highlighted by Fritjof Capra (2007, 4), who described "systems thinking," which, for example, considers every organism (animal, plant, microorganism, or human being) as part of an "integrated whole." Consequently, a systems approach that integrates various academic disciplines may be the most effective way to learn about the environment.<sup>4</sup> Indeed, ecological literacy provides a useful lens to observe attributes such as critical thinking, value orientation, and interconnectedness, which are key to EE.

#### **Challenges to Implementing Environmental Education and Education for Sustainable Development Curricula in Schools**

Previous school-based curricular approaches to EE and ESD have not been extensively studied or evaluated by experts, although there are a few notable exceptions, including a handful that pertain to India. A common theme among these studies is the disconnect between global discourse on EE and school-based implementation of EE and ESD curricula.

In 2004, a report on a survey of district heads of EE in Greece described their perceptions of challenges for the implementation of an EE program in Greek secondary schools (Goussia-Rizou and Abeliotis 2004). Two particular challenges are especially relevant to our study. First, 46 percent of participants indicated that a lack of an integrated education plan for EE made implementation difficult. Second, 36 percent reported a lack of teacher training specific to EE.

A 2005 evaluation of the United Kingdom's sustainable development strategy for higher education institutions highlighted three main strategies for teaching sustainable development: experiential learning, holistic thinking, and teachers as role models (Dawe et al. 2005). The evaluation suggested that sustainable development issues were being integrated across many academic disciplines but argued for more work in this direction. The report identified a number of challenges for implementing ESD, including already overloaded higher education curricula, perceived irrelevance by academic staff, limited awareness and expertise, and limited institutional drive and commitment.

Sean Bierle and Ted Singletary (2008) surveyed 52 environmental edu-

<sup>4</sup> In contrast, school curricula that compartmentalize disciplines into subjects without practical context and real-life experiences make the learning experience mechanistic (Williams 2008).

cators in Idaho secondary schools to learn about their curricular approaches to EE. Although 90 percent of respondents indicated that EE-related goals were important to them, deficiencies were noted in the actual infusion of EE into multiple subjects and the use of diverse pedagogical strategies. Notably, only 27 percent reported doing interdisciplinary activities, and less than 20 percent reported utilizing outdoor activities or being able to convince students to reflect through group sessions or journals, which were prescribed activities.

Research of curricular approaches to EE in India are limited, but of note are Kanakalatha Mukund's (1988) evaluation of Eklavya's Hoshangabad Science Teaching program, Anuradha Pande's (2001) research on EE in rural central Himalayan schools, and S. Anitha's (2004) study on location-specific EE in Palakkad district in southern India. Mukund's (1988) evaluation of the Hoshangabad Science Project showed that innovative curricular changes were adopted in a low-cost manner that included making use of the immediate physical environment of the children as examples. Anitha (2004) discussed a project that assisted teachers in teaching environment-related topics through the screening of existing social science and science textbooks to highlight immediate environmental issues concerning a local site, Srikrishnapuram. Additionally, a manual was also prepared for teachers for science and social science subjects with special focus on topics that related to the site. We focus on Pande's (2001) study because of relevance to the context-based learning that we want to highlight for the Bhopal case and the scale of intervention in an Indian setting.

Pande (2001) described a course to introduce environmental and livelihood issues in the Himalayan state of Uttaranchal. The course was designed to address the immediate realities of the region, specifically deforestation, soil erosion, and related negative externalities, such as landslides and adverse impacts on agriculture. To that end, it has a substantive practical component, focusing on land degradation and other environmental issues faced by residents. Pande observed that the main principles of the curriculum addressed local problems first. Next, practical work involved students' learning from their immediate environment and developing management skills. Finally, the course had direct impact on the local community. The students were required to collect data from their parents and neighborhoods to create solutions to real-life environmental issues. The course has expanded to over 530 schools and, with government support, has sought to cultivate community responsibility for and management of natural resources in the immediate area. Pande noted that evaluations of the program have specifically highlighted the local applicability component as integral to its success and expansion, supporting the argument that context-specific courses are more effective than generic courses.

To advance scholarship on contextualization and evaluative research in

distinct locales, this article explores how a historical event with continuing consequences has (or has not) been incorporated into EE curricula in the affected community. Specifically, we use the ecological literacy framework to see how the Bhopal gas tragedy has affected EE curricular content in Madhya Pradesh, India. Our findings suggest that despite the Bhopal experience, state and national syllabi in Madhya Pradesh and India, respectively, still employ a reductionist approach to EE, primarily focused on the natural sciences. The following sections detail the treatment of EE in the Indian formal education system, its implementation in Madhya Pradesh Board-affiliated schools, and a description of our data, analysis, and findings.

### **Environmental Education in the Indian School System**

Environmental Education has deep roots in India's education system (Sharma 2006; Ravindranath 2007). Ancient Hindu texts address environmental protection, restraint in consumption of natural resources, living in harmony with the natural environment, and promotion of sustainable development of all organisms on "Mother Earth." In more contemporary Indian history, Gandhi's "basic education" movement included an emphasis on respect for nature, which can be seen as the first serious step toward linking modern Indian education with local environmental needs (CEE 2010b). A noted educational commission set up after independence (the Kothari Commission, 1964–66) reiterated this Gandhian philosophy and recommended that "the aim of teaching science in primary school should be to develop proper understanding of the main facts, concepts, principles and processes in the physical and biological environment" (CEE 2010b, 5; see also Gopal and Anand 2006).

While early Indian education policy placed EE in the sciences alone, India was not isolated from global debates surrounding environmental protection and sustainable development. Taking initiative after the Stockholm summit in 1972, India incorporated environmental concerns into its constitution through the forty-second amendment in 1976 (Sonowal 2009). This new wave of environmental consciousness led to the establishment of a full-fledged Ministry of Environment and Forests in the early 1980s (Sonowal 2009). With the rising intensity of problems such as overpopulation, unplanned growth of urban areas, and ill-planned industrialization, school-based EE started to be seen as a potential remedy. This idea was adopted in India's National Policy on Education of 1986, which stated "there is a paramount need to create a consciousness of the environment. It must permeate all ages and all sections of the society beginning with the child. Environmental consciousness should inform teaching in schools and colleges. This aspect will be integrated in the entire educational process" (Ravindranath 2007, 23).

By the late 1980s, the National Curriculum for Elementary Education,<sup>5</sup> developed by the National Council of Educational Research and Training (NCERT), had for the first time systematically infused environmental issues in national textbooks (Sonowal 2009), but critical assessments revealed that the treatment of most environmental concepts was incomplete and required a more “ecological” approach that also dealt with socioeconomic aspects of sustainable development (Sonowal 2009). Consequently, in 1988–89, a nationally sponsored Ministry of Human Resource and Development program, Environmental Orientation to School Education, was piloted in selected states to implement a more contextualized EE curriculum (NCERT 2005; Sonowal 2009). Selected schools existed in similar ecosystems and shared comparable environmental concerns, which allowed teachers to incorporate local contextual elements (e.g., locally grown crops, rainfall patterns). These initiatives relied on the involvement of voluntary agencies and local communities and continue to run small-scale projects.

Although the National Policy on Education of 1986 acknowledged the importance of EE, it was not a mandatory subject in the formal schooling system until December 2003, when the Supreme Court of India ordered that “green curricula” be taught in all 28 states of India (Sonowal 2009). This decision was the court’s response to environmental activist and lawyer M. C. Mehta’s 1991 filing of a public interest application, and the judgment required EE to fulfill the fundamental duties of citizens “to protect and improve the natural environment,” as set out in India’s constitution.<sup>6</sup> In addition, the court directed NCERT to develop a model syllabus for classes (or grades) 1–12 that, according to the order, “shall be adopted by every state in their respective schools.” Moreover, it directed that “the NCERT be appointed as a nodal agency to supervise the implementation of this Court’s order” (CEE 2010b).

While the Supreme Court’s order made EE mandatory, it did not specify the form in which EE should be taught or whether it needed to be uniformly implemented in all states. Subsequent discussions primarily focused on whether EE should be taught as a separate subject or infused into other subjects, and consensus was not reached by the Supreme Court (Sonowal 2009). Later, NCERT clarified that EE had to be included in the compulsory curriculum, but a separate subject was not necessary (CEE 2010b). That is, EE could be integrated into other subjects such as science, social science, mathematics, and language, which emphasized the fact that both scientific facts and wider social contexts are integral parts of EE. Then NCERT pub-

<sup>5</sup> This framework was formulated by the national curriculum body NCERT, a resource organization set up by the Government of India and headquartered in New Delhi that provides technical assistance to the central and state governments on academic matters related to school education. The NCERT develops textbooks for schools nationally, and state governments often translate and reprint these resources.

<sup>6</sup> *M.C. Mehta v. Union of India*, WP 860/1991 (November 22, 1991; environmental education case). Environmental Law Alliance Worldwide (see <http://www.elaw.org/node/2669>).

lished the first edition of the EE syllabus in 2004 for classes 1–12, which the Supreme Court accepted (CEE 2010a). Following the Supreme Court order in 2003, it became mandatory for all schools to teach EE in all classes using the prescribed syllabus. Most of the states responded to this directive and started to initiate the process (CEE 2010a).

Efforts outside the courts have also resulted in greater emphasis on environmental issues in schools. In 1999, the Ministry of Human Resource Development, the Ministry of Environment and Forests, NCERT, and state departments of education began to introduce EE in formal school curricula through the “Environmental Education in School System” program. Initiated by the Ministry of Environment and Forests, the program resulted in middle school–level textbook revisions for science, social science, and languages in eight states in 2002–3. The National Curriculum Framework (NCF) of 2000, a national vision statement for education, also included protection of natural resources and recognized it as one of the fundamental duties laid down in article 51A of part IV.A of the Indian constitution (NCERT 2010a); NCF 2000 also pushed for an “indigenous” EE curriculum, keeping in mind the country’s plurality and diversity.

The Supreme Court’s directive and subsequent textbook revisions accelerated the incorporation of EE in India. By the early 2000s, the textbooks centered around four main environmental themes: land degradation; forest degradation; air, water, and soil pollution; and cluttering and fouling of landscapes (Sonowal 2009). A challenge for environmental educators remained to contextualize social issues related to local environments, since the curriculum being used was developed at the national level. It was feared that localization would lead to inconsistency in the implementation of the curriculum and as a result, there was little room for local variation of the centralized resources (Sonowal 2009).

In 2004, NCERT held a nationwide curriculum review, which laid the foundation for the most recent NCF, published in 2005 (NCERT 2005),<sup>7</sup> in which EE figured prominently. Both the life sciences and the social sciences included environmental issues and, more specifically, a “habitat and learning focus group” was formed to work on issues relating to EE. The 2005 NCF document promoted a more holistic concept of ESD, in which natural resources, socioeconomic factors, local cultural perspectives, psychoemotional

<sup>7</sup> It is important to note the polemic between NCF 2000 and NCF 2005 related to the teaching of history and the presentation of civics. Many scholars have described the policy framework put forth in 2000 as a way of consolidating the then-ruling Bharatiya Janta Party’s vision to “Indianize” education, advocating a Hindu-dominated basis for all disciplinary subjects (Lall 2005); EE, arguably, was thus connected to ancient Hindu texts and a larger Hindu cosmology under this vision. While the NCF 2005 was developed under a different ruling party that sought in large part to reverse the textbook revisions of the previous administration, emphasis on EE remained, although it was linked to sustainable development and human rights. Thus, while local political forces have had very different ideologies on most topics, EE has, to large degree, been supported across the political spectrum, albeit for different reasons.

influences, global and national peace, and economic development are engaged to address environmental issues and promote better citizenry.

The 2005 NCF document suggests that “science be placed in the wider context of the learner’s environment, local and global, enabling him/her to appreciate the issues at the interface of science, technology and society, and equipping him/her with the requisite knowledge and skills to enter the world of work” (NCERT 2005, 48). The framework integrates environmental science with science and social science in the primary classes. In the upper primary classes, it calls for learning scientific principles through familiar experiences and hands-on design of simple technological units and modules, while at the secondary level, science is approached as a “composite discipline,” which includes environmental science. More specifically, NCF 2005 recommended that classes 3–5 have a separate environmental science studies (EVS) subject that emphasizes the natural environment, its preservation, and the urgency of counteracting degradation. These themes are important to gain factual knowledge about scientific processes that influence our environment. However, EVS, in the ideal projected by NCERT, should also introduce social issues like poverty, child labor, illiteracy, and gender, caste, and class inequalities in rural and urban areas. The framework mentions that the content should reflect the day-to-day experiences of children and their lived realities. It acknowledges that the child’s community and local environment form the primary context in which learning takes place, and in which knowledge acquires its significance. The objective is to use education to “provide the necessary perspective on how human life can be reconciled with the crisis of the environment so that survival, growth and development remain possible” (NCERT 2005, 6).

Using the NCF 2005 framework on EE, NCERT developed detailed national syllabi and textbooks. The underlying themes of the NCERT-prescribed syllabi are learning about the environment, learning through the environment (implying a systematic exploration through a variety of activities), and learning for the environment by developing sensitivity toward its protection and preservation (NCERT 2010b). The objectives of EE as stated by NCERT are “the need to focus not only on knowledge but more importantly on generating awareness, developing attitudes, values and skills, and promoting participation and action among children at all levels of school education. By implication, learning opportunities would not remain limited to the classroom alone but extend much beyond it” (NCERT 2010b). To achieve these objectives, the NCERT provided a detailed list of topics to be included in science, social science, and mathematics classes or as a separate compulsory subject that approach the ideals set forth by the ESD framework.

### Environmental Education in Madhya Pradesh Schools

The data presented in this article come from India and, specifically, the central state of Madhya Pradesh, which accounts for 6 percent of the nation's population, or 72.6 million people in absolute terms. The decentralization of Indian education to state authorities was initiated as a constitutional amendment in 1992. Since then, states have played an increasing role in curriculum planning and educational provision. Each state has a board of education, which has its own curriculum, implementation plan, and fiscal responsibility. Not all schools in each state are mandated to follow state board guidelines, however. On meeting certain criteria, schools can follow CBSE syllabi, which are nationally administered through regional offices across the country. Both public and private schools are required to follow either a state or central board syllabus for students to be eligible for admission to Indian colleges and universities.<sup>8</sup>

Since 1975, NCFs have served as plans that translate national policies into action by state and central boards, and they provide a basis for national standards to which individual states adhere. At the same time, frameworks allow flexibility in implementation by the states (Dhankar 2006). Instead of specifying what should be done in the classroom, the NCERT views the framework as a conceptual structure for decision making. Furthermore, it suggests three options for compliance with its guidelines with regard to EE. First, states may adopt the NCERT framework wholesale and in all their schools. Second, states may prepare syllabi that address all the ecozones of their state. Third, states may offer their schools a broad framework for EE through which schools themselves determine their own detailed syllabi and strategies.

Madhya Pradesh chose the first option, adopting the NCERT syllabi almost in their entirety. As a result, the Madhya Pradesh (MP) State Board introduced EE to the general syllabus during 2007–8 for all MP Board-affiliated schools (public and private), following the directive of the Supreme Court. However, in examining the two textbooks and syllabi (MP and CBSE), some variation does in fact exist. Conversations with teachers indicate that in practice, for the primary classes (1–5), environmental concepts have been integrated with other subjects such as general science and social science. There are no separate EE textbooks and exams for the early grades. For classes 6–12, EE is taught as a separate subject, and students have to take a separate environmental studies exam. In addition, classes 9–10's EE courses contain a disaster management component. Unlike other subjects in which students take exams and obtain marks, for EE, students receive a letter grade

<sup>8</sup> There exist some private schools that do not follow any board syllabus, but these institutions tend to be for-profit ventures in rural areas that do not offer students extensive opportunities for higher studies after completion.

TABLE 2  
CLASSES WITH SUBJECT SYLLABI FOR MADHYA PRADESH STATE  
BOARD SCHOOLS

Class	Subject Syllabus
9	Environmental education and disaster management Science Social science
10	Environmental education and disaster management Science Social science
11	Environmental studies Geography Biology Chemistry Sociology
12	Environmental studies Biology Geography Political science Psychology

SOURCE.—Madhya Pradesh State Board.

at the end of the school year that does not count for promotion or admission to higher studies.

Board syllabi—whether generated at the national or state level—form the core of all teaching activities in the classroom, and teachers are mandated to teach all topics listed. Usually the number of sessions designated to each topic is also mentioned in the syllabi. This specification helps teachers to gauge the extent of coverage of each topic. Also, textbooks are designed as per the syllabus. Therefore, syllabi form an important data source to find patterns in topics covered for each class.

#### Data Sources and Methods of Analysis

The data for this study were syllabi for multiple subjects for classes 9–12 utilized in thousands of schools affiliated with the State Board of Madhya Pradesh, the state in which the Bhopal environmental disaster took place. Table 2 presents the subjects covered for each class year. Subjects for the secondary classes (9–10) are compulsory subjects, whereas the subjects for the senior secondary classes (11–12) are electives. These syllabi are available online for the 2009–10 academic year.<sup>9</sup> The CBSE classes 9–12 syllabi are compared with those of Madhya Pradesh, since within the state there are schools there that follow the national board's curricula.

The data consist of the syllabi for the MP Board for classes 9–12. We used QSR NVIVO 8 software to analyze the data, using a line-by-line coding procedure to record the number of occurrences (instances) of a particular theme (Miles and Huberman 1994; Gibbs 2002). We developed themes in two ways:

<sup>9</sup> See <http://mpbse.nic.in/academics.htm>.



first, we identified literature-based, conceptually driven themes; we then identified other themes from the syllabi using Creswell's (1998) *in vivo* coding structure.

The main themes that emerged were EE, environmental citizenship, and the presence of information on human-made and natural disasters. For the EE theme, subclassifications included general education, depletion and conservation of natural resources, understanding the ecosystem, and waste generation and management. Subthemes for environmental citizenship included broader environmental citizenship issues and environmental values and ethics.

### Findings

This section presents the findings from our thematic coding of the syllabi. Table 3 presents the thematic instances coded by class. The following figures (see fig. 1) are a pictorial representation of parts of table 3.

Irrespective of class year, two themes that have the highest number of instances within MP Board syllabi are waste generation and management ( $N = 87$ ) and understanding the ecosystem ( $N = 79$ ). In the area of waste generation, class 12, followed by class 11, has the highest number of instances. Some of the components of waste generation in the syllabi are "effects of depletion of [the] ozone layer, greenhouse effect and global warming—pollution due to industrial wastes; green chemistry as an alternative tool for reducing pollution, strategy for control of environmental pollution" (class 11 syllabus). The class 10 syllabus includes "sources of pollution and major pollutants; oil spills" and the effect of the environment on organisms, pollution, sources of pollution and its effect on environment (Air, Water, Soil)."

Class 11 has a higher number of instances of understanding the ecosystem, followed by class 12 and class 9. Understanding the ecosystem involves the "effect of [the] environment on organisms—Pollution, sources of pollution and its effect on [the] environment (Air, Water, Soil)" (class 11 syllabus); the "Indian concept of environment, Wild life and forest conservation" (class 11 syllabus), and "levels of organisation: population, species, community, ecosystem and biosphere" (class 12 syllabus). In these discussions, however, the number of instances of the role of human-made and natural environmental disasters is extremely limited and mostly found in classes 10 and 11. The class 11 syllabus, for example, differentiates between two types of disasters as "disasters—natural (earthquakes, droughts, floods, cyclones, landslides) and man-made (technological and industrial); their impact on the environment; prevention, control and mitigation."

We found only 13 and 9 instances of environmental citizenship and environmental values and ethics, respectively. Examples of environmental citizenship included "enforcement of acts, laws and policies" (class 10 syllabus) and "human being[s] as rational and social partner[s] in environmental

TABLE 3  
THEMATIC INSTANCES CODED BY CLASS

Source	Environment Education			Environmental Citizenship		Role of Natural or Human-made Disasters Educa- tion and Safety	Total Instances Coded
	General	Depletion and Conservation of Resources	Understanding Ecosystem	Waste Generation and Management	Environmental Citizenship		
Class 9:							
Environmental education		4	6	7		2	19
Science	2	2	4	3			11
Social science			3	2			6
Class 10:							
Environmental education		12	4	10	1	1	29
Science		2	2	3			7
Social science		5	3	3		4	15
Class 11:							
Environmental studies		6	2	16	8	1	33
Geography		3	35	4		6	48
Biology			2	3			5
Chemistry		1	1	1			3
Sociology						3	3
Class 12:							
Environmental studies		2	6	19	4	1	32
Biology		1	11	8		1	22
Geography		4		7		1	12
Political science				1			1
Psychology	1						1
Total instances coded	3	42	79	87	13	9	247

SOURCE.—Madhya Pradesh State Board syllabi.

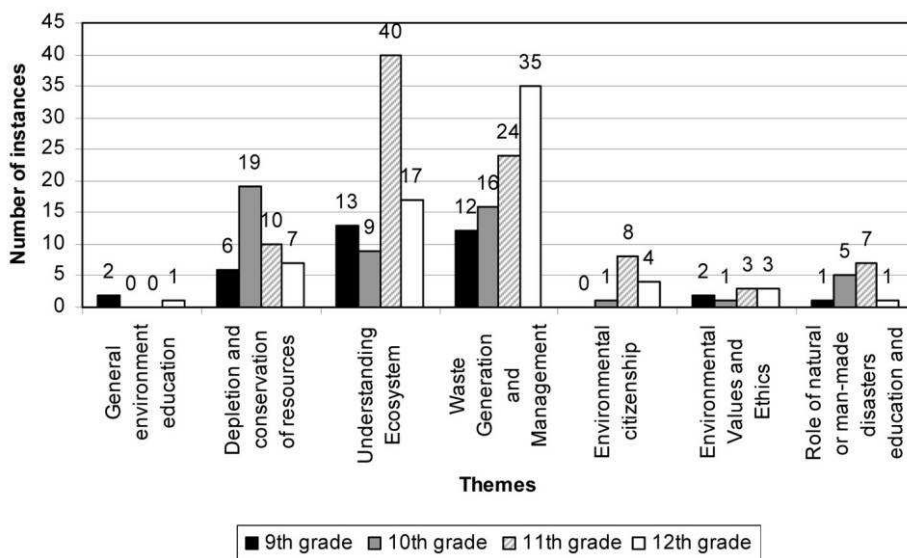


FIG. 1.—Thematic coding by class. Source: Madhya Pradesh State Board syllabi

actions” (class 11 syllabus). Environmental values and ethics were illustrated by these subcomponents: “human rights, fundamental duties and value education” (class 9 syllabus) and the “concept [of the] environment in Indian Culture, Ethics; Legislation on environment” (class 12 syllabus). These findings are presented by theme in figure 2.

Figure 3 shows the number of instances coded specifically in environmental science syllabi by class. The graph indicates that across all classes the maximum instances are for the waste generation and management theme, with the least coded themes being general EE, the role of human-made and natural disasters, and environmental values and ethics. Class-specific occurrence of themes indicates that classes 9, 11, and 12 focus on waste generation, while class 10 focuses on depletion and conservation of resources. The subsections of depletion and conservation of resources include these subcategories: “Cause of depletion of resources—over-use/irrational use, [in]equitable distribution of resources, technological and industrial development, population growth” (class 9 syllabus); “Need for adopting control measures to check spoilage of landscape” (class 10 syllabus); and “Impact of development on environment—changing patterns of land use, land reclamation, deforestation, resource depletion, pollution and environmental degradation” (class 11 syllabus).

Comparisons between instances of environmental themes in CBSE (national) and MP (state) Board syllabi suggest few differences in their curricular

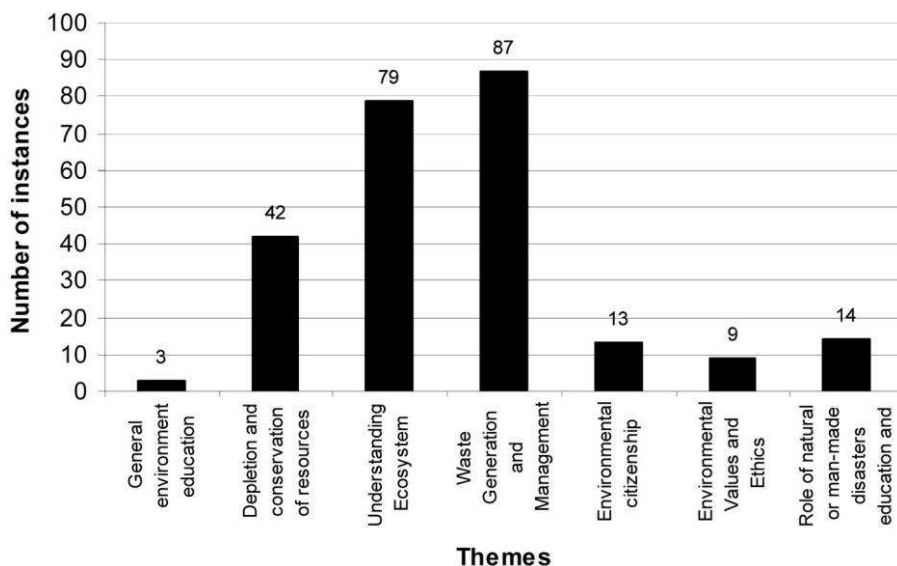


FIG. 2.—Coding instances by theme. Source: Madhya Pradesh State Board syllabi

treatment of the environment. Both systems correspond with the traditional approach to EE, grounded in science rather than in a broader conceptualization of sustainable development, despite NCERT's expansive vision projected in the NCF. The number of thematic instances found in the national CBSE syllabi is shown in table 4. In our analysis, we found 139 instances of the various themes, of which 91 occurred in the senior secondary classes. Most instances appear in the depletion and conservation of resources theme (50), followed by understanding of the ecosystem (46). Information on the effects of human-made and natural disasters on the human and physical environment had only 11 instances. The least referenced theme is environmental citizenship (7).

Tables 5–8 compare our findings of CBSE and MP Board syllabi content. We present the data in several ways. Table 5 provides an overview of content in all classes in schools overseen by both boards. The data (in percentages) indicate that in CBSE schools, depletion and conservation of resources and understanding of the ecosystem had the most coding instances: 36 percent and 33 percent, respectively. The MP Board curricula gave preference to waste generation and management with 35 percent, followed by understanding of the ecosystem with 32 percent. Thus, in general, both boards' syllabi focused on science-based EE more than ESD or environmental citizenship (the theme with the fewest references in both boards' syllabi and textbooks).

Table 6 helps to compare the number of thematic instances of the two

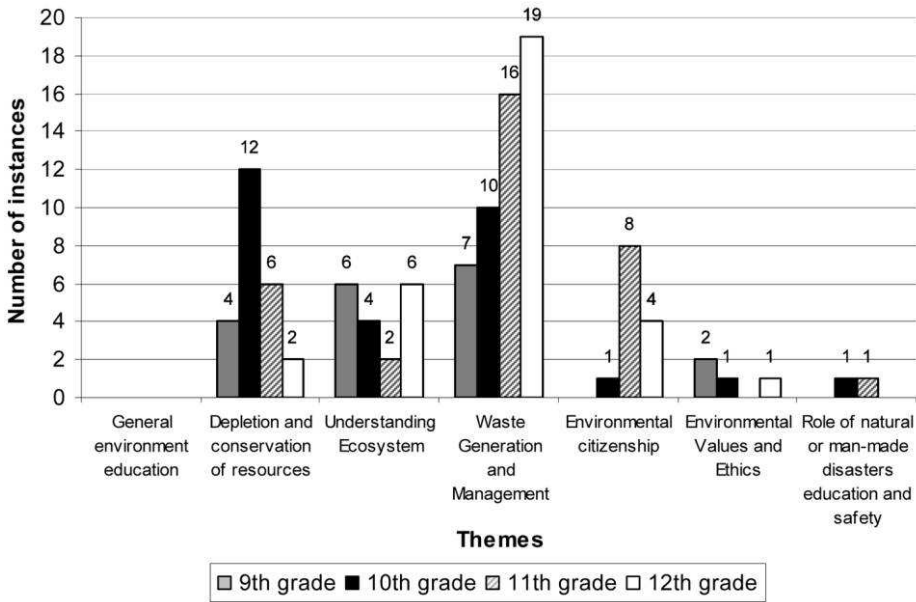


FIG. 3.—Coding instances by class: Environmental science syllabus. Source: Madhya Pradesh State Board syllabus.

boards. For example, for all the occurrences of the environmental citizenship theme, 18 percent came from CBSE Board syllabi, while 81 percent were from MP Board syllabi, making the gap between the boards’ treatment of environmental citizenship 63 percent in favor of MP Board schools. Another prominent gap emerged regarding the treatment of waste generation and management, where MP Board syllabi presented 78 percent of instances. In addition, in both boards’ syllabi, references to themes more associated with the broader vision of sustainable development and ecological literacy were minimal.

Tables 7–8 present a class comparison of the boards’ syllabi. The EE theme dominates, and there are few references to environmental citizenship, although there are more instances of this theme in the senior secondary classes. Again, the role of disasters has fewer instances as compared to other themes, with the national CBSE Board syllabi faring marginally better than MP Board syllabi in terms of the percentage of instances. Table 8 presents the number of instances per theme for both boards. The most visible gap between the MP Board and CBSE syllabi is at the senior secondary school level regarding the occurrences of the environment citizenship theme.

TABLE 4  
THEMATIC INSTANCES CODED BY CLASSES

Category	Environment Education			Environmental Citizenship		Role of Natural or Human-made Disasters Educa- tion and Safety	Total Instances Coded	
	General	Depletion and Conservation of Resources	Understanding Ecosystem	Waste Generation and Management	Environmental Citizenship			Environmental Values and Ethics
Secondary school		16	13	13	1	0	5	48
Senior secondary school	1	34	33	11	2	4	6	91
Total instances coded	1	50	46	24	3	4	11	139

SOURCE.—Central Board of Secondary Education.

NOTE.—Secondary school includes classes 9–10; senior secondary school includes classes 11–12.

TABLE 5  
COMPARISON OF MP BOARD WITH CBSE (PERCENTAGES OF INSTANCES)

Source	Environment Education			Environmental Citizenship		Role of Natural or Human-made Disasters Educa- tion and Safety	Total Instances Coded	
	General	Depletion and Conservation of Resources	Understanding Ecosystem	Waste Generation and Management	Environmental Citizenship			Environmental Values and Ethics
CBSE	.72	35.97	33.09	17.27	2.16	2.88	7.91	100
MP Board	1.21	17.00	31.98	35.22	5.26	3.64	5.67	100

NOTE.—All classes are included. CBSE = Central Board of Secondary Education.

TABLE 6  
COMPARISON OF MP BOARD WITH CBSE BY THEME (PERCENTAGE OF INSTANCES)

Source	Environment Education			Environmental Citizenship		Role of Natural or Human-made Disasters Educa- tion and Safety	Total Instances Coded	
	General	Depletion and Conservation of Resources	Understanding Ecosystem	Waste Generation and Management	Environmental Citizenship			Environmental Values and Ethics
CBSE	25.00	54.35	36.8	21.62	18.75	30.77	44.00	36.01
MP Board	75.00	45.65	63.2	78.38	81.25	69.23	56.00	63.99
Total	100	100	100	100	100	100	100	100

NOTE.—CBSE = Central Board of Secondary Education.



TABLE 7  
COMPARISON OF MP BOARD WITH CBSE BY CLASSES (PERCENTAGES OF INSTANCES)

Source	Environment Education			Environmental Citizenship		Role of Natural or Human-made Disasters Educa- tion and Safety	Total Instances Coded	
	General	Depletion and Conservation of Resources	Understanding Ecosystem	Waste Generation and Management	Environmental Citizenship			Environmental Values and Ethics
Secondary school:								
CBSE	0	33.33	27.08	27.08	2.08	0	10.42	100
MP Board	2.30	28.74	25.29	32.18	1.15	3.45	6.90	100
Senior secondary school:								
CBSE	1.10	37.36	36.26	12.09	2.20	4.40	6.59	100
MP Board	.63	10.63	35.63	36.88	7.50	3.75	5.00	100

NOTE.—Secondary school includes classes 9–10; senior secondary school includes classes 11–12. CBSE = Central Board of Secondary Education.

TABLE 8  
COMPARISON OF MP BOARD WITH CBSE BY CLASSES AND THEME (PERCENTAGE OF INSTANCES)

Source	Environment Education			Environmental Citizenship		Role of Natural or Human-made Disasters Educa- tion and Safety	Total Instances Coded
	General	Depletion and Conservation of Resources	Understanding Ecosystem	Waste Generation and Management	Environmental Citizenship		
Secondary school:							
CBSE	0	39.02	37.14	31.71	50.00	0	35.56
MP Board	100	60.98	62.86	68.29	50.00	100	64.44
Total	100	100	100	100	100	100	100
Senior secondary school:							
CBSE	50.00	66.67	36.67	15.71	14.29	40.00	36.25
MP Board	50.00	33.33	63.33	84.29	85.71	60.00	63.75
Total	100	100	100	100	100	100	100

NOTE.—Secondary school includes classes 9–10; senior secondary school includes classes 11–12. CBSE = Central Board of Secondary Education.

### Discussion and Recommendations

Existing EE literature suggests that there is no one best way to teach the subject and that EE should be context-driven (Vargas 2000; Pande 2001; Bekalo and Bangay 2002). In India, the syllabus is used as a guide for all teaching and learning activities in the classroom. In the case of Bhopal, however, there is a clear disconnect between the immediate historical context and the classroom content taught to survivors of the tragedy and their children. Our syllabi-based analysis illustrates this disconnect in five main ways. First, across all classes, the MP Board strongly emphasizes natural science-based topics such as understanding the ecosystem and waste generation and management. Second, the MP Board environmental science syllabi suggest the same natural science focus. Across all classes, the syllabi have the most instances addressing waste generation and management, with classes 9, 11, and 12 focusing on waste generation and class 10 on conservation of natural resources. Third, our comparison shows that across all classes the most instances of the depletion and conservation of resources and understanding of the ecosystem themes occur in CBSE syllabi, while the MP Board gives preference to waste generation and management and understanding the ecosystem. Fourth, across all levels and both boards' syllabi, there is little to no reference (in required textbooks) to the Bhopal gas tragedy and the role of human-made or natural environmental disasters. Fifth, environmental citizenship, along with values and ethics that tap into the more sociopsychological aspects of EE, were the least referenced theme.

Our analysis of the syllabi raises this question: To what extent have children in Madhya Pradesh cultivated an "ecological literacy" that may assist in future sustainable development efforts? The Bhopal tragedy is considered one of the most deadly human-made disasters in history, yet the evidence presented here suggests that, at least at the level of curricular inclusion, youth will not learn much from or about its causes and consequences. K. King (1986) provided a plausible explanation for this absence: unlike other science-based interventions such as dams, resettlements, or high-yield crops—areas in which local popular knowledge may be directly relevant to the case—an industrial disaster provides fewer opportunities to use popular knowledge. In addition, King suggested that to understand the causes and effects of an industrial disaster, scientists and other experts need to make the incident accessible to popular science. While the NCERT and its 2005 NCF offer a holistic, comprehensive approach to ESD, attention to the environmental impact of the Bhopal gas tragedy—the most devastating environmental disaster to affect Madhya Pradesh state—is largely absent from the curriculum.

There is one exception to this approach. For the class 12 environmental studies textbook, the Madhya Pradesh Board of Secondary Education has

collaborated with the Centre for Environmental Education (CEE),<sup>10</sup> a national institute promoting EE. The textbook largely follows the natural resource approach to EE, but it also includes chapters on environmental management and sustainable development. These chapters focus on the ethical, legal, and socioeconomic aspects of environmental management and sustainability. The legal aspects section also presents a snapshot of the Bhopal gas tragedy in which a short summary of the 1985 Bhopal Gas Leak Act is provided. A more holistic treatment of the tragedy and its environmental and human impact is missing, however.

Apart from this collaboration, which constitutes the only notable reference to the Bhopal disaster, the MP Board secondary schools' environmental science syllabi and textbooks contain little reference to the Bhopal gas tragedy. Human-made disasters are the least discussed component of Indian environmental education, comprising just 6 percent of the instances found through this study. For example, in the disaster management section of the MP Board syllabi, the types of human-made disasters mentioned are "Nuclearic, Biotic and Chemical, Bomb Blast," with little specific mention of the Bhopal gas tragedy. Absent also are the social injustices that led to and resulted from the tragedy. There is no reference to human rights activists' demands for fair compensation and extradition of former leaders of the Dow Chemical company to be brought to justice in India nor any mention of the debate over the inequitable medical care provided to victims. The MP Board syllabi included broad terms such as the "Concept of Environment in Indian Culture, Ethics, Legislation on Environment," which would provide an opportunity to connect to the local needs of Bhopal, but the present syllabi do not do so. Even the significant legal dimensions that activists are advancing related to the tragedy, which could be integrated into subjects such as civics or social sciences, receive no attention.

Our findings indicate that syllabi are science dominated, with the most frequent theme being EE. This theme includes factual scientific knowledge, but it neglects the more sociocultural aspects of EE. Cole (2007, 40) noted that "science is particularly dangerous because of this discourse of objectivity." It is often more convenient to impart scientific facts than delve into more cultural and value-based constructs (Adara 1996), but the absence of any significant information related to the Bhopal gas tragedy is a stark gap in Madhya Pradesh state curricula as well as in national curricula.

Conversations with environmental science secondary school teachers in MP corroborate our findings and further reveal that the Bhopal gas tragedy is not part of the secondary school curriculum (classes 9–12). The only mention is in a textbook not required in preparing for high-stakes national exams, thus limiting students' interest in choosing to research it for independent

<sup>10</sup> The CEE was established as a Centre of Excellence in 1984, supported by the India Ministry of Environment and Forests (see <http://ceeindia.org>).

projects. Teachers also noted that the effectiveness of the syllabus delivery is largely dependent on the teachers' interest. If educators feel that a topic is not addressed adequately in the textbook, they can supplement it with other material, but due to time constraints and incentives for students' strong performance on exams, they usually stick to the prescribed content of what will appear on standardized tests.

While educational officials espouse concepts of ESD in vision statements and national frameworks, they have ignored such trends in teaching about the environment related to notions of citizenship, environmental justice, human rights, and sustainable development (Jenkins 1994; Vargas 2000; Spring 2004). International discourses on ESD could easily be localized given Bhopal's deep and enduring experience with a chemical disaster. It is thus ironic that the curriculum does not educate the students about the multi-dimensional aspects of EE. We now offer some suggestions to use the Bhopal gas tragedy as an opportunity to develop ecological literacy.

### **Recommendations**

The Bhopal gas tragedy can be a useful local example of the sometimes disastrous relationship between humans and their environment. As such, we recommend the following policy changes to the national and state boards of education.

First, we suggest that the natural sciences and the social sciences at the secondary level be revised to include a comprehensive, holistic treatment of the Bhopal disaster. This approach would include all aspects of ESD as defined in the literature, including the cognitive component (knowledge, awareness), an affective component (attitudinal, behavior), an action-oriented component (skills), and an impact component (sustainability, equity).

Second, lessons about Bhopal should emphasize intersections with health, human rights, population, livelihoods, social justice, and global inequalities. To practice the ESD framework in the context of the Bhopal case, students' direct access to the disaster site and NGOs' work with survivors offer multiple opportunities for interactive and experiential learning. Greater efforts should be made through syllabi, teacher training, and student initiatives to bring this tragedy and its consequences into discussions of the environment.

The Bhopal disaster can be part of a multidisciplinary approach to teach about EE and challenges to sustainable development. For example, environmental and social justice aspects can be incorporated in syllabi through case studies of lawsuits against Union Carbide (now Dow Chemical). Similarly, conflict resolution and peace education would add value to the disaster management side of the tragedy. Governance or social politics can be the base for debates on whether such factories should be located within densely pop-

ulated areas. Contextualizing the learning to local needs will lead to “No more Bhopals,”<sup>11</sup> a slogan commonly used against chemical disasters.

If needed to inspire action, the state board could give students incentives (points or additional marks for college entrance) for project-based learning that would connect students to their local environs, as Pande (2001) has observed in northern India. Such action-oriented projects could include awareness campaigns about chemical leaks, greater advocacy for local authorities and citizens groups to be part of deliberations about the establishment of factories containing hazardous materials, and schools or community service with local NGOs and social activist groups.

Third, to bring attention to the lessons of the Bhopal gas tragedy, policy makers at the national level should expand content in syllabi and textbooks, and include the topic in national-level examinations. While education policy makers sometimes avoid controversial issues to “play it safe,” the emergence of a new generation that is not learning from the past offers frightening prospects for the avoidance of such disasters in the future. National-level competitions, student conferences, and debates could commemorate the lessons that the Bhopal disaster offers for the relationship between humans and our environments.

The Madhya Pradesh education system would need more local collaboration to integrate EE into the state’s curricula beyond a few mentions in textbooks. Support systems to aid in curriculum design and implementation at the national and state levels—such as community organizations, NGOs, and teacher training institutions—may accelerate the incorporation of more holistic forms of education for sustainable development and reduce delays in the implementation process. Several activists in Bhopal have focused on the legal aspects of the tragedy, demanding compensation and justice, but the educational aspect has been neglected. It might be initiated first by Madhya Pradesh educators and then travel up to the national level, reversing the traditional direction of educational reforms in India. At present, the national curricular body NCERT tells Madhya Pradesh—and specifically students in Bhopal—what happened over 25 years ago. The class 8 NCERT social science textbook features a pictorial narration of the gas tragedy through to the present-day aftereffects. Bhopal could do much more for its children than merely present snapshots of the tragedy that students gloss over in favor of more instrumental exam-related information.

## Conclusion

This article reviewed the emergence of EE and ESD in international discourse and examined the extent to which Indian EE curricula have heeded international trends by using a local environmental disaster as a learning

<sup>11</sup> See <http://www.studentsforbhopal.org/node/589>.

point for students. In choosing a more science-based approach to EE, Indian education authorities address important physical aspects of the issue but miss an opportunity to articulate a more comprehensive strategy. Ideally, EE should be a combination of both science and social science subjects. Education for sustainable development may have increased in global parlance, with the United Nations having declared 2005–14 as the decade for Education for Sustainable Development, but attention to interdisciplinary curricular reform in India has not accompanied these global efforts. If education is to play a role in sustainable development, as scholars and international organizations have asserted it should, students must learn about historical and current relationships between humans and their environment. The Bhopal environmental disaster provides Indian students an important lesson in this regard, but it has been neglected in formal schooling and requires renewed efforts by policy makers and activists to reconfigure its role in an expansive and forward-looking approach to education for sustainable development in India.

Education for sustainable development as an educational approach still faces a lack of connection to real-life socioeconomic and environmental problems, as evidenced by the case presented here. Though there have been sporadic experimental efforts in India and elsewhere, institutional and structural constraints need to be overcome. Our syllabus analysis suggests that the narrow definition of EE as rooted in and primarily found in the subject of science predominates in India. This approach undermines the essence of ESD, which seeks to integrate the cultural, social, political, and economic aspects of humans and their environments. Advancing an ESD framework would help in its integration into all subjects.

The genesis of EE in Indian schools was not directly influenced by the Bhopal gas tragedy. Multiple initiatives for incorporating environmental science took place before and after 1984, and the year was not a turning point in the evolution of environmental science education in India. Much is to be learned from the chemical disaster, however. Communities in Bhopal are still living through the incident's aftermath, which has taken over the city's economy, health, and environment. The objectives of education for sustainable development advocate for learning about the environment as a way of life, a process that continues outside school. Therefore, not only should students learn from class-based instruction but also from the survivors of the gas leak themselves. Environmental learning should progress from the local to the global. The first step in this process and toward a more holistic education would be to expand the content and coverage of the Bhopal gas tragedy in Madhya Pradesh syllabi and textbooks. Learning from the recent past, especially while it still affects the present, would offer students the opportunity to analyze local issues in a more complex manner and contribute to NCERT's vision of creating future global environmental leaders who have a holistic vision of development.

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