Human/Nature Discourse in Environmental Science Education Resources

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Abstract

It is argued that the view of nature and the relationship between human beings and nature that each of us holds impacts our decisions, actions, and notions of environmental responsibility and consciousness. In this study, I investigate the discursive patterns of selected environmental science classroom resources produced by three disparate subcommunities: the provincial government, a school district, and a non-governmental organization. The findings illustrate how the discursive management of the human-nature relationship and the view of nature in programs and materials for schools offer students a particular perspective, acting to shape their personal relationships with nature and environmental consciousness. The study points to a need for a critical appraisal of resources for schools produced by the environmental/science community.

Résumé

On prétend que la perception qu'on a de la nature et de notre relation avec la nature, influence nos décisions, nos actions, ainsi que notre connaissance de la responsabilité environnementale et de la sensibilisation à l'environnement. Dans cette étude, j'examine divers modèles discursifs de ressources pédagogiques en sciences de l'environnement que trois sous-communautés différentes ont créés : le gouvernement provincial, un district scolaire et une organisation non gouvernementale. Les résultats montrent à quel point la gestion discursive de la relation humain-nature et la présence de la nature dans les programmes et le matériel scolaires offrent aux élèves un point de vue particulier, agissant sur le développement de leur lien personnel avec la nature et de leur sensibilisation à l'environnement. L'étude montre un besoin pour une évaluation majeure des ressources scolaires produites par la communauté environnementale et scientifique.

Keywords: human-nature relationship, discourse analysis, classroom resources, environmental education

Introduction

Environmental education in many education jurisdictions is not offered as a discrete subject, but rather is subsumed primarily within the subject of science and, to a lesser extent, social studies (Simmons, 1989). Hart (2003) suggests that children's school experiences act to shape their personal

relationships with the social and natural world, and that these relationships frame their sense of social and environmental responsibility. Similarly, Östman (1994) argues that science education constructs a particular view of the human-nature relationship and of the world around us, and that "it is therefore not possible to isolate or to separate the teaching of science concepts from socialization in to some kind of environmental consciousness" (p. 142). If Östman is correct, that places a particularly heavy burden on science teachers—as a consequence of our teaching, what kind of "environmental consciousness" will our students develop? How will the textual resources we bring into our classrooms and depend on for instruction impact our students?

Text and textbook materials play a role in enacting curriculum, shaping experience, and shaping identity. Text is not a neutral purveyor of knowledge; rather, it acts to construct a particular view of reality. What counts as knowledge, culture, or beliefs is re-created and legitimated through texts (Apple, 2000). As discourses, texts can function ideologically, contributing to maintaining hegemonic social relations (Lemke, 1995). It is important to recognize, however, that readers interpret texts—meaning is dialogically constructed between the producer and reader of any text. Additionally, it cannot be assumed that what is written in any particular classroom text is taught as the writer intended; teachers' beliefs operate as a mediating factor between the text and students (Cotton, 2006). Nevertheless, texts are oriented towards a specific audience. "These orientations involve value preferences; they commit … to a political stance and a social point of view" (Lemke, 1995, p. 12). Therefore, school texts and their influence cannot be disregarded.

Coupling Östman's notion of the moral nature of science teaching (see also Kolstø, 2001; Kolstø et al., 2006; Zeidler, Sadler, Simmons, & Howes, 2005) with a recognition of the role text plays in enacting curriculum has fostered my concern about the classroom resources available to elementary teachers, particularly in light of the embedded nature of environmental education in Alberta elementary science instruction. The purpose of this study is to investigate the discourse of these resources, specifically, the perspectives and messages presented through written and visual text concerning nature and the human-nature relationship. The study has been guided by the following questions: *How is discourse used to convey the various dimensions of the human-nature relationship? What views of the natural world are presented in the discourse?*

Context

The province of Alberta, Canada is recognized for its natural beauty and diverse landscapes. Alberta is also known for its significant economic dependence on extractive industries and conservative politics. Within this context, instructional resources produced in Alberta present a particular view of

the environment and our relationship to the natural world. In Alberta several subcommunities including government, industry, non-governmental organizations, and school districts develop and promote various science/environmental education resources. In many cases, the resources are produced through a "partnership" among industry, government, and non-governmental organizations.

Through the production of textual resources, the subcommunities comprising the science/environmental education field, intentionally or not, influence understanding, moral responsibility, and individual action by discursively constructing a view of nature and the human-nature relationship. It is therefore important for teachers to approach instructional resources with a critical eye, paying particular attention to the place in which they teach (Chambers, 1999) and how the discourse of environmental education is shaped by this context.

Theoretical Framework

Östman, in collaboration with Roberts, developed the notion of companion meanings, notably in terms of science discourse and text (Östman, 1998; Östman & Roberts, 1994; Roberts, 1995, 1998). Companion meanings include not only the deliberate or policy driven meanings, but also "the not-so-deliberate (but still very real …) 'extra' meanings that accompany scientific meaning, in curriculum and textbook as well as in teaching" (Roberts, 1998, p. 11). Companion meanings are embedded in discourses through *what* is said or not said and *how* it is said or not said.

Drawing upon the dialogical meaning inherent in discourses, Östman (1994; 1996; 1998) describes the concepts of a "nature language" and "subject focus," two category systems useful for revealing companion meanings communicated in science texts. Nature language employs discursive practices and root metaphor(s) (or a blend of different root metaphors) to govern the use of language *about* nature, conceptualizing reality and constructing a particular view of nature. Östman delineates four categories of nature language: *classical*, *biomechanistic*, *ecomechanistic*, and, added by Östman in 1998, *organicist*. Classical and organicist represent opposite extremes, with biomechanistic and ecomechanistic blends of the two (see Table 1).

The concept of subject focus is concerned with the discourse around the *relationship* between human beings and nature. How teachers (or texts) describe and/or use nature in science classrooms communicates a certain view of this human-nature relationship, ascribing a value to nature and our consequent moral responsibility (Östman, 1994; 1996; 1998). Drawing from the work of Fensham (1988), Östman delineates two primary categories of subject focus: *Induction into Science* and *Learning from Science*. The *Induction into Science* subject focus views nature simply as an educational tool for teaching

	Classical	Biiomechanistic	Ecomechanistic	Organicist
	← Continuum from Classical (mechanistic) to Organicist (holistic) →			
Root metaphor(s)	Mechanistic, deterministic, atomistic Objectified approach (nature is an object/thing separate from humans and human values)	Life functional ideas used (nature functions to support life), but classical notions and language predominant	Ecologically oriented form of classical language Holistic views are articulated alongside atomistic and mechanistic, but organicist language dominant	Interconnected, holistic language Ecological/systems perspective (nature is understood relationally, i.e., parts understood in relation to the whole; phenomena understood in relation to other phenomena)
Discourse rules	Root metaphor: machine	Metaphorical blend: view that nature functions as a machine *and* its purpose is to create and maintain life	Metaphorical blend: nature is a self-regulating whole that can be explained by mechanistic/ atomistic reasoning	Root metaphor: integration/whole

Table 1. Östman's (1994, 1996, 1998) categories for nature language.

students science concepts; no moral obligations are associated with this particular stance. Within *Learning from Science*, science is a means for describing and explaining nature and natural phenomena, essentially the reverse of the *Induction into Science* subject focus. Östman further distinguishes four subject foci within *Learning from Science*: *Exploitation of Nature*, *Human Being as Threat*, *Survival of Homo sapiens,* and *Preservation of Nature* (see Table 2). Each subject focus constructs a particular concept of nature, together with a vision of the relationship between human beings and nature.

In the production of texts, perspectives are constituted which set out the nature, purposes, and goals of specific communities. The semiotic resource systems of such texts make possible diverse patterns with potential for diverse meaning. Drawing on the work of Halliday (1978; 1985), Lemke (1995) suggests that three interdependent dimensions (semiotic metafunctions) of meaning-making may be derived from text semantics: presentational, orientational, and organizational. The presentational dimension sets forth the specific themes of the text, providing "explicit description of participants, processes, relations and circumstances" (Lemke, 1995, p. 41). This thematic dimension constructs a view of "how things are." The orientational or atti-

Exploitation of Nature	Human beings have used or can use nature to promote their material welfare; nature is a resource for exploitation by human beings and we have no moral responsibility in that respect.
Human Being as Threat	Human beings are threatening themselves and other living organisms; language used does not ascribe value to nature; communicates the idea that human beings have no moral responsibility or obligation when dealing with nature.
Survival of *Homo sapiens*	Humans should take a responsible attitude towards nature insofar as the survival or well-being of other human beings could be at stake; anthropocentric or human-centred ethical argument.
Preservation of Nature	Humans should take a responsible, duty-based attitude towards nature; nature has intrinsic value which we do not have the right to violate; biocentric or nature-centred ethical argument.

Table 2. Östman's (1994, 1996, 1998) categories for human-nature relationships or subject foci.

tudinal dimension constructs an evaluative stance towards audience and other related discourses. This dimension encompasses value preferences and points to a social and political stance. A third dimension is the structure of specific texts within a discourse, together with the organization of information to give prominence to selected pieces, giving rise to recognizable genres characterizing communities.

Similarly, Kress and van Leeuwen (2006) draw upon the work of Halliday (1978; 1985) to describe and analyze the semantic or meaning potential of visual text. They describe the social semiotic resources of visual text in terms of the representational (presentational), interactive (orientational), and compositional (organizational). Including analysis of visual text is important because, as Lemke (1998b) points out, "the medium of printed scientific text is first of all a visual one" (p. 95). Meaning is co-constructed between visual and linguistic text. Conversely, meaning may be constructed from contradictory messages; in multimodal text, visual text may construct one set of meanings and written text another (Kress & van Leeuwen, 2006).

Drawn together, Östman's (1994; 1996; 1998) notions regarding dialogical companion meanings, nature language, and the human-nature relationship; Lemke's (1995) semiotic resource systems for language and discourse; and Kress and van Leeuwen's (2006) semiotic resources of visual text form the theoretical framework for the discourse analysis of science/environmental education classroom resources.

Mode of Inquiry, Data Sources, and Analysis

My interest is in the dialogical meaning of a text and how a text acts to socially construct the identity and experience of the reader. As a consequence, the analytical method must attend to semantic content and rhetorical interaction in relation to language and other symbolic systems in a social context—in other words, discourse (Lemke, 1995, 1998a). Discourse analysis embodies a theory of meaning-making that co-exists alongside a sociocultural theory of human behaviour (Lemke, 1995). Unlike corpus analysis, which is quantitative and concerned with the pattern and number of occurrences or co-occurrences of particular keywords, discourse analysis is a "form of 'qualitative' social analysis" (Fairclough, 2003, p. 6).

In this study, the language and visual text of science/environmental elementary education documents relating specifically to a curricular topic—forest ecosystems—has been analyzed and interpreted, with the intent of characterizing the discursive management of nature and the human-nature relationship. Data are derived from selected print documents produced specifically for Alberta elementary classrooms by three disparate subcommunities in the field of science/environmental education: the provincial government, a school district, and a non-governmental organization (see Appendix A for resource bibliography). The selected documents address forest ecosystems education at the elementary education level. This particular area was chosen for several reasons:

- "Trees and Forests" is a topic of study in Grade 6 of the Alberta Elementary Science Program of Studies (Alberta Learning, 1996),
- the trees and forest topic includes environmental/human impact learning objectives,
- "forests" is a predominant topic represented in the resources produced by the various subcommunities, and
- Alberta is known for its significant economic dependence on the fossil fuel and forestry industries and its conservative politics. This last reason points to the particular political and social context of production for these instructional resources.

Key grammatical patterns that operate to construct a view of nature and human-nature relationship have been examined, specifically the patterns in relation to cause-and-effect links and human agency. As well, visual semiotic patterns have been analyzed. Particular attention was given to those sections (activities or lessons) in the texts that are concerned primarily with human uses of, or perspectives about, forests and forest ecosystems. For each document, the presentational, orientational, and organizational patterns within the texts have been drawn out.

Findings

View of Nature

As previously described, Östman introduces four views of nature: classical, biomechanistic, ecomechanistic, and organicist. Following are illustrative examples of the predominant nature language found in the forests resources. These examples are drawn from a more comprehensive dataset of findings (see Chambers, 2007).

Ecomechanistic. Östman (1994) describes an ecomechanistic view of nature as using more holistic language which suggests "that nature is a self-regulating whole … the function of the self-regulating whole is to generate and maintain life" (p. 148). The non-governmental organization resource *Between the Stands* predominantly presents this view, both in the language of the text and the conceptual representations of a forest on the accompanying poster. Analytically, the poster images depict the forest as a whole (carrier), composed of a number of conjoined parts (possessive attributes) (Kress & van Leeuwen, 2006). The images portray a shared responsibility and relation to an interconnected whole, as does some of the accompanying text. However, other textual features remove human agency and connection.

From a narrative analysis, the inner poster image portrays a positive relationship between human beings and nature, at least from a human perspective. Where facial expressions can be determined, the people appear happy as they affect essentially every area of the forest. The animals appear to co-exist peacefully alongside humans. But, if the wildlife depicted on the front of the poster (natural forest) is compared to the wildlife in the human-used forest, changes as a possible consequence of human impact are evident.

The numbers of individual animals are considerably less, as is the biodiversity (see Table 3). However, teachers and students will have to come to an awareness of this difference without support from the accompanying lessons, none of which mention loss of biodiversity or a decline in animal populations as a consequence of human development and industrial activities. The implication is there, but what is *not* said may "speak volumes," communicating a particular view of nature.

	Natural forest	Human-used forest
Animals		
Wild	62	31
Domestic	0	9
Species		
Wild	22	13
Domestic	0	3
Humans		
Visible	0	55
Implied +	0	8
+ Refers to humans implicitly present as machine operators, e.g., flying an airplane, driving a truck		

Table 3. Numbers of animals, species, and humans represented on the *Between the Stands* poster.

Organicist. The text in the teacher's guide of the non-governmental organization resource, *Between the Stands*, predominantly constructs a view of nature that is ecomechanistic, whereas the poster images could be construed as shifting between an ecomechanistic and an organicist view. Östman (1998) suggests an organicist view recognizes nature "as an organism, a life-giving entity, in which the parts are subordinated to and intelligible in relation to the whole" (p. 63). Complexity or systems thinking is central to organicism. Similar to the poster images, the student text (banner) moves back and forth between the ecomechanistic and organicist view. Forests and forest ecosystems are described functionally. The constituents are described in relation to their influence on other parts. Nevertheless, words such as "interaction," "community," "web," and "ecosystem" construe a more holistic and organicist view of nature. Consequently, depending on the particular piece of written or visual text examined, the view of nature subtly shifts.

The government resource, *Envirokids*, also presents a blended view of nature. The student text shifts between a biomechanistic and ecomechanistic view, depending on the activity analyzed. The teacher's guide contains additional text that construes a fairly strong ecomechanistic view of nature, counter to some of the biomechanistic views constructed in the associated student text. The activity "A Healthy Forest" exemplifies the differing views of nature. In the student text, there is an image of a young girl examining a branch from a tree (see Figure 1). The girl's expression suggests she is distressed by the damage caused by a caterpillar. A narrative analysis of this image reveals a bidirectional transactional structure, as evidenced by the strong vector from the caterpillar to the girl and the vector created by the girl's eyeline towards the caterpillar on the leaf (Kress & van Leeuwen, 2006). There is an interactive relationship between the two participants, the girl and the

caterpillar. The caterpillar is the cause of the girl's distress. She, in turn, appears to question what it is she can do to alleviate the "problem." Her expression suggests that it is a problem to be fixed, rather than an instance of an organism living its life relationally, as part of an ecosystem.

The accompanying text supports the notion that organisms such as caterpillars are to be viewed predominantly as "pests" that damage trees, ostensibly reducing the forest's productivity, value, and use for human consumption. Conversely, the text in the teacher's guide suggests an alternative perspective, one that holistically recognizes the intrinsic value and necessary place of all forest organisms as part of the biodiversity within a forest ecosystem.

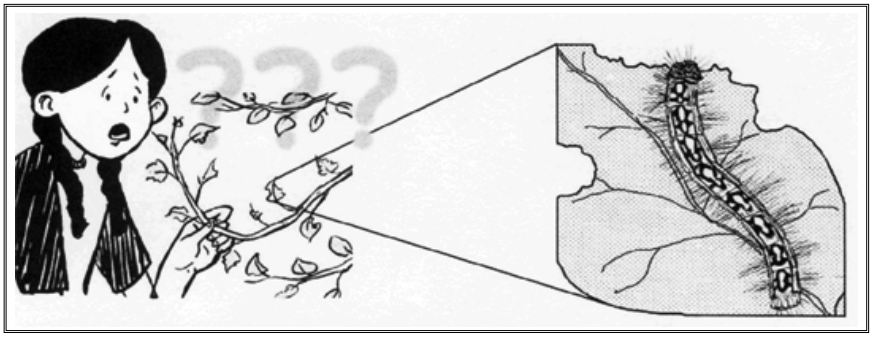

Figure 1. Image showing a negative, interactive relationship between the girl and the caterpillar/pest. (*Envirokids,* 2006, p. 16)

Human-Nature Relationship

Parallel to the findings regarding the discursive management of the view of nature, the resources *Between the Stands*, *Envirokids* (student and teacher texts), and *Trees and Forests* construct a range and blending of human-nature relationships. The predominant subject foci of these may be described as *Exploitation of Nature*, *Survival of Homo sapiens*, and *Preservation of Nature*.

Exploitation of Nature. The *Trees and Forests* resource and, in some instances, the *Envirokids* student text, communicate similar visions of the relationship between human beings and nature—that of *Exploitation of Nature*: "human beings have used or can use nature to promote their material welfare. …[It] also implies that nature is a resource for exploitation by human beings and that we have no moral responsibility in that respect" (Östman, 1994, p. 145). The school district text, in particular, constructs a relationship whereby humans have the power to decide the uses and, essentially, fate of forests and forest organisms. For example, human agency is expressed in terms of control (underlined text), evident in the following text: "You are in charge of deciding which different animals live in the forest. … You are in charge of creating a forest which will improve the wildlife value" (*Trees and Forests*, 1996, p. 131).

The language connotes an almost God-like role for humans in the "creation" of forests. The relationship between humans and animals signified by the text implies animals as a resource (i.e., "game") for human use and exploitation. No explicit statements or implicit indications of moral responsibility are included in the text. Additionally, the "value" of wildlife is viewed entirely from an anthropocentric position, recognized in terms of economic value or usefulness. Wildlife has virtually no intrinsic value on its own.

Survival of Homo sapiens. The government-produced student text, *Envirokids*, though similar to the school district text, does not express human control nearly as strongly. There are also suggestions of an implicit moral responsibility towards nature, shifting the human-nature relationship towards *Survival of Homo sapiens*. Within this subject focus, it is hoped that students will develop an attitude of responsibility for nature because "human beings are dependent on nature" (Östman, 1994, p. 146) for survival. Consequently, this stance is considered human-centric. Forests are still presented primarily as a resource for our own use. Possessive deixis is frequently used: "*our* forests," "*our* use," and "*our* world." In the student activity, "A Healthy Forest," the majority of reasons given for the importance of a healthy forest are to sustain its usefulness as a resource for human use, now and for future generations. The most salient feature on the two-page "photo album" layout is the heading "What does a Healthy Forest mean to you?" The letters in the words "Healthy Forest" are "constructed" out of lumber (see Figure 2). This suggests a strong underlying conception of forests *as* lumber and wood products, ostensibly for human use.

Figure 2. The "lumber" font in the heading "Healthy Forest: What does a Healthy Forest mean to you?" (*Envirokids*, 2006, p. 14)

The pages contain 10 drawings/"photos" of people representing different viewpoints: that of forester, environmentalist, hunter, biologist, government official, First Nations person, and so on. With the exception of the biologist, who suggests forests are important for plant and animal organisms, each represented participant constructs a view of forests in terms of "our"/human needs. The environmentalist's representation constructs a view that could be

interpreted from a human-centric *or* biocentric view, depending on whether the phrase "for future generations" refers to human beings or the more-than-human world.

Preservation of Nature. The subject focus of the non-governmental organization resource, *Between the Stands*, shifts depending on the intent of the particular piece of text. For example, in the section of the banner titled "Value of the Natural Forest," the subject focus shifts from a *Survival of Homo sapiens* human-nature relationship towards *Preservation of Nature*. This focus is very similar to *Survival of Homo sapiens*. Both include a responsible attitude towards nature as a learning objective. The difference rests on the reasons why humans should be respective of and responsible for nature.

In *Preservation of Nature*, nature is viewed as having "intrinsic values which human beings do not have the right to violate. … It is biocentric, or nature-centred" (Östman, 1994, p. 146). In this piece of text, a biocentric perspective regarding the importance of a forest ecosystem is implied; forests are described as "very important" to biodiversity, the "environment as a whole," and to the "whole world." This is preceded with the value of a forest described in terms of its importance to "our national economy" and for personal recreation and enjoyment. Consequently, there exist subtle shifts in subject focus within this piece of text. However, if we take a step back, so to speak, and visually examine this particular page of the banner, the piece "Value of the Natural Forest" is positioned in the lower, left-hand corner of the page, a position low in salience and less highly valued (Kress & van Leeuwen, 2006; Veel, 1998). If we look from even further back at the typography of the banner as a whole, the headings that strongly stand out are information-focused—"The 'Rules' of the Forest," "What is a Forest?" and "Forest Quick Facts." Orientationally, font type, size, and boldface can indicate emphasis or importance. Organizationally, the placement, sectioning, and spatial relations (i.e., caption space to figure space) indicate preferential reading order, suggesting "what goes with what" (Lemke, 1998b, p. 95). The banner typography and organizational structure place emphasis on the factual or informational texts. Though the messages/companion meanings are mixed, taken as a whole, the resource construes a relationship with forests, and subsequently nature, that recognizes some responsibility for nature but is human-centric.

Discussion

The findings of this study suggest the language patterns and images incorporated in the science/environmental instructional resources produced by various subcommunities construct a particular discourse about nature and the relationship between human beings and nature. Through their interaction with written or visual text, children may consciously or unconsciously assimilate

the messages and companion meanings embedded within the text, becoming participants in a particular, socially constructed discourse about nature. And if, as Hart (2003) suggests, middle childhood is extremely important in the construction of environmental and social consciousness, it is crucial we investigate the discourses of classroom resources that may play a role in shaping that identity, particularly in light of the increasing involvement of corporations in educational resource production.

Intentionally or not, the subcommunities comprising the science/environmental education field influence understanding, moral responsibility, and individual action. Corporations play a huge and expanding role in resource production (Beder, 2002; Molnar, 2002-2003), particularly in terms of monetary sponsorship for the non-governmental organizations. Educators must be aware of stakeholders' agendas, and their subtle (and oftentimes not-so-subtle) influences within curriculum, and be cognizant of their place as participants in these discourses. I recognize that meaning is not determined by the text alone—children are co-constructors in meaning-making as they interact with the text—and that teachers play a dynamic role in mediating the messages embedded in instructional resources. However, "educational texts are institutionally defined" (Kalmus, 2004 p. 471) and as such, carry a certain authoritative weight, shaping children's thinking in specific ways. Teachers need to be aware of the discourses of these resources and of the messages they may unknowingly be bringing into their classrooms. It is therefore important for teachers to approach instructional resources with a critical eye—to critically examine and be aware of underlying meanings, social stances, hegemonic ideologies, and possible corporatist agendas embedded in environmental science resources that effectively act to carry forth and shape students' identities, views of nature and the environment, and social practices. This research endeavours to raise questions and awareness of the ecological and science discourses that are part of environmental science resources produced for the elementary classroom.

It is also important for educators to be aware of how the teaching and learning of science, directly or indirectly, plays a significant role in the development of student attitudes towards nature, environmental responsibility, and consciousness. The language of school science can effectively distance students from an awareness or understanding of the interconnectedness of Earth's systems, particularly in regard to human values, interaction, and agency. Lemke (1995) suggests "a discourse, a way of speaking, is considered less scientific, or even rendered 'unscientific' exactly to the extent that it includes elements either of the language of feeling or of the language of action and values" (p. 178). Thus, school science discourses, in order to be perceived as scientific, necessarily remove language related to values and action. And yet, values and critical action are essential to ecological literacy. This is an especially important notion since environmental education is most often subsumed within the subject matter and teaching of science. Finally, it is also crucial that

educators, including pre-service educators, curriculum developers, and resource developers recognize that while school may only form a small part of children's education on their path to adulthood, it "set[s] [them] on certain paths rather than others, paths that foreclose many possible alternative trajectories of development in [their] patterns of beliefs, values and actions" (Lemke, 1995, p. 141). We must ask ourselves, what are the patterns constructed by the discourses of environmental science classroom resources? What do we want those patterns to be? Who decides?

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Appendix A

The following instructional resources were included for analysis:

Alberta Sustainable Resource Development. (2001, Revised 2006). Envirokids investigate forest health, *Envirokids Series*. Edmonton, AB: SRD Information Centre.

Alberta Sustainable Resource Development. (2004). Envirokids investigate forest health: Teacher's guide for Grades 6 & 7, *Envirokids Series*. Edmonton, AB: SRD Information Centre.

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