MINING THE CURRICULUM: Comparing the form and content of the museum exhibit Mine Games with other mining curricula

by

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A THESIS SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF MASTER OF ARTS in

THE FACULTY OF GRADUATE STUDIES
CENTRE FOR CURRICULUM AND INSTRUCTION

We accept this thesis as conforming to the required standard

THE UNIVERSITY OF BRITISH COLUMBIA
AUGUST 1996
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The University of British Columbia
Vancouver, Canada

Date ________________ 1996

DE-6 (2/88)
ABSTRACT

In 1993, facing a future of escalating land-use controversies and a less than sympathetic public attitude towards mining, major corporations in the British Columbia mining industry and the provincial government invested in a public education project: Vancouver’s Science World’s Mine Games exhibit.

This thesis will examine two pedagogical highlights of the Mine Games exhibit promoted by Science World and its sponsors. They are the interactivity of the exhibit (as evidenced by the hands-on stations and the computer games) and the decision-making or ‘consensus-building’ process experienced in the simulated town-meeting, Hotseat! One of the virtues of an exhibition that explicitly makes a case for its merits and attempts to tell an important story is that it encourages debate and makes possible the suggestion of other stories.

In this thesis, I critique Mine Games on the claims it has made for itself. The thesis adopts a comparative approach, contrasting the pedagogical goals and content of the Mine Games exhibit with school based mining curriculum. I argue that the narrative and museological conventions of the exhibit reveal the story of Mine Games for what it is -- a specific, comedic story that excludes other stories. Hidden under the facade of high-tech displays and computer games is a traditional approach used both in schools and museums to exercise control and deliver a non-threatening message: environmental controversies are resolvable, all it takes is reasoned compromise.
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Acknowledgements

I would like to thank Avner Segall with whom I have had the good fortune to discuss many important topics in education. My work on Mine Games began with Avner as an assignment for a course with Dr. Walt Werner. The energy and enthusiasm generated in that first cooperative analysis motivated me to take on the exhibit as a thesis topic.

I would also like to acknowledge my parents, Larry and Jan Korteweg, who repeatedly asked me why I was doing a thesis in the first place. The thesis would not have finished in its final form if it had not been for the involvement and input of my committee. I appreciate that Dr. John Willinsky was willing to get involved with my work at a later point in the process. His insightful comments helped hone the pedagogical focus of the thesis. Dr. Walt Werner was persistent in pointing up particularly baffling terminology and points. Again I appreciate his involvement in this project at a very busy time in his schedule. I am especially thankful to my advisor, Dr. Pamela Courtenay-Hall, who has been very supportive throughout my MA years at UBC. Dr. Courtenay-Hall consistently provided thorough and attentive readings of my work even when she herself was battling illness.

Finally, I would like to thank David Peerla. He is more than a part of the thinking and work that has occurred on these pages. Without his involvement in my life, my learning would be less fun and this thesis less celebrated.
Chapter 1.

The Facts and Fictions of Mines, Museum Exhibits, and Science World

Science World is an imposing silver ball, studded by cross-bars and stellar lights - a footnote to Buckminster Fuller's geodesic domes - situated at the far end of False Creek, an inlet in the heart of downtown Vancouver. Science World is a non-profit institution whose goal is to educate the public about new technologies and improve the scientific literacy of students. It is British Columbia's temple of scientific knowledge, a place where teachers, students, parents and their children travel to be enlightened and astounded by modernity's secular religion - science.

Inside the museum, a new exhibit has been unveiled that promises new insights into the development of a mine. The exhibit, Mine Games, is constructed upon a simple scenario. A large gold deposit has been found not far from a declining B.C. single-industry town. The mine promises a new economic future for Grizzly, B.C, but there are potential environmental costs. Enter the exhibit and learn how the costs and benefits of mine development are weighed. In the balance: the fate of the town of Grizzly.

At a conference of science museum administrators and curators held to coincide with the exhibit's opening, the pundits declared Mine Games an innovative and
"cutting edge" exhibit, unlike any other in the world of science museums. Outside the science museum community, government policy makers were heralding the new exhibit. Three days earlier (October, 1994), the British Columbia Ministry of Energy, Mines and Petroleum Resources issued a press release putting the government's public relations spin on the exhibit's significance.

The $1.6 million exhibition, the first of its kind in Canada, has received solid support from both the B.C. mining industry and governments. Funding for Mine Games has been by donation, with donors including a Who's Who of B.C.'s mining industry, along with consultants, transportation companies, financial houses in the supplies sector, and the federal and provincial governments.

The goal is to encourage understanding about mining, particularly among young people," said Mines and Energy Minister Anne Edwards. "Mine Games is an ideal way to spark their interest in mining's huge range of rewarding careers for men and women -- from geologists, biologists and engineers through to equipment and computer operators."

It is appropriate to be opening Mine Games during Science and Technology Week," added Edwards. "Today's students are the miners, engineers and biologists of tomorrow. Through Mine Games they can get a sense of what these careers entail and make educated choices about their own personal futures. (italics added)

Mine Games represents a form of science curriculum unavailable in the classroom. The elaborate video-computer games and electronic town hall that make up Mine Games are the products of 1.6 million dollars, the creative energies of the Science World staff, and the design by international museum specialists. This thesis will examine two qualities which set apart this exhibit from its counterparts at Science World and other museums. The two pedagogical highlights of the Mine Games exhibit promoted by Science World and its sponsors are first the interactivity of the exhibit (as evidenced by the hands-on
stations and the computer games), and, secondly, the decision-making or 'consensus-building' process experienced in the simulated town-meeting of Hotseat!

On October 20, 1994, a Science World press release invited the world to "learn more about the mining industry of B.C. by playing simulation games that explore the environmental and economic impact of this major resource industry. This interactive model of sustainable development will be seen by more than 500,000 people over the next year ... Mine Games, which opens to the public on October 22nd, consists of six separate modules spread across a 6000-square-foot gallery in the form of intriguing games and interactive theatres" (italics added).

The press release was a condensed version of the exhibit's catalogue. In the catalogue Science World sets out the design philosophy of the exhibit.

It is with great pride that we invite you to experience Mine Games, a unique, new concept in exhibit design. Focusing on the complex questions that lie before the mining industry and our province, the exhibition is itself an experiment in consensus-building. The games are process-oriented; rather than demonstrating or describing scientific facts, they require you to make judgments and test theories. The exhibition is thought provoking and demonstrates that there are no easy answers to the issues of resource management ...

The centre's goal was to create exhibits that involve community science and which address issues that people are familiar with and care about. The senior staff and board supported the idea of Science World being a centre for debate and for creating exhibits which would provoke informed public discussion and thought...

In order to be a social forum on resource management issues, the exhibition had to be geared toward an audience familiar with complex issues and decision-making. (Science World, 1994, p.2, italics added)
'Interactiveness', decision-making and consensus-building -- these are the key words of the Mine Games exhibit. Mine Games marks its difference from the traditional spectator approach of the museum diorama by emphasising the active role of the exhibit visitor. Mine Games isn't an exhibit you passively view, it is something you must play; in a word, interactive.

Interactive is a popular term, a legacy of our current cultural fascination with computer technology. The term is a combination of two words; 'inter' meaning reciprocally and 'act'. To maintain a clear sense of the meaning of the word, the Oxford Dictionary gives us the definition of interactive as reciprocally acting or acting upon or influencing each other. The frequent use of this term to describe the Mine Games exhibit creates the impression that the exhibit is open to the visitor acting upon or influencing the exhibit as much as the exhibit will influence the visitor.

The key words of the exhibit; 'interactive', 'decision making', and 'consensus building' are the bones of a simple story. Playing the computer games is not merely for fun because it leads somewhere. The exhibit games are meant to model how to make decisions about complex issues; decisions that help us to build a consensus as we explore resource management issues in the mining industry.

One of the virtues of an exhibition that explicitly makes a case for its merits and attempts to tell an important story is that it encourages debate and makes possible the suggestion of other stories. In this thesis, I will critique Mine Games on the claims it has made for itself. I will evaluate how Mine Games succeeds or
falls short of its own criteria of interactivity, democratic participation and consensus-building. A school curriculum and a museum exhibit are constructed to achieve particular pedagogical intentions. Both the curriculum and the exhibit provide participants with materials to build intellectual structures. In comparing the different materials embedded in school curricula and the exhibit, I read the identity of the Mine Games exhibit through its differences from school curricula. The comparisons reveal the narrative of Mine Games for what it is -- a specific, determined story that excludes other stories. These curricular comparisons should help us to see more clearly the relative pedagogical strengths and weaknesses of Mine Games, an exhibit intent on helping the students and the public understand the importance of mining in their lives.

In this thesis, I analyse the effects of the museum exhibit, an educational text that many students will be reading during the exhibit’s run at Science World. Exhibits are often considered as outside the array of educational materials at teachers’ disposal. Thus, teachers may overlook the need to critically read a museum exhibit, especially when the publicity surrounding the exhibit is so complementary. The thesis attempts to develop a set of interpretive strategies as part of the critical pedagogy of museum exhibits.

Most members of Canadian society have emotional, political, or professional stakes in the discussion and assessment of mines. Mines are present in all parts of Canada, they have shaped the history of this country’s economy, and, they have profoundly affected the Canadian landscape and environment. Mines are symbols of industrial hopes and economic desires. They can be the object of
environmentalists' and First Nations' concerns or fears. Whether in the classroom or the museum, mines are fascinating topics for exploring the permeable, shifting, and contested boundaries between wilderness preservation and economic development in Canada. Science World has made an important step in attempting to bring this issue of mines and their place in Canadian society to school children. With an ever increasing curriculum and a plethora of new social concerns invading teachers' lives (such as AIDS education, social skills of conflict resolution or anti-violence), the classroom teacher can often feel overwhelmed and leery about teaching technologically and scientifically elaborate controversial issues. Science World has taken on the challenge of addressing this economic-environmental issue for its primary audience, school children on field trips.

The narrative form of the exhibit and the pedagogical values of Mine Games are not rigorously evaluated at Science World, that would require some explicit type of a literary analysis and pedagogical claims hierarchy. Rather, the narrative form is built into the exhibition's conventions and the pedagogical qualities are featured suggestively in its publicity. The exhibit's story is left uncontradicted and the educative merits are repetitiously asserted. The strength of the narrative of Mine Games is such that it is worth reviewing an actual mining case that does not follow the same story as the Mine Games presentation.

I compare and ground this analysis of Mine Games in the history of one of the most public and scrutinised environmental-mining controversies in British Columbia, the Tatshenshini. Although I do not have any evidence of a direct link between the Tatshenshini-Windy Craggy mine controversy and the genesis
of the Mine Games exhibit, the parallels are hard to ignore. Firstly, the two events were related temporally. The Tatshenshini project was rejected by the provincial government a year before the Mine Games' opening. The “Tat” campaign was a landmark victory for environmentalists. Mining developments had been challenged in the past but this was the first occasion when a mine had actually been stopped. Secondly, the two events are similar in their geographical and contextual nature. Both take place in an isolated northern part of British Columbia (Mine Games by loci dramatus) and both would result in an economic surge of activity in otherwise remote locations. Thirdly, the Mine Games publicity pamphlet mentions the Tatshenshini in its section, ‘The development of the exhibition’. “In January 1993, the design team of the Wake/Bradbourne Partnership proposed that the theme focus on British Columbia’s key resource industries: forestry, fishing, and mining. ... British Columbians were in the midst of intense debate over forestry in Clayquot Sound, mining in the Tatshenshini, and depleting fish stocks” (1994, p.2, italics added).

History has shown that when an industry is under duress of negative public opinion, it often turns to education for a positive response and remediation. The mining industry has recently come to consider education an important public relations expenditure. “Funding for Mine Games has been by donation, with donors including a Who’s Who of B.C.’s mining industry, along with consultants, transportation companies, financial houses in the suppliers sector, and the federal and provincial governments” (Ministry of Mines, News Release, 1994). During the first few weeks of the exhibit’s opening, the mining industry (the Canadian Mineral Industry Federation) kept vigil at its doors with a display and table announcing the campaign plea “Keep Mining in Canada.” Why would
all these members of the mining industry feel under duress to invest this money into a museum exhibit and into a campaign for its preservation in Canada? It would appear that the mining industry felt threatened: threatened by the first decision ever to stop a mining project after eleven million dollars had been invested by its company into its initial exploration stages (the Tatshenshini); and threatened by a new mine development and environmental assessment procedure that failed to promote the interests of a mine (the Windy Craggy) but served the interests of environmental and First Nations organisations.

The Mine Games exhibit marks a turning point in the mining industry's approach to the education of children and the general public. Many prominent members of the British Columbia and Canadian mining industry have decided to financially support "this remarkable display which shows visitors how choices and decisions are made in designing and creating a mine" (Anne Edwards, Minister of Mines, 1994). As a teacher of the nineties, I have felt the increasing involvement of corporate interests in education. I have also faced many young British Columbians who are concerned for their future and the future of their surrounding environments. With all the public attention given this exhibit, I have felt the need to read and analyse this exhibit as an educator, to analyse what Mine Games can offer teachers or students in its presentation of mining curriculum that cannot be experienced or offered in the classroom.

A series of questions animates my reading of the exhibit. What does Mine Games teach students about choices and decisions made in creating a mine that teachers

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1 The sponsors of this exhibit, who raised $1.5 million, include prominent mining industry companies such as Cominco Ltd., Placer Dome Canada Ltd., Teck Corporation (these sponsors, the Gold donors, contributed at least $100 000 or more); BHP Minerals International Inc., Falconbridge Limited, Noranda Group of Companies (these sponsors donated funds between $50 000 and $99 000). The majority of the exhibit sponsors are members of the mining industry or companies who rely indirectly on the industry (e.g. stockbroker firms).
cannot access or teach through the available curriculum? What forms of interactivity and democratic decision-making does the exhibit provide or promote with its student-visitors? What new story of mining and the environment will this exhibit tell in order to give the visitor a thought provoking experience? How does the Mine Games exhibit reflect this particular moment of B.C. mining history?

Setting the Stage for Mine Games: The Tatshenshini-Windy Craggy Mine Project

Decisions regarding the planning, designing and building of the Tatshenshini-Windy Craggy mine were widely available to the public through media accounts, government reports, and public meetings. The Windy Craggy Mine project was arguably the most controversial mining proposal in British Columbia’s history. The decisions and procedures and final rejection of the proposal were an important social and political backdrop to the planning of the Mine Games exhibit. It is important to explore what the Tatshenshini project and environmental assessment established in order to determine whether or not the Mine Games’ representation of a British Columbia mining controversy, public interaction, and decision-process is accurate and fair to students.

Northwestern British Columbia, a sparsely populated part of the province dominated by mountains, glaciers and rivers, was one of the most active mineral exploration areas in Canada in the early 1990s. The mining industry had expenditures in excess of $110 million in 1990 alone. One of the most advanced projects in 1990 was the Windy Craggy mine development. Geddes Resources Ltd., the Toronto-based owner company of the project had spent $11 millions on...
the Windy Craggy copper deposit to complete a drilling program, mine planning studies and bulk sampling\(^2\). The large copper mineral deposit was located on Windy Craggy Mountain. The mountain is one of many bordering the wild Tatshenshini River. The Tatshenshini, or the Tat as it is called by river rafters, begins in northern British Columbia, travels into the Kluane Park territory of the Yukon, comes back into B.C., then joins with the Alsek River before making its way through the Saint Elias Range and an eagle sanctuary of the Coast Mountains in Alaska. It is a river that has received international attention because it is known by whitewater guides as one of the top three rivers in the world, up there with the Colorado in the U.S. and the Bio-Bio in Chile. The Tatshenshini has not been developed by industrial interests during the past 10 000 years, since the glaciers retreated. ‘Unspoiled’ or ‘unmarked’ are popular and appropriate descriptors for this area that has never been touched by the modern exploitation of roads for logging, mining, recreation, or settlement. Only First Nations people have historically and regularly travelled the Tatshenshini waters and mountains.

In 1990, Geddes Resources Ltd. made a proposal to open the area with a 100 kilometre road to Windy Craggy Mountain. The company projected that the Windy Craggy mine would last 20 years, create 600 jobs, and generate five billion dollars in economic activity. The mine would be in the middle of a ‘pristine’ wilderness that spreads over 930 000 hectares and connects other large wilderness tracts of the Yukon and Alaska. Under the Geddes plan, a large part of the Windy Craggy Mountain (what is deemed ‘profitable’ by modern mining standards) would be exported to the main consumer of this mineral, Japan. Waste rock would be dumped on nearby glaciers, or buried in a lake created by an\(^2\) This information is provided in the Information Circular of B.C. Ministry of Mines, 1991.
impoundment dam (Hume, 1992, pp.132-133).

In 1990, for the first time in British Columbia mining history, Geddes Resources Ltd. toured the province to explain to the public its mining plans for the Windy-Craggy copper deposit. While it is not required by law, this mining company believed this public relations campaign would help the public discuss and resolve its development's controversies. Working in a climate where the provincial government's land base reform was promoting wilderness areas, local resource use plans, recreation corridors, and parks, the Geddes and other mining companies were facing more regulatory constraints on how mining decisions would be made and reviewed.

The Interim Report on the Tatshenshini Land Use Review by the British Columbia Commission on Resources and Environment (1992-1993) identified five major areas of risk (out of a total of eighty-six undesirable events) which required further consideration before any final decisions on the project's fate could be made. These serious risks included the breaching of the tailings dam; the reliance of perpetual water cover over the tailings impoundment; the control of acid rock drainage; the effects on water quality, fish, and fish habitats; and the effects on animals (eagle, grizzly, dall sheep) and animal habitats. These five risk areas can be all traced to the source of toxic threats, the mine's acid drainage.

Canadian copper mines, along with zinc, nickel, gold and uranium mines, contain sulphide minerals, either in the ore or the surrounding waste rock. When these sulphide minerals, particularly pyrite, are exposed to oxygen and water, they oxidise, and surface waters become acidic. Rainfall and snow-melt
flush the toxic solutions from the waste sites into the downstream environment. If this acidic drainage is left uncollected and untreated, the drainage contaminates ground water and local water courses, damaging the health of plants, wildlife, and fish.

Acid generation (acidic drainage’s source) may persist for hundreds of years following a mine’s closure. The operation of treatment plants for very long periods of time is clearly not desirable nor profitable to mining companies but presently there is no other solution to this toxic problem. Even more worrisome to industry is the concern that the fear of future drainage problems is impeding the development of new mines. Concerns about acid generation (toxic pollution) were identified from the outset as a major impediment to the development of the $550 million Windy Craggy mining project.

To help resolve the controversies surrounding acidic drainage and other toxic mineral development risks, the provincial government legislated Bill 59 -- "The Mine Development Assessment Act"-- on July 5, 1990. In a move that appears designed to respond to recent pressures by the courts and the federal government for more public participation, Bill 59 contains significant provision for public consultation in the decision-making process. "This new Act will upgrade public consultation and, at the same time, establish a legal basis for such a consultation in the review process, including provisions for public hearings", Mine Minister Honourable Jack Davis (1990) said in a statement released with the Bill (CIM Bulletin, August 1991).
The review process under Bill 59 introduced fully developed provisions to allow controversial projects to be referred to an assessment panel. These panels could be exclusively provincial panels or panels jointly established with the federal government. Panel members were to be individuals unrelated to government who possess technical or procedural expertise relevant to the project issues. A separate panel could be appointed for each project. The new legislation would enable British Columbia to enter into the joint review panels called for in the proposed Canadian Environmental Assessment Act. The Windy Craggy project was one of the first projects to be referred to these joint federal/provincial panel hearings under Bill 59.

The Geddes Windy Craggy mine development was eventually rejected by the assessment panel in 1993 and the Tatshenshini was swiftly turned into a provincial park. The new joint review panel and decision-making procedure of Bill 59 allowed more democratic participation for groups located outside the mining industry and the Ministry of Mines. But in this landmark case, the democratic decision forum did not work in the industry’s favour. It was at this juncture that Science World, with the mining industry’s funding and participation, was beginning to consider how to design an exhibit that would show children how mining development decisions are made.

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4 1993 was the year of planning and designing the exhibit for the October 1994 opening, according to an interview with the Science World education curator.
Mining Industry's Responses to the Public's Environmental Concerns

The mining industry was concerned about public opposition to mining long before the Tatshenshini controversy. In 1991, Desmond Connor, a consulting sociologist who specialises in preventing and resolving public controversy, identified the public threat to the mining industry in the Canadian Institute of Mining Bulletin:

In the face of public cynicism and determination, industry pollsters believe that industry will no longer be able to play the public relations game. The views (expressed in polls) indicate not only a high level of concern about the environment, but also general economic illiteracy - few people realise that mining and other major industries are the engines which drive our economy and which, in turn, support our society and fund our social services.

When the general public is ill-informed about the mining industry and its contribution, along with other industries, the media can easily play on people's emotions. This has been described as eco-terrorism through Suzukiscience. (p.55, italics added)

Connor (1991) also offered the solution for this public threat to the industry: the need for education. "Public ignorance is the Achilles' heel of the mining industry. 'Public opinion - well informed or otherwise - will eventually become public policy, or else the democratic system doesn't work,' said Forestry Minister Frank Oberle recently. Although public education is a major and costly undertaking, the industry and its major players had better increase their efforts - the alternatives are worse" (p.56).

Desmond Connor is one of many industrial consultants who lament the public's economic/scientific illiteracy. The plea for education is a desire to rid the public of irrational thinking about mining decisions. Education is to solve the problem
of non-scientists' and non-industrialists' misunderstandings and blowing out of proportion the risks to the environment by mining. Connor is one of many industry spin doctors who are positioning the controversy of mining and the environment into the false dichotomy between rational scientific thought (facts) and irrational emotional thought (fiction). Connor and his associates do not challenge the industry's approach to mining and development decisions but rather contest the education and media that the public is receiving.

Other industrial consultants and risk assessors take a different approach to these issues. Kristin Shrader-Frechette, a philosopher, approaches the issue of the assessment of environmental risks as one irresolvable by rigidly controlled, rational and scientific thought. In an editorial for the scientific journal *BioScience*, Shrader-Frechette (1995) challenges the use of quantitative factors -- eg. the probability of human fatality-- to resolve matters of ecological risks. Different types of risk cannot be quantified into comparable levels of probability and trying to do so would mean the following important issues would not be considered.

Reducing decision making to comparative risk assessment presupposes that quantitative factors are more important than ethical values such as equity. Yet quantitative comparisons ignore questions such as who performs the assessment, how the risk figures are averaged, who is put at risk, why they are at risk, who pays to reduce the risk, who benefits from the risk, and who consents to the risk. No scientific technique can justify imposing hazards on a community without answering such questions. Scientific techniques such as comparative risk assessment are necessary but not sufficient for sound environmental policy. To assume they are sufficient is to confuse facts with values, technocracy with democracy. (p.66)
Peter Sandman, a risk communication consultant, shares Shrader-Frechette's concern. Sandman (1987) suggests that industry recognise that the public does not view risk factors that have a higher probability of killing humans with the same anger and fright as they do other risks with less probability. Sandman believes that the essential problem is one of difference in the definition of risk. Risk does not strictly mean expected annual mortality for the public. Instead, the public is affected by factors that increase their outrage and sense of unfairness at the lack of democratic control. For example, a voluntary individual risk is much more acceptable to the public than a coerced risk (by industry or government plans). A higher probability of risk in a voluntary situation does not provoke the public's outrage. Sandman concludes:

Outrage factors (control, fairness, familiarity ...) are NOT distortions in the public's perception of risk. Rather, they are intrinsic parts of what we mean by risk. They explain why people worry more about industrial emissions than aflatoxin in peanut butter. There is a peculiar paradox here. Many risk experts resist the pressure to consider outrage in making risk management decisions: they insist that the "data alone" (the facts), not the irrational public, should determine policy. The solution is implicitly in this reframing of the problem. Since the public responds more to outrage (narratives) than to hazard (probabilities), risk managers must work to make serious hazards more outrageous and modest hazards less outrageous.... When people are treated with fairness and honesty and respect for their right to make their own decisions, they are a lot less likely to overestimate small hazards. (pp.21-22, italics added)

To reinsert this risk language in an actual mining controversy, the Faro mining project provides a good illustration of these problems. The Faro mine was a world-class lead-zinc mine developed on the slopes of Mount Mye in the southeastern Yukon that was productive from the late 1960s to 1981. The Faro mine resembles the Tatshenshini project in many important ways. First, the
geographical location of the Faro mine is not far removed from the Windy Craggy. Both were to be developed in remote areas, used primarily by First Nations peoples. Second, the type of mining projects are similar in that both mines were on mountains and both were to produce acidic drainage. Third, both mines were to last 20 years and both demanded roads built into a roadless area. One difference between the two mines is that the Faro was developed and ran its course of production whereas the Windy Craggy was stopped after its initial exploration stages. The significant differences are the social and historical contexts in which the mining permits for the respective mines were issued.

In June 1992, a retrospective assessment of the impacts of the Faro mine on the land use of the Ross River Indian people was published. No environmental or socio-economic impact assessment had been conducted at the time of the mine’s development, production, or closure. None were required by law and both government and industry appeared only concerned with how the mine’s development would provide employment. Even in 1992, the Ross River or Kaska People and their assessors seemed reluctant to provide an impact assessment of their land/environmental situation. They believe impact assessment is a science in its infancy and hence provides an inaccurate description of their situation. The models of impact assessment have been faulty because they have not been used to evaluate the success of industrial predictions about the effects of a mine. “Assumptions and hypotheses about the effects of mine developments have typically gone untested. Consequently, the methods that would allow for more accurate predictions do not evolve” (1992, p.11). Particularly undeveloped is the socio-economic impact assessment’s (SIA) lack of consideration or inclusion of the responses (or stories) of affected groups of
people. "The missing step (in the SIA) typically has been monitoring the impacts on the affected communities... This is particularly true for impacts on native land use" (p.11).

The Kaska's most important form of knowledge of land use impact by the Faro mine is personal experience and experiences of the land passed down from generation to generation. The Kaska argue that the way the impact assessment needs to be reconceptualised and revised is to allow for consideration of their experienced and inherited stories of the land.

The traditional means of (knowledge) transmission differs from school educational learning methods. Information is passed, in social kinship settings, through the repeated telling of stories. The transmitted knowledge is not abstracted; the story format roots the knowledge within social and environmental contexts. And the context is the history of the Kaska, the ancestors of the tellers and the listeners, on the same land making their living from the plants and animals of that land. (p.45)

The Faro mine example demonstrates the unresolved and unheard needs that the environmental assessment process of 1990 was meant to address and remediate. The Kaska did not have the opportunity to contest in the decision-making process of the Faro mine's development of the late 1950s. The Kaska stories were not allowed into the mine development assessment because they were considered irrational, emotional narratives that would not produce hard evidence or facts. In 1992, the Kaska people were taking social action on the mine assessment process by demanding that their stories be accorded the authority of the testimony of mining engineers or wildlife biologists. Mining industrialists, on the other hand, today still privilege the authority of speakers of economics, geology and biology -- what would be considered the language of
science— when discussing the development and assessment of a mine.

The Fact/Fiction Dualism

Science historian Donna Haraway has also written extensively to contest the what she sees as a false dichotomy between fact and fiction. Haraway regards scientific texts as stories about human action or experience. For Haraway (1984) the history of science is

a narrative about the history of technical and social means to produce the facts. The facts themselves are types of stories, of testimony to experience. Not just anything can emerge as a fact; not just anything can be seen or done, and so told. Scientific practice may be considered a kind of story-telling practice—a rule-governed, constrained, historically changing craft of narrating the history of nature. (p.4)

In the same way we can argue that mining facts or geological practices are the outcome of a story-telling practice being told to communities that will be affected by the mine, recounted to the public in the media, and offered to students in the Mine Games exhibit.

Desmond Connor’s plea for economic and scientific literacy is a plea for the power of objective science. Donna Haraway recognises the resonance of “ideological fictions” but she also finds that “fictions can hide—and are designed to hide—how the powerful discourses of the natural sciences really work” (1988, p.12). Mining industrialists would like to hide how the powerful discourse of science works in their political favour. By mystifying the production of facts and by validating only those stories that qualify as ‘facts’, the mining industry attempts to control the impact assessment and mine review procedures.
Haraway’s argument opens the door to legitimately criticise the mining industry and applied geological sciences on the level of ‘values’, not just ‘facts’. Mines need to be subject to cultural and political evaluation “internally,” not just “externally” (p.12).

The Mine Games exhibit attempts to show students the internal workings of a mining corporation and the mine’s development. A cultural and political deconstruction of this internal showing and an examination of its external consequences are needed if the exhibit is to be understood and questioned by teachers and students. If we consider Haraway’s contention that any scientific text is both a set of facts and a fictional narrative, then it would be appropriate to analyse the story contextualising and employing the scientific facts of mining in the Mine Games exhibit. I would like to demonstrate in this thesis how the Mine Games story is an ideological fiction by considering its societal implications. Is Mine Games a scientific story that hides its political values and only represents itself as fact?

Northrop Frye, the doyen Canadian scholar of literary criticism, believed the meaning of any story or literary work is located primarily in its form rather than its content. Frye’s literary work has been one of tracing and connecting story form patterns throughout the history of English literature. Frye has described and categorised stories according to four literary genres: comedy, romance, tragedy and satire. All these genres or story-pattern forms have one element in common: a story is about a conflict. Whether it is a moral dilemma or a social controversy, at the heart of any story is a decision-making moment.
At the centre of the Mine Games design are the decisions that citizens must consider when a mine is proposed in their community. The actual assessment of mining projects is a complex task governed by provincial legislation. Mining project reviews can take years and involve a vast array of scientific and social issues. The Mine Games curatorial team faced the difficulty of creating a representation of the mining project review process that was complex enough to reflect the kinds of decisions made in assessing a mining proposal, yet simple enough to create a narrative or story form that was easy to understand and allowed the audience to participate in the exhibit's story.

My contention is that the narrative form of the Mine Games story has significant consequences for the interpretation and experience of the exhibit's 'facts' or content. For example, a narrative form like tragedy assigns certain social values and meanings to scientific facts that a comedic story would not be able to achieve with these same facts. In this thesis, I will examine this interactive science exhibit through the interplay between narrative and form, rational and affective, fact and fiction, environment and science. Reading other curricula with these intentions, I hope to broaden the discussion of environmental issues and provide teachers, curators and students with other story-reading (and conversely, story-telling) practices for the museum and classroom. I will critique Mine Games as an exhibit that fails on its own criteria of interactivity and democratic participation. The analysis of the narrative form of Mine Games is an effective way to demonstrate how the exhibit falls short of its own self-declared merits.
Plan of the Thesis

As the most innovative, expensive and technologically sophisticated attempt by an educational institution in B.C. to instruct the student about science or environmental-mining-social issues, Mine Games raises important questions:

1. What story does Mine Games tell about mining, the environment, technology and the students’ roles in making decisions affecting these issues? What level of interactivity is the student to have in the actual exhibit and by simulation in public policy decisions?

2. How does the Mine Games story compare to other curricular stories of mining available in the classroom?

3. How the interactivity and decision-making qualities of the exhibit and the curriculum limit or expand the meanings of the controversial issue content?

4. How does the form of these mining curricular stories position the students and influence their involvement in the curriculum?

In order to answer these questions, this thesis compares the Mine Games exhibit to mining or geology curricula for different age groups. The core of my research is the unearthing of Mine Games’ promises of interactivity and open-minded decision-making for the student-visitor. I will contrast these educative claims of the Mine Games exhibit to those qualities found in a primary earth sciences unit (Rock-on-Yukon), in an intermediate mining unit (Grade 5 Mining Association of B.C. unit) and in a college level environmental course (David Orr’s course outline and philosophy). These comparisons of Mine Games to other available mining curricula is a methodological device to point up the sophistication of Mine Games. I intend to argue that Mine Games goes further than the other
curricula in promoting a subtle message of how we should understand and conceptualise nature in response to industrial needs or goals.

In addition to analysing the curricula materials themselves, I have informally interviewed curriculum designers, a Mine Games curator, Science World employees, the Mining Association of British Columbia education coordinator, and a computer games designer. The curricula and interview materials are supplemented by press releases by the mining industry, Science World, and the provincial government; promotional pamphlets from Science World; and the student work sheets used in the actual exhibit. Finally, I have observed a number of school groups, ranging from grades 7 to 10, as they participated in the exhibit. By comparing all these curricular forms and their explicit and implicit messages, I hope to highlight in the thesis how these forms tell particular stories about "nature" and technology and what these forms ask the student to become in order to use and work with them.

CHAPTER OUTLINE

Chapter 1. The Facts and Fictions of Mines, Exhibits, and Science World

In this chapter, I examine the fact/fiction dualism presently dominating and being contested or questioned in actual mine assessment processes. This dualism is evident in the Tatshenshini and Faro mine projects and the Mine Games exhibit. I also review the Tatshenshini case as a contrast to the Mine Games presentation of a mining project assessment.
Chapter 2. The Exhibit as Narrative: The Mine Games Comedy

We can locate a museum exhibit on two foundation poles: its origins and conditions of its time, and, its place in the structures of story-telling practices for society. The Mine Games exhibit at Science World reflects its time and location in its choice of subject matter: mining and environmental controversy. While many commentators have discussed the origins and conditions of environmental controversy, few have considered the genre or form of how controversial stories are told and their decisions resolved, the interactivity permitted to stakeholders and the public in the issue, and their actual democratic decision-making power in public environmental issues.

The initial problem set of the Mine Games exhibit consists of an isolated northern community, fragile beautiful ecosystems (or "wilderness") and economic problems of a single-industry town. From this problem set, the museum could tell one of the Fryean story forms: a tale of tragedy, a tale of romance, a tale of satire, or a tale of comedy. It is my argument that Science World has chosen to tell only one story in the Mine Games exhibit, a tale of comedy. In this chapter, I attempt to illustrate how Northrop Frye's analysis of comedy applies to the narrative form of Mine Games. I also attempt to demonstrate that embedding scientific 'facts' of mining in a narrative form such as comedy has consequences for the socio-political meanings and choices available to the student-visitors.
Chapter 3. The Literary Form and its Political Visions of Mine Games and Rock-on-Yukon

"Mine Games" and the primary curriculum unit Rock-on-Yukon (Burke & Walker, 1995) are both scientific texts designed to teach children the key elements or facts of the science of mining and the role of the mining industry in our society. It is my contention that Mine Games and Rock-on-Yukon share a common narrative form: comedy. By demonstrating the similarities between a science museum curriculum and a classroom science curriculum, I intend to further pursue the meanings and values in the claim of 'innovation' of interactivity and decision-making that the Ministry of Mines, the mining industry and Science World are making. The goal of this chapter is to demonstrate that these two comedic curricula provide similar social-political experiences and limited value choices for students.

Chapter 4. ISSUES, OPTIONS, AND CONSIDERATIONS: How Science World and the Mining Association of B.C. Script Student and Teacher Participation in Environmental Decision-Making

In this chapter, I will compare the involvement and participation of students (and to some extent the teacher) in two mining curriculum units that devote a large part of their unit to a simulated town meeting. Both Mine Games and the Mining Association of British Columbia's Grade Five unit (Hutchinson & Kiloh, 1991) conclude with a democratic forum, the town meeting. Both designers had to determine which form and procedures for the meeting should be selected in order to ensure that the unit's narrative or social meanings are implicitly
recognised or understood by the students and teachers.

What is most at issue in environmental controversies, and in town meetings that discuss the controversy, are decisions: decisions on whether to log a valley, develop a mine or build a hazardous waste facility. Mine Games and the Mining Association's curriculum units share the goal of changing students' understandings of how decisions about the siting of a mine are made. Decisions as they are regularly made in Mine Assessments -- the Tatshenshini-- can be considered to have four components; stakeholders, issues, options and considerations. In this chapter, the exhibit and the unit will be examined through the lens of these actual decision components in an attempt to understand what roles, or more importantly, what participation (or level of interactivity) the student is given in each institution's participatory form of decision-making. Moreover, I will attempt to highlight a decision-making component that is unavailable in both the Mine Games and Mining Association's curriculum but which is definitely available in real life mine decisions such as the Tatshenshini: the decision to say NO to the mine's development.

Chapter 5. The Goal is the Roles: An Examination of the Use of Computer Games in the Mine Games Exhibit

In this chapter, I want to examine the role of computer games in the Mine Games exhibit. In his essay “Do Artifacts have Politics?”, Langdon Winner takes the position that: “No idea is more provocative in controversies about technology and society than the notion that technical things have political
qualities" (1986, p. 19). It is my contention that the artifacts of the Mine Games exhibit, the computer games, have political qualities. The games have a form that demands the user/student to adapt her thinking in order to use the technology. The games are not merely fun ways to learn geological, biological and engineering knowledge, but, more importantly, ways to familiarise children with ways of positioning themselves as mining employees and adopting a particular logic of decision-making. By accepting the decision-making logic of the exhibit, children can internalise the thinking necessary to arrive at what the Minister of Mines referred to as “win-win solutions to the environmental, scientific, social and economic impacts of a mine” (Province of British Columbia, October 21, 1994).

Chapter 6: Closing the thesis: Reclaiming Mine Games

Alternatives of museum exhibits and computer education that challenge different structural forms of Mine Games are considered in this chapter. The Tatshenshini and Faro mine projects offer different stories of how mining, “nature”, and humans/students can be imagined, constructed, and positioned. Museum scholars such as Susan Vogel, Ivan Karp and Elaine Heumann offer different curatorial approaches that would support a broader examination of decision-making processes and environmental values than those used and envisioned in the Mine Games exhibit. Technological scholars such as Ricki Goldman-Segall and Sherry Turkle offer wider views on the applications of technology and computers. A museum exhibit that takes these scholarly ideas, David Orr’s environmental education approach, and the Faro/Tatshenshini decisions into account would provide an educational experience which is more
open, participatory and similar to the actual British Columbia public mine assessment review. It is unfortunate for students that their choices of mining stories have been limited in this exhibit to only one choice rather than the multiplicity of stories (and story genres) that circulate in the democratic forum that B.C. society uses to decide its future mandate on resource extraction and wilderness preservation.

In this thesis, I develop a critical environmental pedagogy which can facilitate the reading of an environmental museum exhibit. This critical pedagogy requires each curriculum designer and teacher to read nature and construct curricula from a variety of narrative standpoints, particularly those standpoints that presently affect and shape mining policy and have concrete consequences on British Columbia’s environment. Each reading represents a partial story with its own silences including my own reading of Mine Games. By recognising that all stories and curricula are partial but, that some stories are awarded greater social status than others, we make a step toward a more critical, student inclusive, multiple perspective and transformational curriculum. In this thesis, I attempt to demonstrate that the Mine Games exhibit adopts a standpoint that has been awarded greater social status in education over other important standpoints such as the one which prevailed in Tatshenshini project. I also demonstrate how the exhibit in return does not do the proclaimed ‘good’ job of helping B.C. students prepare for open-minded and critically aware participation in democratic (environmental) decision-making procedures.
Chapter 2.
The Exhibit as Narrative: The Mine Games Comedy

Walking into the Mine Games exhibit at Science World in November 1994, my eyes were drawn to a T.V. monitor suspended at the exhibit’s entrance. A young journalist introduces herself as Karen and is standing outside the town hall of Grizzly, B.C. (a fictitious northern B.C. town). Grizzly faces a dilemma. In an oft told tale, the town must decide whether or not a much needed mine will proceed. The jobs and prosperity symbolised by the mine must be weighed against the environmental costs of economic development.

During the last ten years, news stories of environmental controversy have entered the lives of many British Columbians and made them worried, anxious or angry about the fate of the environment and of the economy. The media stories revolve around a set of familiar oppositions: preserve the old growth forests or the jobs of forest workers; develop the world’s richest mine or protect the world’s premier eagle habitat.

All the characters in these media stories tell their tales in a preferred and identifying narrative form. The proponents of “economic development” tend to
tell a tale of comedy. Industry and the environment marry in an economic tale of resource extraction supporting the lifestyles of good Canadian families and small-town communities - a probable headline would read ‘New Mill Opens in Fort Remote’. The opponents of mines and logging are modern tragedy tellers who warn that development leads to an inevitable ecological catastrophe. The oft told tale of ecological tragedy is more dramatic as clear cut logging, dam building and mine developments threaten to destroy unique ecological habitats and the species which depend upon them - here the headline would read ‘Canadian Chainsaw Massacre Ravages Rainforests’. This is not to say that environmentalists could not tell a comedic story of a town marrying its environment or mining industrialists telling a story of economic tragedy. However, the barrage of media reporting in the late 80s and early 90s have not varied the forms of these typical tales of tragedy and comedy and the tellers behind them.

British Columbians have become accustomed to seeing the drama of environmental controversy through the frame of their T.V. Government enters the story as the referee and ultimate arbiter of the disputes; a role which has become politically uncomfortable as environmental controversies have multiplied and escalated. There are growing calls from the public to resolve these disputes through consensus-building rather than by blockades, arrests or boycotts. Out of this climate of conflict the controversial issue exhibit “Mines Games” opened at Science World.
A simulated T.V. broadcast frames the exhibit's initial problem and sets the story in motion:

Welcome to Grizzly B.C., a pretty town nestled between postcard mountains and picturesque lakes in Northern B.C. NorthStar Mining has discovered that Grizzly has some of the richest ore deposits in North America and has thus proposed to build a mine in this spectacular wilderness area. The idea has met with mixed reaction from the town's residents; they need the jobs the mine would bring, but have concerns about the environmental sensitivity and beauty of the region. (Science World, 1994, p.4)

From this set of initial conditions, the museum could tell a variety of stories: a tale of tragedy, a tale of romance, a tale of satire, or a tale of comedy. It is my argument that Science World has chosen to tell only one story in the Mine Games exhibit, a tale of comedy. In this chapter, I will examine the hidden narrative form of comedy animating and directing the exhibit's story. What makes the Mine Games story particularly important for educators to pay close attention to is its representation of an 'interactive' story about the environment. Analysing the narrative form of the Mine Games story provides critical readers of curriculum with an effective framework for recognising the exhibit's implicit values. The narrative form approach can also help readers recognise the successes of the exhibit as well as its problems, especially those factors concerning the participation of the visitor-reader in decision-making and the range of choice and complexity afforded the controversial issue.

For Northrop Frye (1965), a comedy revolves around an 'irrational law blocking force' or an irrational force that momentarily blocks the return to social harmony.

The normal action is the effort of a young man to get possession of a young woman who is kept from him by various social barriers: her low birth, his minority or shortage for funds,
parental opposition, the prior claims of a rival. These are eventually circumvented, and the comedy ends at a point when a new society is crystallised, usually by the marriage or betrothal of hero and heroine. The birth of the new society is symbolised by a closing festive scene featuring a wedding, a banquet, or a dance. This conclusion is normally accompanied by some change of heart of the part of those who have been obstructing the comic resolution. (p.72)

Typically, two lovers wish to marry and an authoritarian father strives to keep them apart. The lovers' families act as irrational emotional blocking forces which stall the natural and reasonable conclusion of a wedding.

The Mine Games exhibit and its simulated T.V. broadcast presents the polarised dichotomy of environmentalists versus industrialists as a battle of reason versus emotion. The initial broadcast shows film footage of a recent showdown of environmentalists blockading a logging road outside of Grizzly. The journalist reports that this blockade resulted in the area being turned into a provincial park and the loss of the logging industry in Grizzly. The next shot in the broadcast is an interview with the mayor who pleads that "the NorthStar mining project is a chance for a new lease on life for Grizzly's survival." This short series of clips has prepared the exhibit visitor to view environmentalists as extremists who tend towards emotional and inaccurate outbursts and law breaking acts of confrontation. Environmental philosopher, Neil Evernden (1993) finds that:

the most effective means of discrediting environmentalists has been to brand them as impractical and emotional - in contrast to their sober, rational critics, of course ... How selfish they are, say their detractors, to try to deny the nation its rightful bounty, or to try to interfere with personal profit and industrial growth, just because they have a weakness for fuzzy animals and picturesque scenery. (p. 7)
The simulated newscast suggests that these emotional environmentalists must be kept in check a second time around in order for the communal rational choice to be made regarding Grizzly's future.

The fact that this exhibit is framed by its location in "Science World" reinforces a message of the prevailing rule of rationality. Science World as an institution is an exemplar of the rational, a citadel of scientific knowledge which cannot be construed as irrational or emotional. Science World presents a marked contrast to the environmental world view defined by Neil Evernden. "The environmentalist is one who experiences a strong subjective sense of value in nature and is moved to assert the reality of her experience to others" (Evernden, p. 4). The rational industrialist or bureaucrat, on the other hand, concentrates on the realm of calculation, on numbers, and the science of economics. The industrialist and scientist appear as representative of an objective reality that is believed to be fundamental to everyone's good standard of living and well-being. In the Mine Games exhibit, the emotional blocking force of the environmentalist must not prevent the well-being of the community and the marriage between Grizzly, B.C. and NorthStar Mining.

In Frye's analysis of comedy, the second stage of a comic narrative involves uncertainty or confusion of identities. In the theatre, uncertainty is represented by the use of disguises, invisible characters, and the substitution of one character for another. The movement in a comedy is toward the integration of two divergent and sometimes conflicting identities. For example, two families have to be united through marriage. The integration that the Mine Games exhibit aims at is the integration of the mining company into the community: in the
imaginary case of Grizzly and in the larger sense of B.C. For that integration of identity to take place, one of the things that has to happen is for the exhibit participant to see the world through the various eyes and aspects of the mining company.

The first identity for the visitor to assume is that of the mining company's exploration manager in the station "High Stakes". The introductory sign invites you to win the ore and go for the gold. But the sign also cautions you that "Bob, the president of North Star Mining is a great guy - as long as you're making money. After all you're betting his bottom dollar." Your new identity makes you responsible for the profit, success or failure of the mining company.

As NorthStar Mining's exploration manager, it is your job to find the gold and copper deposits in the Grizzly Valley and determine if they would be profitable to extract. To do this, you must play the game High Stakes which consists of eight hands-on exhibits and a computer game.

You will search for gold, test rocks for copper content, locate ore deposits, identify fossils, examine core samples, and learn to tell the difference between real gold and impostors. Each of these challenges will offer clues to the precise location of the ore bodies, which you will need to know before you start investing in the computer game's drilling program. You must locate the gold and copper in a cost effective manner. Turn your hunch into a million dollar mine! (Science World, p.7)

The hands-on activities and computer game lead you through an adventure or quest. The vision animating your quest is the goal of making millions of dollars. The eight preliminary activities teach the participants to find the gold under a budget constraint. The message is clear: find the gold without exhausting your exploration fund and succeed.
The second identity you assume as a visitor to Mine.Games is that of a wildlife biologist for the NorthStar company in the station "Wild Things".

The challenge in the Wild Things! game is to recommend an environmental plan for mining in the Grizzly Valley. As NorthStar Mining's wildlife biologist, you must determine the best place to put the mine tailings. Long-term environmental damage must be avoided so all the land can be reclaimed in ten years' time.

You will measure the pH levels of the lakes and creeks in the Grizzly Valley, identify animal tracks of species which live there, determine the effect of the tailings on the local fish population, identify the plants in the valley, and measure the permeability of the soil. Walk through the four proposed sites and assess the impact that the tailings pond would have on each of them.

One wrong move and all the salmon in the river will die. Harm the grizzlies or the elk and it's game over. (Science World, p.7)

Your task as an employee of the mining company is to determine the best place to put the mine tailings in order that all the land claimed by the mine can be reclaimed in ten years time. Once again, the type of quest is governed by searching for certain species, locating their habitats, and then determining which tailings pond location would be the least harmful. Never is the student given the more open-ended option of questioning the tailings pond existence anywhere in this valley or elsewhere in British Columbia. Instead, to experience this exhibit, you must adopt the quest of identifying certain species, locating their habitats, and then according to the deal of the company with the town, you must determine which location could best be 'reclaimed' in ten years.

The term, reclamation, is not defined nor elaborated upon in the exhibit for the student's education. Do the exhibit designers mean to imply that the ecosystems affected by the tailings pond will in some way revert to their previous numbers, quality, diversity ...? This station is the only environmentally concerned part of
the Mine Games exhibit. Here reason and traditional scientific investigation remain uncontested and control the quest. Student-visitors are only guided by definitive questions throughout the preparatory tables and the computer game. If you do not give the correct answer during the game, you lose your job with the company immediately on the spot. The student is not asked to investigate the complexities or subtleties of important pivotal terms in environmental assessment such as reclamation.

The assessment of nature in the Wild Things station is not governed or influenced by any discourse of subjective reasons or emotions. Instead the assessment is based purely upon identifying the species, counting their numbers, and locating their habitats. In this respect, the Wild Things station mimics the High Stakes quest but substitutes animals for ore deposits. The ultimate goal of this station is for the visitor-student to determine which site in the valley would be most preferable for the tailings pond location. The least number of animals, the most acidic water body and the fastest growing types of trees and plants are all important factors to help choose the appropriate location for the toxic deposit.

The third identity available to the visitor is that of a NorthStar mining engineer in the station Blast It!

An abandoned mine shaft in the Grizzly Valley may be the best place from which to reach the new ore deposits. At Blast It! you will assume the role of NorthStar’s mining engineer and the task of ensuring that the old mine is safe. You will also design a plan to mine the new deposit. Four hands-on exhibits and a computer game which takes you on an underground adventure will assist you.

The hazards of an old mine include poisonous air and unstable rock. You will design an underground ventilation system and experiment with roof-bolting techniques. As the ore
must be mined safely as well as cost effectively, you will test how much rock can be removed before endangering the stability of the shaft. You will also try out different vehicles to assess which would be the best for removing the rock from the mine. This experience will help you when you descend into the mine on the computer game. Imagine being 1000 metres underground with 700 tonnes of rock overhead. To beat this challenge you must take all the right turns through a maze of tunnels, find the stations to recharge your vehicle’s batteries, and avoid flooded and unstable areas. Take a deep breath and watch your head. (Science World, p.8)

The preparation steps for this computer adventure are very important for you or your identity’s personal safety. Steering correctly through the maze, recharging the vehicle’s battery before it runs out, losing your way in submerged tunnels, and, ceilings collapsing on you are all obstacles avoided by the preparatory lessons. If you the visitor/mining engineer are successful then the final stage of the adventure is a wall of rock exploding behind you. The only plausible or rational way out of this predicament is to mine your way out to safety. This predicament also corners the participant-player to conceive of mining as life-saving. This psychological state echoes the initial problem set or predicament of Grizzly. A town is economically distressed and waiting for a life-saver. Could the answer be mining to light, prosperity, and success?

This game is the most enthralling and captivating of all the games that I personally experienced at the Mine Games exhibit. Thrills, spills, and explosions meant a greater sensational and emotional experience than the other more abstract and intellectual games of High Stakes and Wild Things. In an ironic inversion, the most emotional and memorable game of the exhibit is one of ore (resource) extraction; however, its mise en scène and raison d’être are steeped and steered by an argument of scientific rationality. The exhibit designers have
emptied the emotion out of the environmentalist sphere of wildlife protection and poured it into the industrial sphere of mining.

The last identity the visitor will experience directly in the Mine Games exhibit are those of a bicycle designer and mountain bike racer in the station Boulderdash.

Can you build a mountain bike that can withstand a rigorous race course? That's your challenge in the games of Boulderdash. A local entrepreneur has created the world's toughest mountain-bike race course in the hills around Grizzly. Three top designers have entered their bicycles in the race. Your job is to select one of the frames and add the components that will enable you to win the computer-simulated race down the treacherous Grizzly Valley.

The hands-on exhibits in this area will give you important information. Your bike will need to be lightweight - yet stiff and strong. You will test the quality of various metals to meet your exacting standards and add these components to the frame. Then you will be ready to test your prototype on the computer game.

If you make it all the way through the race course without crashing, you are a winner. If not, it's back to the drawing board. (Science World, p.9)

The station demands that you pay close attention to the mechanics of the bike construction to insure your successful finish in the race adventure. The important purpose of this station according to Science World employees is to teach people that their esteemed consumer goods are only available through mining. The lesson taught to urban visitors is one of their consumer connection to mining in Northern B.C. The remote isolated North has an impact on their daily material lives. Yet, the Wild Things station was silent on the important connections a remote northern ecosystem has on the health and values of those urban dwellers thousands of kilometres away. The destruction of a valley's ecosystem has an impact on B.C.'s cultural image of itself ("Beautiful
British Columbia") as well as the purity of the province's air and water systems.

After assuming these different identities and experiencing their different quests, the visitor's own perspective and values regarding mining may be confused, uncertain, or at least not as clearly defined as they were upon first entering the Mine Games exhibit. Northrop Frye (1965) comments, "The action of comedy often leads to a kind of self-knowledge which releases a character from the bondage of his humour. This is not necessarily an introverted knowledge, which is of little use to a comedy, but a sense of proportion and of social reality" (p. 79). Walking out of the exhibit, the visitor has come to a new understanding and self-knowledge of the identity of the mine and the people who work for the mining company. The visitors have put themselves in the shoes or perspectives of the game identities, thereby releasing themselves from the bondage of their prejudices and irrationality.

At this point, the visitor can leave with a better sense of the important role mining plays in society or they can choose to participate in the climax of the exhibit, the Hot Seat public meeting. If the visitor left at this point, they may not have made a final decision of the fate of Grizzly B.C. in their minds but the sensations of the games and the role-playing could make them more sympathetic to the position of industrialists in controversial issues.

Frye has determined that the third and very important stage of the comedy narrative is the wedding and celebration in the final act.

The third and final phase is the discovery of identity. This may take many forms but we may generalise them as social (A identified with B). The identity at the end of a comedy may be social, the new group to which most of the characters are
attached, or individual, the enlightenment that changes the mind or purpose of one character ... To this singular and plural identity we may add a dual form: the identity of two lovers who are finally united. When there are three or four marriages at the end of a comedy this identity obviously coincides with the social one. (1965, p. 78)

Mine Games’ final act, the Hotseat 1.1 meeting confirms the thesis that Mine Games is a conventional comedy. The outcome of the meeting has been predetermined as the marriage between the town and the mine in the design of the exhibit. However, Science World and the exhibit try to please all factions. At the same time that the marriage is decided, Science World proposes a contradictory experience for the visitor.

Hotseat! is the culmination of the Mine Games experience. This multi-media theatre featuring a giant 16-monitor video wall is the site of Grizzly’s town-hall meeting. It is here that the fate of the mine -and the town- will be determined by you and other audience members.

Grizzly needs the jobs that a mine would bring. A provincial park was established here last year. This protected the old-growth forests, but it brought the logging industry to a standstill. Initially, the townspeople were eager to embrace the prosperity that NorthStar Mining’s proposal would bring as it would mean the survival of the town. However, some tough decisions need to be made in order to achieve consensus on how to balance immediate economic demands with environmental and social issues. With a SCIENCE WORLD moderator to show you the consequences of each of your decisions, you must try to find a way for Grizzly to have its mine without compromising its past or its future. (Science World, p.9)

In the first paragraph, the visitor is led to believe that the fate or existence of the mine can be determined by his/her decision. Yet, the second paragraph makes it clear that the mine will be developed and the visitor is only meant to find a way for the community to develop a consensus on how the mine will be built.

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5The original Hotseat! (or 1.1) ran in the exhibit from October 1994 to June 1995. Hotseat 1.2 is the term I employ to refer to the revised Hotseat! that began in September 1995.
On one day that I observed the Hot Seat, a grade ten class was participating in the public meeting. They began the meeting by stating that the majority were opposed to the mine. The SW moderator then pressed a button on the computer and we suddenly had a video clip on the 16-monitor screen. We watched two people (representing two perspectives) oppose the mine. A First Nations man and a woman historian walk out of the fictional Grizzly town meeting because they refuse to mediate their extreme positions. These two characters look emotional and have allowed their subjective reactions to dominate their reason. They are seen as a problem and obstacle for the community’s good. We are encouraged by the moderator to find middle ground for these characters by using the information or “facts” that we acquired at the exhibit’s stations.

On the screen flashes the first rule of this consensus-building game: Get the facts. The moderator helps us to understand that the real problem or ‘blocking force’ for these two characters is the location of the tailings pond because it is the only hazard to the environment. If we can determine the best location of the pond, the we can solve these extreme positions. Next, another clip appears on the screen of the Ministry of Environment’s biologist speaking of the effects of the tailings pond on the elk habitat and population. The moderator /actor asks students for a definition of a tailings pond and what possible locations for the pond they discovered in the Wild Things station. Very quickly, the location of the tailings pond becomes the centre point of the mediation and debate, the

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6 These singular regurgitated answers or ‘facts’ came directly from the Science World design and script. These ‘facts’ were never contested in the stations, rather the visitor was rewarded for correctly reciting these ‘facts’ by winning the game. If the student is to use these ‘facts’ in the decision-making process of Hotseat!, how much independent choice is left for the student?
question of whether the pond should exist at all drops off the table.

The second rule of the mediation game fills the monitor screen: Explore all options. The options explored for this tailings pond dilemma removes the question of the mine's development completely from the axis of the conflict. Gone is the idea that the students are debating or protesting the mine project. In its place, the debate becomes one of the needed location for a tailings pond. The First Nations man and woman historian in the video clips find themselves in conflict with each other. Should the tailings pond be located on the historic fort site or the elk habitat? There is no good conclusion to this conflict, only the elimination of one player. The woman historian walks out of the meeting furious with the First Nations man and the meeting. On the screen, a news headline flashes of this woman suing the mining company for compensation for loss of the historic site.

The final and third rule of the mediation game appears to help the audience solve the conflict with the last obstacle, the First Nations' position of saving the whole elk herd. The third rule reads: Avoid all or nothing positions. The Science World moderator with the help of his computer guides the audience to think of an offer that the First Nations man will accept in order to move him from his extreme position of saving all the elk. The audience is shown a wildlife biologist explaining that if the tailings pond is located in the historic fort site, the least amount of damage will be done to the elk herd. Only 25%, according to the biologist predictions, will be put in jeopardy. The next video clip shows the First Nations man agreeing to negotiate a loss of 25% of the elk herd in exchange for jobs and high tech training. Never does the First Nations man dispute the
scientific 'fact' or need of 25% of the herd being destroyed. The First Nations man does not ask for a second opinion or the funds to hire his own consultant to offer a different environmental account of the elk herd predictions.

In this Hotseat meeting, the First Nations man was the only stake holder shown who quickly changed his position. This swift change of position suggests a message that the First Nations man did not really object to the mine in the first place. He appears to be simply holding his ground until the best deal was offered to his people. The opposing voices to the mine had to give up something but the mine was allowed to stay and profit as the North Star company had proposed from the beginning. The logic of the Hotseat consensual exercise was clear: opponents were required to make concessions and the mine's existence was never seriously challenged.

As the last conflict is resolved or negotiated away, fireworks explode on screen, marching bands blare down the streets, bottles pop open and champagne overflows at the mine opening in Grizzly, B.C. The marriage of the town and NorthStar Mining is celebrated and consummated. There could never be any other ending to this conventional comedy narrative. The student groups walk out of the Hotseat! amphitheatre and leave Science World to return to their schools. The conclusion is final. No questions need linger afterwards as the narrative reached its strong apex. The future is bright and successful in Grizzly.

The conclusion of the Hotseat! reminded me of the visual representation of the exhibit which every visitor passes either walking into the exhibit or in exiting. I returned to this visual depiction to see what it could tell me after the Hotseat!
Upon entering this first/final station, one's attention is immediately focussed on a large painting/mural located directly at the fulcrum of the entering visitor's perspective. Warm bright colours, vibrant community life, picturesque wooded mountains, and solid renovated historic buildings, all capture your eye and attention. I immediately was drawn closer to the mural to identify the characters and their actions. It was at this point that I realised there were frosted letters in backwards formation and window pane lines superimposed on this ideal romanticised town. Upon closer observation, I could read the letters, NorthStar Mining and I realised that I was looking out from the mining office on Main Street in Grizzly, B.C. This mural is emblematic of the comedic vision the exhibit designers are trying to teach the young of British Columbia. If we follow the mining industry's rules of consensus-building and give the mining industry its rightful, rational place on the Main Streets of our communities, our future is secure, bright, and promising. The message of the mural and the conclusion of the Hotseat! are certain and clear. There does not seem to be much room for the student-visitors to add, change or alter this vision even in a town-meeting simulation. The choices provided in either the stations or the Hotseat! are those that will guide the students down a particular pathway, to arrive at a bright future of mineral economic promise.
Chapter 3.
The Literary Form and its Political Visions

The Mine Games exhibit was designed during a particularly contentious and unusual time for the mining industry of British Columbia. British Columbia in the early 1990s was an attractive investment location for mining capital. Rich ore deposits were still being discovered and the Vancouver Stock Exchange, primarily an exchange of mining stocks, was booming. The unusual challenge to the industry's comedic story of financial success was not nature's resistance to the mining companies' quest for ore but the public's changing views on the role of wilderness in their lives. A new story of public politics had begun to take shape in the province. Urbanites, the majority of B.C.'s population, began to believe that what was once an apparently limitless resource, wilderness, had been reduced to a finite and threatened set of endangered spaces. Campaigns to stop
the clear-cuts of B.C. rainforests, reduce the toxic pollution of the Fraser River, and protect 12% of the province’s lands as wilderness were beginning to have cumulative effects on the public psyche.

In Northrop Frye’s view, we live in an era greatly influenced by a defining imaginative event: the Romantic inversion of the traditional order of things. It is the central mythological event that has set the terms for politics and the way the public receives political stories, whether tragedies or comedies.

... it (Romantic Inversion) throws the emphasis on movements from below upward. Revolutionary philosophies, like those of Marx and of most Freudians, do this: they move from below upwards, or at least tend to draw their strength from what is below. The whole set of metaphors where everything that is good for man came from above (read God) and came down on top of him has been changed to a set of metaphors where everything that is good for man comes from inside him and works upwards toward manifesting itself. (1992, p.105, italics added)

Environmentalists, like those who campaigned to save the Tatshenshini against the Geddes’ Windy Craggy mining project, would likely view the present order of things as faulted and, at times, destructive. The present economic order with its global drive for markets and consumerism, may be leading our planet toward tragedy. The dominant order is already driving animal species to extinction, poisoning our water and air, and destroying the last vestiges of wilderness. One dominant version of an environmental politic could be described as one that aspires to invert the traditional order of ecological tragedy into a comedy in which nature and humans join together in a new green visionary world.
The Tatshenshini campaign has been interpreted by some journalists and environmental supporters as a tale of the triumph of environmentalists and First Nations, the small righteous Davids working below, against the Goliath mining companies of above. The story was not a tragic story of ecological devastation where the mining company paves a road through paradise and digs a hole so deep that this nature cannot be representative of our social meaning of wilderness. Instead, the victory of the environmentalists could be written as a story of comedy in which the public marries the environment. The irrational blocking force of corporate imperialism and greed of consumerist culture is overcome. The madness and destruction of that path is recognised by the public. The Tatshenshini decision demonstrates another type of restored social order of harmony and it has helped alter the larger political story framework of the province. In this case it is between two different communities, the biotic and the human. For most environmentalists, the Tatshenshini represents a happy ending in which government did the right thing. Mine Games, the first mining exhibit in Science World, became a story in a broader political spectrum with a public open to more narrative possibilities. The curatorial choices for exhibit story form and content and the involvement of the public in determining choices and decisions regarding the mine’s development had widened considerably with the Tatshenshini decision. In the British Columbia of 1993, comedies promoting the public good as one of harmony with wilderness or one of economic prosperity with the mining companies had become available options within the comedy story genre.

In this chapter, I will examine three comedies - three different mining-environmental curricula - which convey different social-political visions within
the narrative genre of comedy. Manifestations of these comedies are available in educational texts. I will examine which comedy is available in the Mine Games exhibit, the Rock-on-Yukon unit, and the brief summary in David Orr's book, Ecological Literacy. A story form contains multiple meanings and readings. While the literary form effects the nuances and values to be associated with the scientific 'facts', there is no one politic (or political vision) embedded in a particular narrative genre. To tell a story of comedy does not imply that only a story of conservative economics and industrial dominance can be told.

Mine Games proceeds through the conventional steps of a Fryean comedy. Components such as a blocking force, conflicting identities, quests, and a final wedding have been combined to create a comedy of mining in British Columbia. In the Mine Games comedy, the environmentalists are the irrational blocking force in the town of Grizzly. They are contesting the mine's wishes to marry the town. The student-visitors integrate divergent and conflicting identities as they adopt the three character roles (exploration manager, wildlife biologist, structural engineer) of the mining company. The role-playing games allow the visitors to shed their previous prejudices against mining. The student-visitors experience the different quests of each mining character in order to understand the role in the social order that these characters fulfil and create. Finally, the last act of the exhibit, Hotseat!, is the ceremony and celebration of the mine marrying the town after the last obstacles dissolve in the public mediation.

The exhibit's narrative framing has been used to tell a political tale of industry marrying communities and the traditional economic social order being restored and reinforced. It is a political story in which conservative public good and
continued industrial prosperity are equivalents: what is good for mining is good for Grizzly. The public and industry are wedded together in faithful harmony. Only environmentalists threaten this solidarity by their irrational, emotional claims that confuse and bewilder the public.

In this chapter, I want to examine how the comedic story form and scientific facts can combine to tell other political stories. Rock-On-Yukon is a mining unit intended for Yukon children in grades K-3. It was written by the curriculum developers Jeanne Burke and Eric Walker and the unit is a joint project of the Yukon Department of Education and the Yukon Chamber of Mines. The unit never directly confronts the controversial aspects of mining development but concentrates on the relationship of mining to our lifestyles. Rock-on-Yukon is a comedy not concerned with the communal or public good but instead focuses on individual consumer reliance on the products of mining.

Mine Games and Rock-on-Yukon, are both scientific texts designed to teach children the basic elements of the science of mining and the role of the mining industry in our society. Scientific texts can contain multiple stories and multiple political meanings. In this chapter, I will attempt to demonstrate that Haraway's thesis can also be applied to the science curricula of Rock-on-Yukon and an education plan designed by the environmentalist, David Orr. By comparing the comedy of Mine Games to the comedies implicit in these two new units, I will highlight their political themes and silences. Again, the purpose is to use the comparisons of other curricula to point up the environmental values and pedagogical implications of the Mine Games exhibit. Specifically, what choices and what type of participation students are allowed to have in these units, on
their communities, and by extension, on their environment.

Rock-On-Yukon

The unit Rock-On-Yukon is a mining unit intended for children in grades Kindergarten through Three. While I have not had the experience of watching children engaged in the actual activities of the unit, I have carefully read the unit's teachers' guide. The unit is a joint project of the Yukon Department of Education and the Yukon Chamber of Mines. The Funding for Rock-On-Yukon was provided by the Canada-Yukon Mineral Development Agreement. Of the Rock-On-Yukon's Steering Committee, five members represent direct interests of the mining industry and the other four are representatives of curriculum branches and teacher associations. The goal for all members was to design a curriculum package that would address the needs and the situation of learners in the territory of Yukon. Most frequently, teachers in the Yukon rely on materials and pedagogical resources imported from the provinces of British Columbia and Alberta. Creating a Yukon-specific unit demonstrates a recognition on the part of this committee that the social context of a student's life must play a role in learning science and that science curriculum should address the student's local situation to become meaningful science for that student.

Curriculum units and museum exhibits can be seen as examples of story forms. Where an exhibit team must determine a story that will run threadlike throughout the entire exhibit,7 curriculum writers must also determine the story foundation for a unit's design. A curriculum's narrative form is located in the unit's objectives, purpose, and/or framework. Rock-On-Yukon outlines the

Students will examine their role as consumers dependent on mining products. The connection of our society's living standard to the mining industry should foster a sense of personal and collective responsibility towards future development of non-renewable resources. The consumer's demand for both mining products and environmental integrity should be addressed within each student's mind. (1994 draft, p.2)

The curriculum designers have decided upon a story which connects a consumer's lifestyle and the mining industry. I would argue that this connection can be described as a marriage between the consumer and the mining industry.

Rock-on-Yukon unit conforms to Northrop Frye's (1965) analysis of comedy. Like Mine Games, Rock-on-Yukon contain a blocking force that acts as an obstacle that must be overcome before the symbolic wedding. This blocking force is absent from direct consideration in the Rock-on-Yukon unit but is implied in the framework. "The consumer's demand for both mining products and environmental integrity should be addressed with each student's mind" (p.4). Children at this formative age are beginning to question the imagery of mining scars on the environment. Many children have seen images of open pit mines, tailings ponds, and slag heaps. On T.V. they generally view these images as ugly and contrary to their preferred images of pristine green wilderness. Every day children see advertising of desirable consumer goods. Most of these goods are made from minerals but television does not make the connection between these products and mines. The obstacle the curriculum unit attempts to overcome is the unacknowledged link of consumer products and mining. The link has been
long established through society consumption of mineral products. However, the public has come to forget or not recognise that their present consumer lifestyle is connected to mining and open-pits and tailings ponds. The public has forgotten or chosen to ignore this marriage.

Each activity in this unit is comprised of the three following parts: the descriptors of learning from the British Columbia ministerial curriculum guide; the activity itself; and finally, connections to other curricular areas that the teacher can pursue if desired. Areas of connection include art, outdoor studies, science, and First Nations studies. The unit turns on a central comparison of the roles of rocks. Rocks have two primary characteristics as components of the ecosystem and as the origin of consumer desire for products. The activity entitled 'Earth Rocks' introduces children to the notion that rocks provide important spaces for plants and animals and, thus, construct dependent relationships in the ecosystem. "Earth rocks are living spaces for plants and animals. Earth rocks are food for plants. Plants are food for animals. Plants and animals are food for people" (p.25). In their own bioregions (ecosystems), children are asked to find and draw eight of these relationships (ex. rocks with insects, rocks with animals living underneath). The activity immediately following 'Earth Rocks' is called 'Mined Rocks.' The few sentences that are written on this page are key to understanding the marriage implied in this comedy. "Rocks are important. They give us things. Rocks give us gold, silver, and diamonds. They give us all the metals we use. They give us glass for windows. Many things come from rocks. Look around your classroom. What can you see that is made from a mine. Make a list of what you see. Find things in your home that are made of metal. All of these things come from a mine. What did you find?" (p.29).
Consider the use of the word *important* in 'Mined Rocks'. "Rocks are important because they give us things" is a much stronger and forceful statement than 'earth rocks are living spaces for plants and animals'. We could infer that the children are to understand that gold, silver, and diamonds are more important to human beings than intact living ecosystems. The significance of mining for our lives is confirmed through an examination of our consumption. If we make a list of every object in our homes or schools that are derived from metals, we will have a much longer and impressive list than the mere eight relationships identified in the 'Earth Rocks' activity. Importance here is reinforced by amount. The traditional economic values of quantity and esteemed scarcity (gold) are not challenged but reinforced.

The marriage in the Rock-on-Yukon comedy is one of the consumer recognising the important lifestyle afforded to her due to a marriage with the mining industry. The irrational blocking force of the negative images of mining is mediated by the final good of mining products. Students are encouraged to accept and celebrate the impacts of mining on nature because they ultimately provide the student with the valuable products that construct the boundaries or container of their present social reality.

One important alternative to mining that environmentalists advocate and encourage the public and the mining industry to consider is the recycling of post-consumer surface metals.

Most materials used today are discarded after one use - roughly two thirds of all aluminium, three fourths of all steel and paper, and an even higher share of plastic. Society will become dramatically less energy-intensive and less polluting only if the
throwaway economy is replaced by one that reuses and recycles. Steel produced entirely from scrap metals requires only one third as much energy as that produced from iron ore. And recycling glass saves up to a third of the energy embodied in the original product.

Recycling is also a key to reducing land, air, and water pollution. For example, steel produced from scrap reduces air pollution by 85 percent, cuts water pollution by 76 percent, and eliminates mining wastes altogether. (Flavin & Postel, 1991, pp.64-65)

The recycling alternative is never mentioned in the Mine Games exhibit and is given a passing reference in the Rock-on-Yukon unit. This reader can only ask why is this a silence in both mining units. I believe the answer is located in the narrative form of the story and the ideology influencing this choice of narrative. To produce a strong convincing narrative of the importance of the mining industry, the writers wanted to maintain one story line rather than incorporate many diverging plots. A focus on recycling in these narratives would raise the question of the link of mining to consumer goods. If recycling can provide these goods, why should children accept the harmful effects and negative images of mining on nature? The marriage and social good in Rock-on-Yukon would then have to be one of recycling and an environmentally-cautious lifestyle.

To move the story towards the ultimate comedic end of marriage, the Mine Games exhibit asked the visitor to adopt many identities of the mining industry while locating and developing the mine and assessing its impact on the environment. The Rock-on-Yukon unit does not explicitly ask the student to assume these mining roles or jobs but in the activity "What would I do?", the unit does ask the student to acknowledge and play with solutions for the problem of tailings and land disruption. The range of choice is a problematic
element in this activity. The student is given the following instructions:

You will need a spoon. You will need to go outside. Find a space, in the school yard. Mark a circle on your space. What do you see in your space? Plants? Animals? Look very closely.

Problem: You must dig a hole in the ground. Try not to disturb the plant and animal life. Where will you dig your hole? Where will you put your pile of soil. Start digging. (p.33)

The student is asked to make a close environmental assessment of the plant and animal life involved in this biotic community. Once determined, the student is told that she must dig the hole. What was the purpose of this simple environmental assessment if it cannot be employed as reason enough to not dig?

The metaphor implied in this digging activity is that biotic communities have to be disturbed and sacrificed for the purpose of mining. Children are actively engaged in this destruction without given a choice to voice or discuss opposition. The activity does effectively show children that they have disturbed more space than just the hole and that they cannot put things entirely back to the way they were before. The final questions of the activity ask children, “What can you do? What would you like to do?” (p.29) Perhaps the student could reply that she would like to not dig a hole but the reality is that she has already dug it.

These questions would have been more effective for a critical examination of mining if they had been positioned before the actual digging. The class could simulate environmental assessments and discuss cost-benefit analyses and/or issues, options, and considerations in the digging up of this area. However, in the Rock-on-Yukon unit, the position of the questions are consistent with the comedic story grammar. The student can recognise the problem of tailings but dissociate its cause from mining. Taking a similar approach as the designers of
the Mine Games exhibit, the Rock-on-Yukon unit writers have formulated the problem as one of the location of the tailings rather than the mine's existence. This activity's first science connection directs students and teachers to do the following: "Look at different types of mine sites. What would you want to see once mining was finished? What would you have to do?" (p.34) The option of refusing the mine does not appear in either the Mine Games or Rock-on-Yukon units. The only conclusion is a resolution of an irrational block and the resumption of the social good: the student must recognise and celebrate her already existing marriage between her consumer lifestyle and the practices of the mining industry. She can no longer allow her sense of aesthetics to block the rationality and existence of this connection.

The second final activity of the Rock-on-Yukon unit is 'Travelling Rocks.' This activity describes the unit's notion of a consumer cycle of mineral products.

Important rocks are mined. Sometimes the rocks are made into powder. The powder is called concentrate. Then the powder travels by big trucks. Sometimes the trucks travel to Skagway. At Skagway the powder goes on a boat. The boat travels to far away places. Somebody takes the powder off the boat. They make the powder into something metallic. Then it comes back to us. It comes back as things that we use. When you go to the store you see important rocks and minerals. They have travelled a long way. They come back as bicycles, batteries, and light bulbs.

What important rocks and minerals can be recycled? (p. 35)

The written activity is accompanied by an illustration that begins with a man standing on the top of a mountain. This small illustration is connected to the next illustration by a bold arrow. The second illustration is a drawing of an open pit mine. Again a bold arrow connects it to the third drawing of a factory crushing the rock into powder and loading it into a truck. Again an arrow
connects the truck to an ocean vessel. And finally the boat is connected to a
drawing of a child holding a camera. The illustration and the text both end with
the consumer.

The Rock-on-Yukon unit describes the product pathway as linear and not
cyclical. Products originate in a mine cradle and end up in a store. There is no
mention of waste produced by consumer discard and its effects on the earth. The
product's final destination in a landfill grave is not discussed. The suggested art
connection to this activity informs teachers of the option to 'make a mural that
explores market pathways that include the processes of: exploring, mining,
milling (making concentrate), exporting, smelting, manufacturing, and finally,
use by consumers'. Once again the activity illustration and the proposed mural
both present a linear single direction model for the student. The rational
connection between consumer and mining is again reaffirmed and the possibility
of recycling instead of mining or refusing a product remains out of the poster
activities' frames.

Both the Mine Games and the Rock-on-Yukon units contain an artistic
representation which visually reinforces their narrative. Walking into the Mine
Games exhibit, your eye is immediately drawn to a large mural emblematic of
the vision the Mine Games designers are trying to teach the young of British
Columbia. The Rock-on-Yukon unit comes complete with a large poster for
teachers to hang in their classrooms. The similarity between the Mine Games
mural and the Rock-on-Yukon unit is uncanny at first but logical when one
considers that they are both telling the same story. The Rock-on-Yukon poster is
also a painting of a vibrant community nestled to one side on the banks of a
river. Beautiful mountains and a sunset sky assure the viewer that nature is still aesthetically pleasing. All the people of this painting are involved in activities that require products made from metals: parent and child on a bike; plane in the sky; aluminium canoes, and motor boats on the river; people fishing; mother and child in stroller; cars travelling on the road etc. There are two small images of industry in nature to the far left side of the poster and not immediately apparent. A mine shaft and machinery building a road up the mountain have been included. There is a second half to this poster which is textual. Just as the text of the Mine Games mural was crucial to its meaning so is the text of this poster important to the interpretation of its meaning. The title 'What's mined is yours' reaffirms the direct linear connection between lifestyle (product ownership) and mining. The subtext of the poster continues this message:

At the heart of our modern lifestyle is a diverse and healthy mining industry. Mines provide the raw materials for virtually everything we own - from our homes, furnishings, transportation and recreational equipment to the medicines we need for our family's health.

The title and subtext of the poster imply that our good lifestyle is due to a healthy, read profitable, mining industry. No explicit consideration of the harmful consequences of mining are balanced against the consumer experiences provided. The unit portrays the mineral product pathway as one of being rich in means necessary for rich in ends. An alternative Deep Ecology analysis of a product's pathway is the production must be simple in means and rich in ends. Bill Devall, a philosopher and leading thinker of Deep Ecology, would beg the following considerations to be included in any mining curriculum: Are minerals and the environmental costs of their production necessary for our best experiences? Can we find simpler and less environmentally harmful means for
achieving rich experiential ends?

Not only does the text and title of the poster conform to Frye's comedy narrative in the Rock-on-Yukon unit but it also leads to a question of containment. Frye writes in the *Anatomy of Criticism* (1965); "On the archetypal level proper, where poetry is an artifact of human civilisation, nature is the container of man. On the anagogic level, man is the container of nature, and his cities and gardens are no longer little hollowings on the surface of the earth, but the forms of a human universe" (p.145). The unit has defined the relationship between nature and humans as one where human lifestyle contains and controls the mine or nature: our human consumption controls the nature of the Yukon.

The idea that nature is subordinate to human consumption raises significant questions. Firstly, the term lifestyle is culturally and contextually situated. Consumerist lifestyle is the embodiment of the tension between our consumer desires and our environmental values or morality. Individually, we are constantly mediating between our own environmental morality and consumer desires; however, in a society where consumption is of paramount importance, the goal is to make the desirable moral. This goal is easier to achieve if one believes that the human contains and controls the natural world. Frye dictates this tension as the following; “Civilisation tends to try to make the desirable and the moral coincide... The moral and the desirable have many important and significant connections, but still morality which comes to terms with experience

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9 Here I am referring to the idea of a tension when one's environmental morality can be heightened by information that leads one to reconsider our consumerist desire. E.g., Buying a certain type of tuna may be hurting dolphins so we may then opt to buy canned salmon even though our initial consumerist desire was to buy canned tuna.
and necessity, is quite another” (p.156). Presently, most societal desires take the form of consumable products and the desires of capital is controlling most of the decisions made regarding nature.

The Rock-on-Yukon unit asks us to be conscious of the fact that we desire mineral-based products but it does not ask us to consider reducing our consumption in any way nor does it call for a reconsideration of the means of producing mineral or metal products. Our individual or societal morality is not involved or challenged in this unit. It is unfortunate that young people are not given more of an opportunity in this type of unit to reflect on how their morality can deal with the dilemma of enjoying the experience of mineral and metal products but be also aware of the environmental harms.

**Another View of Nature**

Environmental writers would question Rock-on-Yukon's framework of containment. Other stories of mining exist embedded within a framework of the natural universe containing the human. David Orr, a professor of Environmental Studies, has constructed a story and framework of action which locates humans within nature. Orr (1992) writes what we could describe as a comedy in which humans "marry" nature by identifying with nature in a new relationship.

We need an accounting system that includes all of the costs of consumption. ...Ecological economics takes a wider and longer view in terms of space, time and the parts of the system to be studied. In contrast to conventional economics, ecological economics does not assume that the biosphere is unlimited. Nor does it assume the centrality of human wants or that these should necessarily take precedence over the stability and
integrity of the natural systems on which the fulfilment of real needs and wants ultimately depends. Ecological economics does not discount the future in the manner of conventional economics... In short, ecological economics regards the economy as a partial means to higher ends and not as its own end; and the study of things economic as 'life science', not as the study of greed efficiently practised. (pp.181-182)

Orr encourages us to consider nature and its limits and the consequential impact of our behaviours upon nature in order to define and control our consumption and lifestyle. Orr believes that a lifestyle which is simple in means (i.e. has the least harmful consequences on the natural world) but rich in ends (i.e. achieves optimal valuable experience) is the most satisfactory path for our conflicting consumer impulses and environmental morality.

Orr's curriculum design for a college campus is a comedy narrative that opens up a different set of possibilities than Mine Games and Rock-on-Yukon. In his book Ecological Literacy (1992), Orr sets out a different view of the relationship that an institution and students can have to an environmental curriculum.

Every educational institution processes not only ideas and students but resources, taking in food, energy, water, materials, and discarding organic and solid wastes. The sources (mines, wells, forests, farms, feed lots) and sinks (landfills, toxic dumps, sewage outfalls) are the least-discussed places in the contemporary curriculum... Yet they are the most tangible connections between the campus and the world beyond. They also provide an extraordinary educational opportunity. The study of resource flows transcends disciplinary boundaries; it connects the foreground of experience with the study of other and more desirable possibilities. (p. 105)

Orr is not here demanding the end of the consumption of mineral or metal products nor is he demanding the end of mining. Instead he is offering students a cyclical model to analyse consumption habits within a school or college and
modify them according to the dictates of ecological principles or limits. Unlike the Rock-on-Yukon story, Orr's curricular narrative does not end with the fact that human consumption is connected to nature but rather it begins with the consequences of human consumption on nature.

The study of institutional resource flows is aimed to determine how much of what comes from where, and with what human and ecological consequences. ... The study of actual resource flows must be coupled with the study of alternatives that may be more humane, ethically solvent, ecologically sustainable, cheaper, and better for the regional economy. Are there other better sources of food, energy, materials, water? The study of potentials must also address issues of conservation. (p. 105)

These important questions are not raised in Rock-on-Yukon. While the unit does ask children to examine their reliance on mineral products, the students are not asked to take their most used mineral products and trace them back to their source. Could it be that the mining in Yukon is not contributing to the products that the students regularly use? Could there be a more sustainable way to have mineral products in our lives? What are the working conditions of miners in Yukon? Do their salaries match the type of labour they are being asked to do and the profits that the companies net? Rock-on-Yukon needs to go further in its examination of the way a student's life and their mineral consumption impacts the Yukon environment.

Another distinctive difference between the Orr and the Rock-on-Yukon comedy is the location of responsibility for the environmental problems. David Orr and the Mine Games unit assign responsibility through a process of collective responsibility. The Mine Games exhibit uses an imitative town hall meeting where consensus-building is the focus. Before entering the town hall forum, the
visitor has tried on the different mining employee identities. The weakness of the Mine Games collective strategy is the lack of role playing of non-employee roles in the community, especially those of environmentalists, before participating in the Hotseat event. Another significant weakness of the Mine Games exhibit collective is the fiction and decontextualisation of the town and characters. Every item including the rock, animal, and plant specimens are unidentified. They come from nowhere and everywhere at the same time. Students can interact with these items without considering important questions such as the following: Who mined these rocks and how are their lives affected by mining? What community life is supported or poisoned by mines? What children live in mining communities and how are their lives similar or different from mine? Where do these trees and plants grow? What animals depend on them? ...

Orr's curriculum implies that the whole student body, faculty, and support staff must work together for the community and environmental good. In fact, he would argue that his curriculum has a far reaching effect on the state and perhaps other states. Orr headed a project to conduct studies of the food systems of Hendrix College in Conway, Arkansas, and Oberlin College in Ohio.

Both institutions are served by nationwide food-brokering networks that are not sustainable and that tend to undermine regional economies. In the Hendrix study, for example, students discovered that the college was buying only nine percent of its food within the state. Beef came from Amarillo, Texas; rice from Mississippi. Yet the college is located in a cattle and rice-farming region. In both studies, students uncovered ample opportunities for the institutions to expand purchases of locally grown products. Not infrequently, these are fresher, less likely to be contaminated with chemicals, and, surprisingly, they are cheaper because shipping costs are lower. In conducting the research, which involved travel to the farms and feedlots throughout the
United States that supply the campus, students confronted basic issues in agriculture, social ethics, environmental quality, economics, and politics (p.106).

Orr's biocentric approach in which the effects on nature determine the boundary or limitation of human activity combines with the narrative form of comedy to offer a different standpoint for teaching students about "natural" resources. His story motivates people to be action-oriented, interdisciplinary in their thinking, and practical in their decisions.

Rock-on-Yukon departs from these two other units in emphasising individual responsibility as the basis for the relationship of consumer and natural product. The message 'lifestyle creates the demand for mining' centres on the individual act of consumption. However, "lifestyle" is not merely the outcome of individual consumer choices but the product of the consumer's social context as Alan Durning (1992) notes in his book, How Much is Enough: The Consumer Society and the Fate of the Earth.

The forces that manufacture desires - advertising, commercial television, and shopping centres - are so familiar as to go virtually unnoticed in the consumer society, and among the middle-income class they are rapidly becoming pervasive as well. Yet the conscious and widespread cultivation of needs is a relatively recent phenomenon in human history, tracing its roots back scarcely a century. There is no reason these forces cannot be fundamentally redirected - constraining advertising to its appropriate role of informing buyers, turning television to conserving ends, and replacing shopping malls with real communities. (p.135)

The Rock-on-Yukon's slogan of 'What's mined is yours' can be read as a causal statement of individual responsibility. If you consume mineral or metal products, you are responsible for the environmental effects on nature from
mining. A positive interpretation of the slogan could mean that once a consumer has bought a mineral product, they have a responsibility to know where the product comes from. But a citizen has little control over the modes and means of production in this statement. Also, the unit has not shown students how to trace the product pathway of a mineral commodity. Instead the unit has shown students that they need to recognise that mining is what provides us with our rich modern lifestyles and celebrate this marriage. The message is supporting interests of the mining industry and the market economy. If one locates the blame of environmental effects on the individual consumer, then the myth of "consume or lose economically" can continue on unexamined. The slogan does not question the means of production by which these products arrive in our hands. The slogan’s message delegates a responsibility far from the cause of the environmental degradation.

“What’s mined is ours” would be a better slogan because it would still recognise the responsibility of consumerism but it would also allocate responsibility to the mining producers who have control at the site. The full costs of the mining process - for one small example, the tailings pond’s regeneration and surveillance that can last decades - would be paid by the company and reflected in their practices because it is “theirs” as well as “ours”. The consumer in return would also have to face the augmented costs of the products and realise the harm that consumerism can deal nature. Their consumerism would be held in check by the costs of the products and the reasons for the cost increases.

If goods’ prices reflected something closer to their full environmental costs, through comprehensive revisions of subsidies and taxes, the market would help guide consumers toward lower resource consumption. (Durning, 1992, p.110).
One of the most dramatic environmental consequences of mining are tailings; the waste rock discarded after the valuable minerals have been extracted. Every story of mining must confront the fact that mining produces a lot of waste rock. Mine Games and Rock–On–Yukon locate the fact of tailings in radically different ways in their stories. Mine Games presents a startling figure in the Wild Things station. At the entrance beside a large plexiglass cylinder filled with black rocks and dust, a sign states that this cylinder holds toxic tailings. Not only are the tailings "toxic", the tailings produced by the Grizzly mine could fill the B.C. stadium in Vancouver seven times over. The tailings and tailings pond problem is not evaded by the Mine Games exhibit. The ratio image provided is shocking when one also considers the extent and distribution of mining in British Columbia.

The Rock-on-Yukon unit deals with the issue of tailings but it does not provide an accurate representation of magnitude to the student. Digging a hole with a spoon is a creative representation to young children of the problem of soil and earth disturbance but it does not give the student an accurate representation of the scale and complexity of the problem. The Worldwatch Institute, in the book Saving the Planet (1992), offers an important corrective for the restricted lens through which Rock–On–Yukon views the problem of mine tailings and land disturbance.

Although the focus in recent years has been on wastes at the consumer end of the production cycle, far more is wasted in the mining and processing of both materials and fossil fuels. For example, nonfuel mining in the United States produces, at conservative estimates, 1 billion tons per year of waste material in the form of slag, mine tailings, and other discarded materials— at least six times as much as the garbage produced by all U.S. municipalities in 1988.
With most minerals now being produced from surface mines rather than from underground, the land disruption is extensive. A worldwide estimate by the U.S. government for 1976 showed that over a half-million hectares were disrupted by surface mining. Of this, roughly two thirds was from the mining of nonfuel minerals and one third was from coal. (p. 66)

Conclusion

There are many ways to design a curriculum. In my analysis I have examined three different mining stories within the genre of comedy. Comedy as a narrative form can be used to tell a variety of stories; a happy marriage of mining company and community; lifestyle and mining; or, humans and nature. Exhibit and curriculum designers face a common difficulty: how to select and order the knowledge they wish to represent and communicate. When we describe curriculum construction as a story–telling practice, what is at stake are not particular scientific facts but the meanings constructed with those facts. In order to tell their stories, curriculum designers locate the facts in narrative forms or plots.

Narrative forms like comedy assign the values and meanings to the facts that make up the story. The tailings pond has a much different value and meaning in a tale of comedy in which mining marries lifestyle than in a story of tragedy in which the tailings pond bursts destroying a salmon stream. It would be simple to conclude that a story of environmental controversy that falls within the genre of comedy has a predictable political subtext: mining can continue in its present form, accepting some reasonable levels of regulation and, in fact, our lifestyle depends upon it. What Orr's alternative alerts us to is that there is a new wedding possible, but only if we change the roles of the partners in the marriage.
Environmental stories and curricula need not be tragic, or merely marriages of humans and nature in which nature plays a subordinate role. What Orr offers us is another way of telling a comedy in which we fundamentally change our power relationship to nature, and consequently, change the way we act daily in our communities.

In my view, the development of a critical pedagogy requires us to read nature and construct curricula from a variety of narrative standpoints. Each reading represents a partial story with its own silences and focal points. By recognising that all stories and curricula are partial we make a step toward a more inclusive curriculum. Mine Games, with its pedagogical agenda, tries to teach one story as the most promising for our future. Yet it is a story that the student-visitors are not creating but primarily consuming. The sophistication of the exhibit, and a success that should be well noted by educators, is that Mine Games promotes a simulation of being involved and acting on a community without having to be a member or have relationships with the members or with the community’s environment. The exhibit presents the simulation in a rule-driven environment that is not side-tracked by chance, strong opinions, or conflict.

Orr’s unit is fundamentally different because it asks students to act in the real, more chaotic world outside the museum’s doors. The purpose of Orr’s approach is to encourage students to create their own analysis and ideas of community, to act upon it after much study and reflection, and to make decisions that will not only affect the school and outside communities but the students themselves and their environment. Where the museum exhibit wished to teach a perfect contained world of environmental decisions that students can internalise, Orr’s
approach wishes to open the doors of the museum and teach students to act on the world and externalise their environmental ideas on their communities.
Chapter 4.

ISSUES, OPTIONS, AND CONSIDERATIONS:
How Science World and the Mining Association of B.C. Script Student and Teacher Participation in Environmental Decision-Making

There is a widespread perception today that the public debate over environmental issues is a zero-sum game; either the Tatshenshini or any ecologically “unique” area is declared a park or the river is destroyed by the toxic emissions of the mine. With the polarisation of debate the public is left to line up on the pro or anti side of the latest battle over logging, mining or toxic waste. In an attempt to avoid the simple oppositions of environmental news stories and to add substance to the public debate on mining, Science World and the mining industry lobby, the B.C. Mining Association, have cooperated and directed their energies and resources to studying and offering alternative ways of discussing the controversial issue of mining. The Mining Association have developed an expensive “teacher friendly” new curriculum unit (written by Hutchinson & Kiloh, 1991) on mining for Grade Five Teachers; while Science World launched what it describes as a ‘state of the art’ interactive exhibit, Mine
In this chapter, I want to compare the involvement and participation of students and teachers in the educational change enterprise of Science World and the B.C. Mining Association. The challenge that both the curriculum writer and the exhibit designer confront is one of transforming their version of knowing into an effective form of telling. By telling another story about mining and the environment, the exhibit and curriculum designers hope to change the minds of students and teachers by replacing the present dominant (environmental) story to a more industry-sympathetic story. Both writer and designer must determine which 'facts' and reading 'procedures' should be selected and how they should be ordered to insure that their "story" is accepted by the students and teachers. What has been at stake, traditionally, for curriculum writers and exhibit designers is continued authorial power, expertise and control of the stories they construct and tell. In this chapter, I intend to argue that the participation of the Mine Games' audience in the conclusion (Hotseat!) does not impair the strength of the narrative's deliverance. The Hotseat! demonstrates how Mine Games is a triumph of sophisticated curriculum development and continued authorial power.

Teachers and Students: Objects or Agents of Change?

In any form of educational change, whether it be a change in classroom curriculum or a change on the part of public attitudes, for successful change to occur, students, teachers and the public must be able to find meaning for themselves in the proposed change. Unfortunately, this process of finding and
making meaning out of someone else’s innovation is fraught with uncertainty at
its best and frustration at its worst.

New experiences are always initially reacted to in the context of
some ‘familiar, reliable construction of reality’ in which people
must be able to attach personal meaning to the experience
regardless of how meaningful (the mining industry’s perspective on the environment) they might be to others.... Change may
come about either because it is imposed on us (by natural events
or deliberate reform) or because we voluntarily participate in or
even initiate change when we find dissatisfaction, inconsistency,
or intolerability in our current situation. In either case, the
meaning of change will rarely be clear at the outset, and
ambivalence will pervade the transition. Any innovation
cannot be assimilated unless its meaning is shared. (Fullan, 1991,
p.31, addition mine)

Fullan points up that to help teachers and students find meaning in the
educational change, the innovator must attend to the viewpoint and needs of
each affected player in the innovation’s conception and wake. The change
agent’s attitude, position, and use of power will have great impact on the
innovation’s adoption by its audience.

When those who have power to manipulate changes act as if
they have only to explain, and when their explanations are not
at once accepted, shrug off opposition as ignorance or prejudice,
they express a profound contempt for the meaning of lives other
than their own. For the reformers have already assimilated
these changes to their own purposes, and worked out a
reformulation which makes sense to them. (p.31)

Educational change can fail when the change agent does not attempt to relate the
innovation to the lives and meanings of teachers and students. It can also fail
when the change agent is not directly involved with the innovation’s
implementation. A constant process of clarification, negotiation, and new
change between the two (or more) parties is necessary for the innovation’s
success. Essentially, a partnership has to be forged between the author of the change and those who will employ it. Who is involved in the clarification; how is the innovation negotiated between user and writer; and, what changes result from this interchange and exchange of ideas? If these questions are not discussed between the curriculum writer (change agent) and the implementers (teachers, students, district personnel, administrators ...) then the educational change can have the tendency to fail.

The extent to which proposals for change are defined according to only one person's or one group's reality (e.g. the policy-maker's or administrator's) is the extent to which they will encounter problems in implementation. This is not to say that subjective realities should define what is to change, but only that they are powerful constraints to change or protections against undesirable or thoughtless change (depending on your viewpoint and the particular change). Ultimately the transformation of subjective realities is the essence of change. (p.36)

The Museum and the Community

The re-thinking of the methods and avenues of change is not confined to the field of public education. Museums are questioning fundamental assumptions of their practices. Museum attendance has plummeted as the public fails to find its reality mirrored or its needs attended to in these institutions. The desire to make exhibits more accessible in content, language, and style for the public at large is fast becoming a contentious debate between those curators who favour populism and those who favour scholarship. Regardless of the curator's orientation, if the museum's goal is accessibility then the involvement of the visitor must be through a process of personalising the institution. "Just providing an open door is not enough, the visitor must want to walk through."
The door the visitor most readily walks through is his or her own. Ideally, the visitor gains a sense of what can be thought of as ownership of the ideas that the curator seeks to convey or share with the visitor” (Spicer, 1994, p.185).

Sherman and Rogoff (1994), two museum critics, have described how public audience is an integral part of the museum’s identity even though the scholar-museologist might not wish to recognise that connection or dependence.

Although museums seek to characterise their classification as somehow inherent in the objects they present, it always takes place, at least in the first instance, within some externally constructed discursive field, such as the local “community.” A historical “epoch” or “period,” or the categories of “artistic school” or “style” is the second set of concepts that museums institutionalise: the context, usually constructed as some kind of community (of people or of values), that objects are held to signify. The museum by representing it, of course participates in the construction of this notion, and in the historical shifts it undergoes. It does so in the name of a third concept, that of the public or audience it claims to serve, and in terms of whom it defines the public sphere in which it operates. The way in which the audience or public receives the displays and meanings that are offered in turn constitutes a fourth pole of museums’ discourse and practice. (p. xi)

The museum’s definition of itself and the decisions it makes as an institution relies very much on its construction of its own community or audience. Fundamental to any discussion of museum change or innovation is an examination of the museum’s relationship to its audience or community. Developing new museum environments in which the public can feel, think, question, and respond requires a great deal of learning and self-examination on the part of the museum. If museums are to be valued as institutions in the years to come, curators and museologists must be attentive to how their visitors and communities personalise their museum experiences.
Science World has responded to the attendance crisis and financial cutbacks by entering into partnerships. But the definition of partner has been confined to the museum's financial supporters, not its teacher and student users. Science World entered into a partnership with the Mining Association of B.C. and the Ministries of Education and Technology and numerous mining companies to develop and fund the Mine Games exhibit. These agencies entered into partnership in order to respond to what was perceived by the sponsors as a lack of public understanding of the importance and complexity of mining in British Columbia.

Surprisingly, while the Mine Games exhibit is intended primarily for an audience of teachers and students, neither group was involved in the development of the exhibit. Rather than engage in a power sharing partnership with the exhibits users, Science World opted to involve primarily government and industry in the exhibit's design.

The Mine Games' curators could argue that there was a form of partnership with educators. After all, a number of representative teachers, recommended by the Mining Association of B.C., who had experience in writing mining curriculum, were consulted at certain stages. But a consultation with a limited number of subject specialists is not the form of participation contemplated in Fullan's model of active participation.

In excluding teachers and students from impacting or acting on the exhibit's construction, Science World was not an unusual example of the museum world.
Others (other museums) believe the visitor to be of no importance whatsoever, and therefore direct their exhibitions at what and whom they know: friends and fellow scholars. In such instances, the 'collective self' of the exhibition begins and ends with the curator's own mind and personality: such work becomes easy to identify. (Kavanagh, 1995, p.125)

To change the genre or style of an exhibit, as Science World did with Mine Games, and for the institution to help its audience accept or read this exhibit, it is imperative that the museum reconsider its relationship with its audience and community. If a partnership with the museum public is entered into where ideas and views are provoked and exchanged over controversial issues, then the museum has to be more aware of itself and its audiences. To use Michael Fullan's words, "Change works or doesn't work on the basis of individual and collective responses to it. Shared meaning, shared cognition, or interactive professionalism, as I have called it, goes a long way in making significant change a reality" (1991, p.46). If the museum curator, like the curriculum innovator, does not attempt to acknowledge, consider and work with the audience's responses and meaning-making systems, then significant change will not become a reality. A controversial exhibit like Mine Games will not effect change of attitude on the audience or change of presentation in the museum for future exhibits if it does not involve and ask for intervention by the audience.

However, if the intent of the museum is to try and impose one story as superior to those stories circulating in society, then Mine Games does offer a sophisticated museum device in the Hotseat! The narrative is not new or revolutionary but the delivery in the Hotseat! is extremely sophisticated. No narrative distance is provided for the visitor-participant as is the case in most stories that are told to
the reader/receiver. In the Hotseat! the participant is given specific rules and
guidelines to follow as they enact certain parts of the simulated town-meeting or
they respond to direct questions from the Science World moderator. The result
is an event that happens to you, but, over which you have limited control or say.
The illusion of participation is believed but the conventions and participatory
conventions make the Hotseat! a contrived and contradictory experience. In this
chapter, I intend to demonstrate the sophistication of the Mine Games'
participatory structures and the effects of the audience guidelines/rules on their
decision making and democratic involvement.

Mining and the public

With the defeat of the Windy Craggy mine proposal, the British Columbia
mining industry was forced to re-examine its practices and to respond to public
concerns. Mining is under increasing public and governmental pressures to be
more accountable. The demand for public accountability is embodied in a lengthy
public review process for all new mine proposals. The outcome of that process is
not predetermined and the Windy Craggy example shows that mining projects
can fail the test of a public review.

In the wake of Windy Craggy, the mining industry has reconsidered its
relationship with public education. The emphasis has moved away from public
relations to public education. Taking the long view, the Mining Association five
years ago shut down its public relations branch and created in its place an
education branch. The change is significant when considering who the lobby
group considers important. Teachers and students are now the object of the
mining industry's attention, communication and resources. The mining industry has realised that developing a relationship with the people who will be tomorrow's voters and public review participants is a crucial means for changing public opinion.

What is most at issue in environmental controversies are decisions: decisions on whether to log a valley, develop a mine site or a hazardous waste facility. Mine Games and the Mining Association's curriculum unit share the goal of changing students' understandings or simply providing new information of how decisions about the siting of a mine are made. Besides the people directly involved, the stakeholders, decisions can be considered to have three components: issues, options and considerations. In this chapter, the exhibit and the unit will be examined through the lens of the decision components in an attempt to understand what 'interactive' roles, or more importantly, what participation students and teachers are given in each institution's model of decision making.

Hotseat! Version 1.1: Framing the Issues

The town meeting of the Hotseat! 1.1\(^\text{10}\) resembles the assessment process that all mining companies must undertake. Different stakeholders have an opportunity to speak and voice their opposition in public. During the public review process the mine's application to proceed is in question. Similarly, the Hot Seat facilitator begins by asking the students whether or not they would:

\(^{10}\) This Hot Seat was only available October 1994 to June 1995. After that date, major changes were implemented in the Hot Seat and I refer to the new one in this thesis as Hotseat! 1.2.
support the development of the mine. Mine Games represents the major viewpoints in the resource management debate to maintain the appearance of neutrality. But that neutrality is compromised by a narrative that has been determined for the exhibit. The result is that Science World proposes a contradictory experience for the visitor.

In the first paragraph of the exhibit catalogue's description of the Hotseat!, the visitor is led to believe that the fate or existence of the mine can be determined by his/her decision. "It is here (in the Hotseat!) that the fate of the mine -and the town- will be determined by you and other audience members" (1994, p.3). This would mirror the involvement of the public in actual environmental assessments of mines. Yet, the second paragraph makes it clear that the mine will be developed. “With a Science World moderator to show you the consequences of each of your decisions, you must try to find a way for Grizzly to have its mine” (p.3). The object of the exercise is to find a way for the community to develop a consensus on how the mine will be established and built. The visitor is first led to believe that s/he will be allowed to participate in the determination and authorship of the exhibit. However, the second paragraph contradicts and denies this participation. It becomes evident that the participation of the visitor is not fundamental to determining the exhibit's storyline. The visitor is simply allowed to decide which way the mine will develop. Authentic participation has been deterred by curatorship that values the visitor's role as reinforcing the exhibit's narrative rather than allowing its audience partners to confront, redirect, or provoke the exhibit's meaning. However, the decisions that had to be made were very quickly executed and the moderator was an effective director of steering the audience in certain pathways. The audience
could not resist or oppose the narrative thrust because they were led to believe that their decisions or compliance were driving the narrative forward.

When I observed school groups participating in the Hotseat! there were pauses in the proceedings after certain video clips. The students were not asked at these important lulls in the action what their opinion of the meeting was or how believable they felt these video-clip stakeholders were. The students were not asked to gain any distance from the narrative or to become involved in the event on their own terms. It was simply assumed that the students needed directions to follow and a subsequent task to complete. With the clock ticking and the three-rule agenda firmly in place (see chapter 2 for a full description), the moderator and exhibit designers wanted to give the audience a constant stream of problem junctures to solve. Students would have benefited from some time and freedom to reject, reflect or consider if the presented problems were the real issues at stake or if they were being used as diversions. The conventions of the exhibit’s game motif had not instilled a sense or right in the visitor that their experience here is to question and critique but rather follow the rules given to win the game.

Defining the Issues and Restricting the Considerations

The SW moderator was asking specific, single response questions to the audience throughout the Hot Seat presentation. The students were expected to individually venture a response without consulting their peers. In one group that I observed, there were only two boys who attempted to contribute answers. For the most part, the group was quiet and passive. Quickly the SW moderator
resorted to asking interrogative statements that solicited yes or no responses. Again the emphasis of the communication and audience participation relied on answering the scripted questions which solicited the facts which would resolve the dilemma that had been presented on the screen. The audience's responses were restricted in order to reinforce the predesignated issue: the location of the tailings pond.

Ironically, in the actual mining assessment procedure, it is the mining company that is on the Hotseat! rather than the public. The mining company is the one that has presented a mining project prospectus that must be approved by the representatives of public interests. In that process, the mining company must answer hard questions fired at them from many different groups who are often in conflict with the mining companies' goals and philosophy. The mining assessment is a procedure fraught with conflict that is often not resolved. In the Mine Games' Hotseat! the mining company is virtually absent and it is the public who is on the Hotseat! The audience of students must (or feel under duress by the game imperative) answer the questions fired at them by the moderator. It is not up to the mining company North Star to explain their proposition but rather up to the students to arrive at a solution that answers the three consensus-building rules and eliminates any conflict.

The moderator's script was a sophisticated version of call and response: questions were employed as cues to visitor behaviour. The students were not invited to challenge the story's episodes, dilemmas or resolutions. They were expected to passively receive the "facts" and the story embedded in the questions. The students were to echo the definition of the issue as fed to them by the questions.
An invitation to make the event relevant and meaningful to the students' lives was inevitably lost. An invitation to the students to participate in the definition of the issue and to voice concern for different considerations to the issue was denied. No partnership was attempted.

The use of the consensus rules at the original Hotseal! was a sophisticated method of controlling the audience's participation in the event. The rules eliminated any spontaneous challenges (other issues or considerations) to the exhibit's logic. The meeting was engineered to be simple and brief even though this is rarely the case in reality. If multiple levels of complexity to the debate had been permitted, if more issues, considerations and options had been introduced, the visitors would have had more choice to select their preferred level of discussion. If it had been relevant and meaningful for the audience to contest each dilemma from many angles, from many points of consideration, a conclusion to the meeting may never have been found. And that is how many public meetings end; not with clean resolutions and decisions, but with unresolved questions.

When the Hot Seat was concluded, the students could leave the theatre secure in the belief that 'getting the facts', 'exploring options' and 'avoiding all or nothing positions' were the rational ways to achieve community harmony. What appeared to be an intractable dispute could be resolved if the three golden rules of consensus building were faithfully applied and the issues, considerations and options were narrow and few. The SW moderator or any of the museum staff did not ask the students what they felt about this conclusion or how this meeting may have changed their ideas or views about mining. The exhibit had attained
its conclusion and the work on the part of the museum staff was over. All that remained for that group of students was perhaps the transformational effect of a unified and conclusive narrative working on their unconscious psyche. To rely on this effect, rather than ask students for their interpretation of the exhibit, is to deny any partnership with the audience.

There can be no deep commitment or deep consideration on the part of the students if they have not been asked for their opinion. The museum maintains control by denying the meaning-making of its audience to have an impact on the museum exhibit. Democratic participation and thought-provoking involvement has not occurred in the Hotseat! Instead, the interactive display of Hotseat! is a complex and elusive ‘exchange’. The narrative is acting on the audience with the audience believing they are the ones deciding its path. It is hard to reject a story when you believe you created and determined its direction and conclusion. And, it is difficult to understand the story you have participated in if you have never created your own before the Hotseat! experience.

This is the sophistication of Mine Games. An illusion of participation or interactivity is given but the reality is that there is rarely any space (if there is, it is limited and controlled) for the audience to impact the exhibit. All is neat, clean and tidily resolved away in this artificial game forum. Unfortunately, neither nature nor democratic participation work this way. It is only a game that the students are participating in, not a simulation that can be applied effectively to the outside world.
The Town Meeting of the Mining Association of B.C.

Shortly before the Mine Games exhibit's conception, a new mining curriculum was introduced to B.C. teachers and classrooms. The mining industry contributed $300,000 to the B.C.'s Mining Association's Education branch to develop curriculum units for B.C. teachers. The objective of the Grade 5 Mining Unit was to update the archaic mining information being taught in B.C. schools and to encourage positive attitudes on the part of students towards mining.

The unit itself was written by two teacher-writers who also conduct teacher workshops. Through word of mouth advertising and in school posters, teachers sign up for workshops hosted by the teacher-writers. The workshops encourage "teacher-talk" whereby the unit writers and the novice implementers exchange ideas and views on the process of the implementation. The workshops also encourage the teacher-implementers to take ownership of the unit; to change the unit according to their needs; and, to keep in contact with the Mining Association and the teacher-writer for further support and comment. In other words, an authentic partnership is being extended to the teachers by the Mining Association.

Unfortunately, the partnership only extends to teachers: students remain the silent partners in this form of educational change. To illustrate the lack of active partnership with the students, it is instructive to analyse one section of the unit that anticipate Mine Games in the simulation of a town meeting. Again, the analysis will be based on the amount of participation allowed to students and teachers. This participation is controlled primarily by the model of decision-
making embedded in the unit guide's text. The decisions of the issues, considerations and options of the controversial issue imply the amount of democratic participation by the users of the unit.

The town meeting section of the Mining Association's unit is entitled ENVIRO\textsc{\textit{NMENTALLY INVOLVED}}. For the industry and these curriculum writers, involvement means learning "... how mining operations affect the environment and what is being done to protect the environment in and surrounding a mine site" (Unit, p. I-1). In this statement, the philosophy and the objective of the section is communicated to the student: only the environment directly touched by a mine is of concern. The section portrays technology overcoming the barriers put up by nature. The story the unit tells is one of how mining technology will protect, or rather, not alter visibly the environment in and surrounding the mine site. The section will introduce students and teachers to the technical fix, the scientific positivist approach to nature. The audience is to submit to a narrative that locates the problem in nature that needs to be repaired and altered by man's scientific and technological achievements. In the unit, the students are never really given an opportunity to contest or negotiate this thesis. They are to be passive receptors of the narrative's message rather than co-creators of the section's narrative.

Defining the Issues

Activity 1: "Brainstorm, in groups or individually, how mine sites could negatively affect the environment. List on the board and add problems that are missed. Brainstorm, in groups or individually, for solutions to these
One question that begs to be answered by this activity is why are these problems considered environmental problems and not MINING problems. The site of responsibility, or the site of the issue, has been located in Nature. No opportunity has been given for the students to question this use of language or the definition of the issue. No other issue such as the mine's pollution or toxic emissions have been brought into the decision-making arena.

Students are being set up for a great disappointment when they are taught that these "problems" have solutions that can make the problems disappear. No scientist, group of scientists, or corporation, has yet been able to determine or come to consensus on all the ways that the environment is affected by a mine. The controversy over the environmental effects of mining is protracted not only because of a clash of values but also because there are no clear answers to some of the scientific questions mining raises. Students are not being helped to understand that it is this definition of the issue (environmental problems need technological solutions) that could be adding to the difficulties and expenses of decision-making in controversial issues.

Framing the Considerations

Activity 2: A Map of Mountain Grove

Mountain Grove is a fictitious town in B.C., which will be the focal point for the town meeting activity, to follow. In order to prepare for the town meeting, the students should become acquainted with the layout of the town.

Give each student a copy of the map of Mountain Grove. Discuss the legend and have the students find each item. Then decide on a colour key and have the students use pencil crayons to colour the legend, then the entire map. A typical plan might
To prepare for a town meeting in which stakeholders debate the development proposal of a mine, the unit writers ask the students to study the human made structures of the town. The activity stresses the importance of the town’s built recreational facilities. Recreation can occur in buildings such as an ice arenas and pools, however, recreation that seems rarer and more esteemed by an urban perspective is the type that cannot be built or housed (as evidenced by the number of city travellers paying large amounts of money for trips to remote areas such as the Tatshenshini rafting trips or canoe trips in the Yukon etc). Recreational opportunities that can only occur in unspoiled habitats would be many and available to the citizens of Mountain Grove. Instead a theme of lack of recreational buildings in this community sets the stage for an argument of the consideration of economic benefits the mine would provide the town. A consideration of the natural recreation in Mountain Grove, already available to the town, has been eclipsed.

It could be argued that the students’ participation has been engaged at a certain interactive level in these activities. The student can make suggestions following
the guidelines set by the curriculum's narrative; they can interact with and support the story with their own examples; but, they have not been asked to take the story into their own control and direction. The students have not been asked to define the issue(s), to decide the array of considerations, or to offer any options. Conducting research on actual towns and mine sites would give students a larger range of data and knowledge for creating their own town and setting for the town meeting story. Furthermore, the students could brainstorm all the concerns and needs different towns peoples might have regarding the development of the mine. That is to say, they could decide the set of considerations. To the students' detriment, the singular consideration of recreation has narrowed the range of student participation in this grounding work for the rest of the section's activities.

The Stakeholders of the Town Meeting

The Mining Association's unit's town meeting outlines a simple process for the teacher and the students to follow. The meeting process begins by the teacher dividing the class into seven groups. Each group represents a stakeholder in the town meeting. The teacher and students are informed that the meeting is the place to discuss a proposal. The proposal being made is the following: The Maple Leaf Corporation owns the copper deposit near the community of Mountain Grove. Since they are a new company, they do not have the money to mine the copper themselves. As a result, they have found a partner, the Copper King Company, a larger and more financially secure company.
The seven stakeholders in the meetings are the following: the Maple Leaf Corporation (small company that owns the deposit); the Copper King Company (a larger financially secure company); the Ministry of the Environment (Fisheries, Wildlife, and Habitat Protection Branch); The Mountain Grove Chamber of Commerce; the Ministry of the Environment (Environmental Protection Branch); the Ministry of the Environment (Lands and Water Management Branch); and finally, the We Don't Want A Mine Here Action Committee. Each stakeholder group has its own separate sheet and script. The script provides details about the stakeholder’s history, concerns, and possible concessions. The unit efficiently reduces the position and concerns of the stakeholders to their essence. Similar to the style of the news media, the students and teachers are given clear descriptions of who the typical stakeholders are and what their demands entail. There is, however, one exception to this sympathetic portrayal. The citizens’ environmental group is portrayed in an exaggerated and one-dimensional manner. As discussed later below, this stakeholder receives an unrealistic treatment, unlike the other stakeholders.

The Definition of the Issue and the Elimination of the Options

The students are informed that the new copper mine will create jobs and, as a result, the community, province and shareholders will benefit (e.g. the community will receive new recreational facilities). The task for the students is to read their stakeholder’s script or position statements. Next, the group is to present their stakeholder’s reaction to the proposal at the first meeting. The following three or four meetings will be a series of negotiations and concessions to solve any problems (read conflicts). Finally, the class votes on a “solution”
which is the best option. The meetings will show the students which "solution" or option they felt was best.

To reach a solution must mean there is a problem. If the unit had asked students to arrive at a response to a mining proposal then the emphasis in this class discussion could have involved the whole group in an exchange of views and ideas rather than pinning those who are "in favour" positions against those who are "opposed." In the unit's guide there is no mention of any distinct problem presented at the meeting. The only problem could be voices of dissent to the proposal. If the goal of the meetings is to solve a problem, then, accordingly, the aim of the procedure is to silence the dissent and develop the mine.

In order to understand the type or amount of dissent that could be possible in these meetings, it is important to analyse the stakeholders' scripts. The texts of the scripts reveal the extent to which the proposal could be denied or supported by the meeting's various stakeholders. Another consideration is how reflective of British Columbia mining disputes and assessment meetings are these stakeholders, their histories, and their interests.

The participation level for the audience appears high in this activity, and yet, the students have not yet been invited to be partners in the curricular innovation. The students can role-play characters and breathe drama and life into this activity. However, the parameters of this drama-the issue, considerations and options-are still in the control of the curriculum writer. There is no opening in the script for the students to make important decisions of what are the issues, considerations or options from the point of view of their own stakeholder. The
students are not permitted to flesh out and determine the kind of stakeholder that they want to create and enact. Consequently, the curriculum writer is not asking the students to make personal meaning out of this event or to share in the creation of the event. The students fundamentally remain passive consumers of the unit's directions and scripts.

Another limitation on the students' participation in this town meeting is the emphasis on the issue that the community and stakeholders have only to benefit from the mine because it will create jobs. Ironically, the students are not asked to brainstorm the detriments of the mine in order to gain a wider spectrum of issues for their participation in the town meeting. The issue of the meeting has been dictated in order to drive the role-play towards a certain end. The authorial control remains with the curriculum writer and teacher.

To be fair, it is important to recognise that not all the decisions of the unit writer limit student involvement. For example, the curriculum writer did offer a procedure that would encourage greater participation by the students. The class is to hold a series of town or public meetings. The decision of the mine's development is not restricted to one sole quick meeting. Instead, the class will have the opportunity to present and counter-present; to consider and negotiate; and, to reflect and brainstorm. Most importantly, the process does maintain to some degree the democratic right of dissent from the majority. In these meetings, if there are groups (stakeholders) who disagree with the majority vote, these stakeholders will have the right and opportunity to speak again of their considerations and options. Then all the groups will consider what they can offer as options in order to bring all groups into consensus. The meetings
continue to diminish the amount of dissent. Finally, in the fourth meeting, the solution (option) with the majority vote will be accepted as the final decision. This final solution is the last option meant to end the remaining dissent. The guidelines are open enough that the students can decide how to negotiate and they can decide the changes to the options. This part of the activity must ask the audience to take control because it has to be enacted in order to function. The curriculum writer did not provide an explicit text where all the lines of the meeting or all the aspects of the options are given. That part of the role-play is the sharing of the curriculum with the students. Finally, the audience is given a chance to be a more active partner in the creation of the event.

Assuming the Role of the Stakeholder: the scripted options and considerations.

The curriculum writer does maintain some sense of authorship in the meeting event. She has provided a type of script that draws the parameters and boundaries of each stake holder's position -their considerations to the issue/proposal. Each group which represents a stakeholder has a leader. The leader holds and reads the basic script of the stakeholder's position. The script states what considerations the stakeholder wishes to voice and the options that the stakeholder would prefer. It is worthwhile to compare each stakeholder's script to determine how the position of each stakeholder has been drawn by the authority of the writer.

1) Maple Leaf Corporation: Out of seven statements outlining this stake holder's position, five contain the future verb "will." These "will" statements demonstrate what this little company will do to protect the environment and the interests of the workers. The company has already begun to consider options in
order to win the public's support.

2) The Copper King Company:
Five statements out of a total of eight statements begin with the pronoun YOU. "You" holds more personal appeal than repeating "The Copper King Company." One statement also gives an emotional characteristic to this stake holder/company. "You are anxious to get started (on the project). Your company needs money from this project in the next two years or it will be in serious financial trouble" (p.1-6). Other than this emotional state, all considerations and options confirm the good intentions of this stake holder. Again the future is emphasised by the verb will. Again the environment's and workers' best interests are the only considerations other than the starting date of the mine.

3) Ministry of Environment: Fisheries, Wildlife, and Habitat Protection Branch. The considerations of this stakeholder are not as optimistic or affirmative as the first two. The important conditioning verbs in these statements are "could" and "might." These verbs condition the statements' considerations about the negative effects of the mining production. This stakeholder is in a more apprehensive and less authoritative position.

4) The Mountain Grove Chamber of Commerce:
The statements of this group are more definitive and affirmative than the previous stakeholder: "You are in favour", "You realise", and "You know." The Chamber of Commerce is also coloured in an emotional tone: "You feel"; "You are excited!"; and, "This is the best news you have heard in years!" These are
emotive statements and punctuation that add to a powerful position of high considerations for this stakeholder.

5) Ministry of the Environment: Environmental Protection Branch.
The only consideration of this stakeholder is air quality, even though the real Environmental Protection Branch is concerned with many more considerations. For the first time in this unit, there is a possible cause of pollution connected with mining. "The emissions from this plant could cause health problems for the people and animals in the area" (Unit, p.I-9). However, immediately following this statement, a resolution or option of a technological fix is supplied. "You have just returned from a recent technological convention and know of a new power plant stack scrubber that could be used by Copper King to make their emissions acceptable" (Unit, p.I-9). The Ministry of the Environment is willing to make a concession (supply an option) by having the large company address only the emissions ratings problem (and eclipse all the other environmental harms which may ensue from the mine) in a glib manner. The student audience is not supplied with any information of the costs involved in this stack scrubber or how long will the mine be able to afford this option.

This stakeholder's position is comprised of only two statements as opposed to Copper King's eight. The consideration of this stakeholder is that the water be clean enough for fish to live and for people to drink. This acceptance of 'clean enough' gives an unclear idea to the audience of what acceptable clean is. Presently, the Vancouver water has a high amount of silt in it due to mud slides in the watershed. The water is clean enough to drink because high amounts of
chlorine have been added but what does this condition mean for the long term. Does clean enough for people to drink immediately mean that it is safe enough for long-term consumption and exposure? These fine points become the key issues for the environmental assessment of mining projects. To bypass these issues does not serve the students’ learning or their future democratic participation.

7) The We Don’t Want A Mine Here Action Committee:
The first unusual characteristic of this stakeholder is its name. Whereas the other stakeholders have believable and in some cases actual names, the one environmental group has an exaggerated and negative name. A typical environmental group begins its nomenclature by the word Save or Friends. A more convincing and realistic name in this situation would be Save Mountain Grove or Friends of Mountain Grove.

Secondly, the background of this group is unusual. The group is primarily focussed on the considerations of the property value of their homes and the recreational value of the area. Both values should maintain their respective status with the opening of the mine. The unit tells us that the citizens of Mountain Grove will have even greater recreational opportunity with the construction of recreational facilities in the town. Also, the economic boom and migration to the area will mean an increase in the property values. The mine would be in the best interest of this group when considering the first paragraph.

The position of the Action Committee changes with the addition of six other considerations. These considerations focus on irrational, selfish, and aesthetic
factors. It is evident that the mine will be noisy and ugly. But when this consideration is weighed against the economic benefits of jobs for people, it appears overwhelmingly superficial. The other listed considerations follow suit. Environmental groups rarely (if at all) employ this type of language when expressing their options and considerations. The objectives of most environmental groups is to weigh the mining companies' issues of economic profit and development against other types of issues such as the health and vitality of the ecosystems and the people living in them. The normal position of this type of stakeholder is one of considerations very similar to those of the different branches of the Ministry of the Environment. In this meeting, why are the citizens' considerations not the same as the MOE considerations?

This thorough analysis of the considerations, issues, and options of the different stakeholders in this unit is necessary. Students only have these written descriptions to form their opinions and ideas of who these stakeholders are and only these issues, options and considerations to determine their participation. Elementary or even secondary students have likely never participated in a town meeting or an environmental assessment meeting. It is this section's text that will give students their first intellectual engagement with the Ministry of the Environment or a citizen's environmental group. It is unfortunate that students have only the industry's definition and characterisation of these stakeholders. Ideally, a juxtaposition between these characterisations and the characterisations these stakeholders would write for themselves would help enable students to choose their own issues, considerations, and options. Students would be able to reorganise their knowledge about stakeholders and, more importantly, about the decision-making model supplied here by the Mining Association. The
monovocal town meeting of this section perpetuates the narrow range of choice and participation for the student.

The unit instructs the teacher to be the chairman of the meeting. The term is formidable in its authority but the unit does not suggest any ways that the teacher is to enact this role. The curriculum writers have only suggested that the teacher videotape the meetings for the students to enjoy and, if time permits, to have students research different options such as reclamation or waste-water to "help with their problem-solving." It is interesting to examine the freedom and choice given to the teacher in contrast to that provided for the student. The teacher has become the privileged partner in the relationship with the Mining unit whereas the student is the underprivileged partner with minimal choice and voice in the unit.

The New Hotseat! 1.2 (available 09/95 to present)

Changes have occurred at the Mine Games exhibit that I could not have envisioned during my visits of the school year 1994/95. When I inquired as to the schedule of Hotseat! school visits at the beginning of this school year, I was astonished to learn that there were only six registered school tours of the exhibit in the whole month of November and the majority of these groups were Grade 5/6 classes. Only one class, a Grade 10 science group, would be having the Hotseat! experience. I arranged my timetable to accommodate this scheduling because I would only have one opportunity this autumn to view another group's experience of the town meeting exercise of Hotseat! 1.2.
I was hoping to observe the differences of interactions with the video clips and the subsequent decision-path choices between the 1995 students and the 1994 students. I was surprised to discover that the two Hotseat! programmes, the original of 1994 and the revised one of 1995, were fundamentally different. My analysis had to shift from differences in student responses to differences in student participation in the new 1995 programme.

Defining and Restricting the Issue

The first difference in the November 6th (1995) Hotseat! was a large banner sign. The sign announced that the Hotseat! is now a game show. The SW moderator ran in and introduced himself and welcomed the students to the Hotseat game show. The "game show" began with the class of 18 identifying themselves by which station they had spent the previous 45 minutes. One half of the class had visited the High Stakes station and the other half had spent their time at the Wild Things station. The moderator then asked one member from the High Stakes group to come forward and identify on a three dimensional model of a topographic map which location they had determined for the drilling of gold and the development of the mine. Next, a member of the Wild Things group was asked to identify on the same model where they felt the best location for the tailings pond should be put.

The SW moderator commented that the class had come up with some good answers for these two issues and now it was time to see what answers Bob the Mining Manager has in mind. The moderator touched the computer and a video clip of Bob giving a speech to the stakeholders at the town meeting
appeared on the 4X4 monitor screen. Bob gives a very optimistic speech of the benefits and economic future for the town of Grizzly once the mine is opened. Many stakeholders smile and nod in the audience of the meeting.

The SW moderator comments that not all members of Grizzly feel the same way as Bob and he presses another video clip. On the screen, Maxine, the mayor of Grizzly, also gives a speech. She is opposed to the mine because the flats' nature will be ruined and there will be no protection for the grizzly bears in the area. She also argues that the economic vitality of tourism will be ruined by the fact that camping and hiking will be stopped by the mine's presence. Immediately following her clip, the other stakeholders state their issues. The woman historian states that she intends to preserve Fort Hope and her image is left on one of the bottom monitors. Next the First Nations man states that he intends to protect the elk. His face is also positioned on a monitor and each stakeholder has a slogan appear on the bottom of their own monitor. The final stakeholder on screen is the ski resort developer who wants to protect from the mine's development an area designated for his resort.

The stage has been set. The students have seen active passionate people giving their views and issues expression. At this point, the SW moderator makes a crucial intervention. He states, "All these people WANT the mine to go ahead! They just want to protect their interests. It is your job to help them protect their interests and find a solution for the development of the mine" (emphasis added). The moderator has eliminated all the other issues of the stakeholders. Once again, as noted in earlier chapters explaining the Hotseat! 1.1, the moderator has lowered their status to that of considerations and/or options. Considerations
and options never contest or stop the development of the mine: they only
determine how the mine will be developed. The students’ participation has lost
an essential power element that the real environmental assessments
acknowledge: the right and option to refuse the mine.

The class of 18 is divided into four groups. Each group represents one of the
video-clip stakeholders. Each group receives a card that states their character’s
interests, or as the SW moderator rephrased it, “What you want to get”, or the
options. On the other side of the card is a list of facts or considerations that may
be useful for the group to argue a point or venture a option to another group.
One consideration on the First Nations card was the “fact” that tailings pond area
will be returned to its natural state 10 years after the mine closes. The SW
moderator informs all the groups that their job or the issue is to figure out
where the parts of the mine should be placed and he invites them to examine
the topographical model up close.

The groups are given 10 minutes to read the card, brainstorm strategies, and
figure out their position. While the groups were meeting, the class’s teacher and
the SW moderator visited a couple of groups. To the First Nations group the
SW moderator advised them that their present option for the mine’s location is
unrealistic because it is not near the gold deposit. To the Mayor group, the
teacher told them that their option was also unrealistic. “The whole idea is to
bring money into the town. Shipping the waste rock and tailings elsewhere, out
of the valley, loses money for the town.”
The participation of the students was highly controlled during the introduction. The SW moderator transmitted directions and asked questions for specific "factual" answers. When the students finally had a chance to talk amongst themselves and use the information to their own purposes, the teacher and SW moderator still would not give them the freedom to have 10 minutes completely to themselves. Instead the two men were actively steering the groups towards certain options and considerations by using the call to heed scientific realism.

Soon, too soon, the enacted meeting began. The ski resort stakeholder group was called upon first. One boy quickly jumped up with the card in hand and proceeded to read off the list of considerations and options of Lenny, the resort developer. Next the SW moderator asks the mayor group what she proposes as options (or what she wants). The group answers that Maxine the Mayor wants to construct a big fence around the mine to keep bears out of the mine. This group's spokesperson was as outspoken and boisterous as the first group's spokesperson. There was no consultation with the group before either spokesperson had assumed the role or decided what to say. The third group is the First Nations stakeholder. One boy reads out the options and he is echoed in a more profane and racist manner by his buddy. "We want jobs because we are all unemployed bums." The class laughs and the SW moderator ignores the comment.

The meeting quickly became a loud boisterous affair with the different spokespersons posturing and arguing against the other spokespersons' options. The groups were not consulted and the meeting became a test of wills of the four
strong personalities. There was active participation by four members while the others watched bemused. The SW game show host stopped the four spokespersons’ exchange and then concluded the event. “You have all come up with most of the solutions (read options) that we have in our programme. However, most real life negotiations are never resolved in 30 minutes. For example, the point of what wage will be paid to the First Nations people by the mine has yet to be decided. Most real life negotiations take weeks, months, or even years at times. Well done and thank you for coming to Mine Games.” The class exits with their teacher telling them that they must hurry to get on the bus in order to return to school for their extra-curricular events.

I spoke briefly to this SW moderator to try and discover the reasons for the significant changes in the Hotseat! 1.2. He replied that this Hotseat! 1.2 session of role playing was the first try of its kind. Science World staff felt it was too demanding to ask students to stand up and declare their beliefs in the Hotseat! 1.1. And, it was even more difficult to consequently be forced into a position of defending these beliefs in front of one’s peers. This SW moderator believed the role playing of the 1.2 version permitted the students an opportunity to play a role but not have it be their own personal standpoint. Effectively, the Hotseat! 1.2 version has removed an opportunity for students to bring their own personal meaning making into the event.

I also asked for the moderator’s explanation of why the issue of the mine not being allowed to develop had not been given or permitted to the students in the 1.2 meeting. He disagreed and stated that if a group felt strongly in the Hotseat! 1.2 that there should not be a mine than he would abide by that decision. But the
notion that a group of students would fight for the elimination of the mine's development is almost inconceivable in this revised exhibit when one considers the museum's assumption of students not personally participating in the town meeting event.

The change in the Hotseat! 1.2 to remove the students' personal implication is in direct opposition to the movement in exhibit innovations occurring in other museums. In an exhibit designed by an artist turned curator, Fred Wilson, the exhibit examined the racist practices of the historic museum in which the exhibit itself was located. Wilson emphasised (1994) the same need that I have noted in earlier chapters, the need for museums to validate the personal perspective. "It is personal history and personal meaning that forms the basis of a lingering engagement with the exhibit". ...Wilson's fear of imposing a personal moral statement on others led him to use the questioning process as the organising principle of his work so that the visitor looks at the exhibit and asks "Where am I in all this?" in relation to the curator vision (p.13).

The broadening of curatorial authoring will necessitate the inclusion of visitors' views and interventions. To facilitate this, audience members such as students need to be invited to enter into a dialogue about the representations of mining and nature occurring in the exhibit. The students have to be made aware that there are other issues, considerations, and options available to them. Partnership in the innovation demands a type of communication that does not attempt to present received opinions (i.e. this is the issue or the best option) or to affect attitudes. Sharing in the exhibit's innovation means drawing attention to the essentially open-ended issues which underlie museum processes. To do this
it is necessary for Science World to reveal something about these processes (why did they choose this one issue and not others ...) and to call for comment from the students. It is necessary for Science World to ask students to review and comment upon their experience of the exhibit while they are experiencing it as well as after the event.¹¹

The Relationship Between the Mining Association’s Unit and Science World’s Mine Games

After experiencing first hand the new Hotseat! 1.2 programme, I had a lengthy interview with one of the two education coordinators of the Mining Association of British Columbia. We spoke of the Mine Games exhibit and its connections to the Mining Association. The exhibit was partially financed from the support of the Mining Association. The exhibit also received educational support from the Association’s education coordinators and the teacher-writers of the MA’s units. After further discussion, I mentioned how similar the Mining Association’s Grade Five unit’s town meeting was to the new Hotseat! 1.2 programme. The Mining Association’s coordinator guffawed and exclaimed that the reason for this similarity was no accident. It was due to the fact that the MA unit’s teacher-writer had reviewed the exhibit and made a list of recommendations for change.

The coordinator continued by detailing the history that led to the review and the innovations. Many teachers had been complaining to the Mining Association during workshops that the Mine Games exhibit was not appropriate for the elementary age students nor was it easy for adults to understand. As the numbers of registered classes dwindled and the complaints continued, the

The coordinator told me that there was communication between the administration of Science World from the Mining Association of B.C. After this intervention, the Mining Association education coordinator and the Grade 5 unit teacher-writer went through the exhibit with a class to assess the needed changes. The results of their assessment are the new characteristics of the Hotseat! 1.2.

There are differences that remain between the Mining Association unit and the Science World exhibit that deserve consideration. If the Hotseat! 1.2 is to benefit from the unit's "Environmentally Involved" town meeting, can it achieve this improvement even when the exhibit's context is radically different from the unit's? The Mining Association Unit has certain advantages that can never be simulated in the Science World context. Conversely, the original Hotseat! 1.1 had advantages that have now been lost due to the adoption of the Mining Association's unit's design.

Firstly, the unit's town meeting provides ample opportunities to the students to repeat, formulate, rehearse, and reattempt their own town meetings. The more time spent creating a town meeting, the better and more familiar the students will become with the process. And hopefully, the more able students will become at recognising the limitations of the issues, options, and considerations in the meeting. The Hotseat! (either 1.1 or 1.2 versions) can never be longer than 30 or 40 minutes due to the time restraints of classes on field trips. Thus, students are hardly given time to understand the process of issues, options, and considerations, let alone become actively engaged in the event. The Hotseat! 1.1 or 1.2 could be a more engaging event if the students had been prepared in their classrooms before the field trip. Exhibit preparation packages which explain the
model of decision-making and its three components would give students the opportunity to rehearse this type of town meeting process. Students would then have a previous background upon which they can realise what issue or options they would like to propose or argue for in the meeting.

Secondly, the unit's town meetings are many; therefore, the possibility of the students playing various stakeholder roles is available. The new Hotseat! 1.2 only permits a student to adopt one stakeholder's position. Their experience will be limited by what they saw on the position card and what they offered to the role-play. The original Hotseat! 1.1 was different from both the unit and the new Hotseat! 1.2 because the students were asked to intervene in the meeting not as stakeholders but as themselves. Which interaction on the part of the students is more meaningful or powerful: to air one's own views or to posture what someone else supposedly would feel in this situation? The Mining Association people and the Science World moderator may be correct in stating that asking students to state their own beliefs in public and in front of their peers is too demanding and difficult. Yet, I believe the problem is that it is an uncommon experience for most students and one that they do not know how to handle. Rarely are students asked to state their beliefs on any issue in the classroom or in the museum. To suddenly ask them on a field trip, in regards to a controversy that they may feel they have scientifically inadequate expertise or views, is to ask them to participate in a manner that no one has ever asked or expected of them. It was an important offer in the original Hotseat! 1.1 But it was one that lost out to quick hassle-free entertainment.
Thirdly, the issue of providing a script is a significant difference between the original Hotseat! 1.1 and the new Hotseat! 1.2. The cards or scripts for the new meeting curtail the stakeholder's issues, considerations, and options at the beginning of the meeting. The original Hotseat! 1.1 did not give a script for the audience. Opportunities were given to the audience to make choices at critical moments in the meeting. The audience made choices to remove the conflict and build consensus. The range of choice for the options were essentially narrow but the audience was not reading the event as a scripted path, even though the moderator was. The audience still maintained a view of themselves as spontaneous decision-makers.

The goal of any use of script or text in an exhibit should be one of opening the dialogue between the museum and the audience. Through creative means, the museum can open the dialogue for the visitor to question the script or text being presented. In the case of both the original Hotseat! 1.1 (without a text to the audience) and the new Hotseat! 1.2 (with the use of text on the cards), the agenda of this type of interactivity was set by the curator and not by the visitor. This curatorial position frankly assumed that the questions posed by the Science World employees are likely to be more fruitful than those set by the average visitor.12

Elaine Heumann Gurian (1991) has attempted to point up to curators this inherent elitism towards their audiences. It is at times more evident when the targeted audience is one of children. Gurian challenges her colleagues to imagine and strive for a more respectful and inclusive attitude towards their audiences.

If we, the creators of exhibitions, think that viewers are inherently smart (though not necessarily well-educated or familiar with the subject matter) and that they are entitled to ask questions and receive answers, then we will address questions the audience has rather than tell them what we think they should know. (p.185)

If the Science World curators and staff had offered many issues, considerations and options to the students, they would be admitting that they consider the students equal partners in this simulated mine assessment meeting. Science World would be giving the students the right to be independent decision-makers assessing a controversial issue. Unfortunately, Science World abolished that right for the students to decide to educate themselves on the issues, considerations and options of a town meeting. We can only here surmise what effect(s) this model of student democratic participation will have on future exhibits and other curriculum concerning controversial environmental issues.

Conclusion

After examining the exhibit and curriculum unit we can construct a typology to assess student and teacher participation in dimensions of decision making. The ideal situation of student and teacher participation in any simulated mining assessment meeting would have the following characteristics.

Table 1:

| Stakeholders Defined by Script | Mostly No |
| Possibility of Rejecting Mine Proposal | Yes |
| Issues Defined by Script | Mostly No |
| Options Defined by Script | Mostly No |
| Considerations Defined by Script | Mostly No |
| Student Represents Own Interests | Yes |
| Student Assumes Role of Stakeholder | Yes (if wanted) |
| Multiple Meetings | Yes |
| Teacher Input into Script | Yes |
| Student Input into Script | Yes |
We can represent our assessment of how the actual unit and exhibit compare to our ideal type model of participation below:

**Table 2:**

<table>
<thead>
<tr>
<th></th>
<th>Hotseat!1.1</th>
<th>Mining Assoc. Unit</th>
<th>Hotseat! 1.2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stakeholders Defined by Script</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Possibility to Reject Mine</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Issues Defined by Script</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Options Defined by Script</td>
<td>Yes</td>
<td>To some extent</td>
<td>To some extent</td>
</tr>
<tr>
<td>Considerations Defined by Script</td>
<td>Yes</td>
<td>To some extent</td>
<td>To some extent</td>
</tr>
<tr>
<td>Student Represents Own Interests</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Student Assumes Stakeholder Role</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Multiple Meetings</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Teacher Input into Script</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Student Input into Script</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
</tbody>
</table>

As can be observed in the above tables, all three models of the town meeting (or public democratic discussions) found in the school or the museum have control over certain aspects of the audience's participation which the ideal—modelled on real public meetings which occur outside of the museum or school texts—does not attempt to impose. Hotseat! 1.1 does minimally allow the audience the idea that they can reject the mine at the beginning of the meeting session whereas the ideal town meeting leaves the rejection of the mine a viable option throughout the duration. The Mining Association of B.C.'s unit has the advantage of time. This unit can permit multiple meetings and teacher input into the script because the constraints of the museum's location and price and the Science World moderator have been erased. More responsibility falls onto the teacher and with that task comes the chance of more freedom from the script and more input by the teacher to alter and revise the town meeting procedure. The most limiting and controlled meeting, as demonstrated in the table, is the Hotseat! 1.2. Unfortunately, it is the present and longest running representation of a town meeting at the Mine Games exhibition. Thus, it is the model experienced and viewed by the majority of visitor-students.
In conclusion, museums and schools need to reach out to their audiences not simply as customers but as constituents, to become partners with their communities in effecting change in their respective institutions. Listening thoughtfully to our audience, in the museum or in the classroom, may provide the lexicon for a new language of communication. This communication would enable audience interactivity in meaning-making events of the museum or the classroom. Museums and classrooms would become places where the audience expects to have their views and perspectives welcomed and challenged. If museums and schools are to be valued as institutions in the years to come, if their innovations are to be effective and meaningful, they must be attentive and open to being acted upon by their partners.
Chapter 5.

The Goal is the Roles:
An Examination of the Use of Computer Games in the Mine Games Exhibit

The young today reject goals. They want roles -R-O-L-E-S. That is, total involvement.
-Marshall McLuhan 1967

In the late 1980s the environmental consciousness of the Canadian public peaked. Public opinion polls reported that while in 1986, only 18% of respondents felt that individual Canadians were primarily responsible for protecting the environment, by 1989 that number had risen to 35%. At the same time the public became increasingly critical of industry's environmental record and skeptical of the credibility of government and business spokespersons on environmental issues. Alarmed by the credibility gap, industry and government defined the environmental problem as one of communication. Writing in the Canadian Institute of Mining Bulletin (1991), a self-described 'specialist in resolving public controversy", Desmond Connor, argued that there is " not only a high level concern about the environment, but also general economic illiteracy....When the general public is ill-informed about the mining industry and its contribution....the media can play on people's emotions" (p.55).
For the Canadian mining industry the visible proof of the Canadian public’s economic illiteracy and general mistrust of the mining’s environmental record was the rejection of the Tatshenshini mining project in 1993, as I demonstrated in chapter 1. Facing a future of escalating land use controversies and a less than sympathetic public attitude toward mining, the major players in the B.C. mining industry and governments invested in a public education project: Science World’s Mine Games exhibit. In the press release issued by the B.C. Minister of Mines, Minister Edwards described the goal of the exhibit:

The goal is to encourage understanding about mining, particularly among young people....Players put themselves in the roles of the people involved; first, they become the exploration manager for the imaginary NorthStar Mining company, then NorthStar’s mining biologist, and later, the mining engineer as they face the challenge of developing a mine that is safe, environmentally sound and economically viable.


In the list of roles, the role of the environmentalist is notable by its absence. Mine Games has a clear standpoint; the standpoint of NorthStar Mining.

In the previous chapters I argued that the Mine Games exhibit can be read as a comedy in which the mine marries the community. The comedy plot line is recognised at the outset in the provincial government’s press release where the exhibit is described as one “in which participants make decisions that balance industry and the environment while setting up a mine site ”. The mining industry’s understanding of their environmental problem as one of communication or the illiteracy of the public is reflected in the strategy of setting up an educational exhibit. In order to close the credibility gap revealed in the
opinion polls, the public needed to "understand about mining" and in particular understand how to "make decisions that balance industry and the environment while setting up a mine site". In short, the exhibit was designed to give the public, and in particular children, an understanding of mining decision-making. By understanding the logic of corporate decision-making, the participant arrives at the conclusion that a marriage of mine and community can be arrived at in which the concerns of industry and the environment are balanced.

The "game" design of the Mine Games exhibit, which is moulded into every aspect and at every turn into the exhibit, was a direct response to the fact that the majority of the "target audience", children, play computer games. Exhibit participants move through four game stations, playing games which put them in the role of exploration manager, wildlife biologist, mining engineer and mountain bike designer and rider. In this chapter, I want to examine the role of computer games in the Mine Games exhibit. The games are not merely fun ways to learn geological, biological and engineering knowledge, but, more importantly, ways to familiarise children with the logic of decision-making.

PLAYING MINE GAMES

The Mine Games exhibit offers four computer games, one for each mini-exhibit. I began with the first mini-exhibit game, High Stakes. I followed the suggested sequence of touring this exhibit by first exploring and recording the information from the six concrete or clipboard stations. I then sat down at one of the four computer terminals to play the High Stakes game.
The game involves the player taking on the role of the mining company's exploration manager who is prospecting and drilling samples in order to locate the richest ore deposit. The game gives the player a budget from which she purchases drilling permits and spends sums to pay for the actual costs of the drilling.

The player begins her game in the offices of NorthStar Mining, sitting down in front of a terminal, and next takes a helicopter flight through the Grizzly valley. These landscape images entertain the player while the game instructions are given orally. The game actually begins once the player chooses the quadrant and exact spot where drilling will begin. The player chooses the depth of the drill and spends a proportionate amount of money on exploration drilling. The strategic choice is one of distributing the number and cost of drill holes.

I lost my funds and the game quite quickly because my strategy involved drilling a few deep holes rather than opting for a more extensive exploration programme involving more, but shallower holes. The scientific information the player recorded at the clipboard or concrete station is used only to determine which of the 4 drilling locations available contain the gold. Having narrowed down the gold's general location the problem becomes one of determining the most effective way to spend your drilling budget: in simplest terms whether to drill a few deep holes or whether to drill a lot of shallow holes in the hope of narrowing your search area.

The second game I played was Blast It! Here, the player is given the role of a mining engineer. First, I had to determine which air shafts had to be closed in
an old mine in order to travel the tunnels safely. Second, I chose the most
effective machinery, the scooper, to use as my vehicle. The game was really a
maze where the player must find an exit to this old mine. Many obstacles such
as a dead battery, floods, and rock wall crashes, waited around every corner of the
maze.

The graphics used in the game were very effective. The atmosphere of dark,
dusty and claustrophobic tunnels was well conveyed. I had the feeling that this
was an environment not available on the surface of the earth and I wanted to
escape this gloom as soon as possible. The graphics helped enhance the
excitement. The idea of not knowing what was waiting around the corner or
knowing exactly where I was going, gave the game a strong element of surprise.
The level of intensity in my concentration increased over the concentration I
used in the High Stakes. However, this game was relatively easy to win in
comparison to the High Stakes game. The type of game the designers chose to
teach structural engineering of mines is one of overcoming surprising
challenges.

The third game I played at Mine Games was the Wild Things. The game begins
again with a helicopter ride through the valley while an introduction and
instructions are given aloud by the company's director, Bob. The first part of the
game is the selection of tools and accessories for the pack you will carry as the
company's wildlife biologist. Your mission is to travel through all parts of the
valley and correctly identify the plant and animal species from a multiple choice
selection. The game is intensified by the fact that if you choose a wrong item or
you are missing an essential tool in your pack, you will encounter a danger that
you will not be able to overcome; For example, if you did not pack the bell, you cannot scare away the bear.

The graphics of the plants, animals, and tools were realistic and well-defined in this game. I also enjoyed the different habitat scenes of the valley. This game was the only one that dealt specifically with the nature of the valley rather than the stages of mining. Identification of the right answer per multiple choice question is the type of game the designers chose to use in order to teach children wild life biology.

The fourth and final game I played at Mine Games was the Boulderdash race. This game is composed of a mountain bike race course. First, the player-racer must choose the parts of her bike. Three choices are given for each of the following parts: the shocks, tires, and frame. Your choices here will affect your timing on the race by either slowing you down or not permitting enough flexibility on turns and over terrain. Next, the player actually rides down the mountain course. Using two buttons, one for the shifts and the other for the brakes, the player tries to control her descent and capture the fastest time. You have to both be able to read the topography graphics and respond quickly. My inability to “read” the topographical features of the race course led to an inevitable crash into the river. For my students, and particularly the boys, Boulderdash is similar to any one of a number of arcade games that rely on translating a machine landscape into quick hand-eye moves. Boulderdash is clearly the most marginal of the exhibit’s games. In conversations with the Science World staff they describe the game in the terms of a supermarket loss leader; designed to get you through the door of the exhibit so you can try some of
POSITIONING THE PLAYER

After I had played all the games, I found myself returning to the Wild Things game for a second try. The game appealed to me because of its basis in knowledge rather than random search or the mastery of particular hand-eye coordination skill. In evaluating my own response to the games I was led to reflect on the relationship of a game's appeal and its audience. Each game attracted different audiences. The High Stakes game was maintaining the attention of older visitors. The Wild Things game was primarily attracting younger children accompanied by their parents and a larger number of girls. The Blast It game was engaging mainly boys, aged between eight and thirteen years old. Finally, the Boulderdash race game was attracting all ages and both genders; however, the boys were the most insistent on playing the game more than once.

Why were these computer games having this sorting effect on the audience of this exhibit? Why did I find myself preferring one game over another? Did the Mine Games design team take these effects on the audience into account when deciding on the games? What could these computers and computer games mean to children in the context of a science exhibit of a controversial issue?

To consider the answers of some of these questions, I turn to Langdon Winner (1986), a critic of the social uses of technology, who sees a relationship between design and patterns of power and authority in his book Do artifacts have politics?
In the first instance I noticed ways in which specific features in the design or arrangements of a device or system could provide a convenient means of establishing patterns of power and authority in a given setting. Technologies of this kind have a range of flexibility in the dimensions of their material form. It is precisely because they are flexible that their consequences for society must be understood with reference to the social actors able to influence which designs and arrangements are chosen (p.38).

This first criterion in Winner's view, flexibility, can provide a valuable framework for analysing the intentions on the designers' part. The design of each game was controlled by one or a group of game designers: the type of game chosen, the content employed, and the role the player must assume. These decisions could have been influenced by time constraints, external requirements to the funders of the exhibit or other pressures. Regardless of their locus, these elements combine to reveal patterns of authority located in the politics of the exhibit. Each game demands that the player take on the identity of a company employee and examine a stage of the development of the mine. The range of flexibility for player movement and decision in these games is constrained by single correct responses repeating the lessons presented in the concrete or clipboard stations. Abstract political values regarding mining are given concrete representation in the mining computer games, and together produce a unified subject position that the player is invited to occupy and triumph in order to make sense of the game's text and win the game.\textsuperscript{13}

These computer games try to construct an ideal subject position which they invite us to occupy, and if we do, reward us with the ideological pleasure that is provided by experiencing, once again, that the dominant ideological practice of the mining industry (or status quo society), apparently, works. The pleasure is\textsuperscript{13}See Fiske, 1987, p.50.
the pleasure of recognition. Of course, the degree of fit between these social meanings and the games' preferred ones will be determined by how closely the ideological practices of our everyday life fit with the dominant ideology of the mining industry. If our subjectivity conforms easily to this dominant ideology we will find little strain in adopting the subject position that these games construct for us (Fiske, 1987, p.51).

The irony of these games in the Mine Games exhibit is the fact that the student can play and enjoy them but still reject the existence of the mine in Grizzly at the initial stage of the Hotseat! 1.1 forum. [In this Hotseat!, the Science World moderator begins the meeting by asking if the students support the mine being developed in Grizzly. Even after a negative response by the majority of the audience, the quick firing questions by the moderator can overturn the debate axis from one of the development of a mine to one of how the mine will be developed --as I demonstrated in the preceeding chapters.] There is a multiplicity of readings available in the game space. The game connects with the student as an active part of their recreative/social life but the games' content can be contradictory to their ecological beliefs. While the contradiction and tension is present, it does not appear to be overwhelmingly significant for the student. Their focus remains on the game even if they are blasting tunnels in a mine shaft that they would wish to keep closed.

A good description of my experience with these games and how they represent certain styles in our culture can be interpreted from Sherry Turkle's work in her landmark book The Second Self (1984). Turkle points up two distinct cultural styles that occur when people are interacting with computers. She calls these
two styles soft mastery and hard mastery.

Hard mastery is the imposition of will over the machine through the implementation of a plan. A program is the instrument of premeditated control. Getting the program to work is more like getting "to say one's piece" than allowing ideas to emerge in the give-and-take of conversation. The details of the specific program obviously need to be debugged - there has to be room for change, for some degree of flexibility in order to get it right - but the goal is always getting the program to realise the plan.

Soft mastery is more interactive. It is like a painter who stands back between brushstrokes, looks at the canvas, and only from this contemplation decides what to do next. Hard mastery is the mastery of the planner, the engineer, soft mastery is the mastery of the artist: try this, wait for a response, try something else, let the overall shape emerge from an interaction with the medium. It is more like a conversation than a monologue. (p.104)

Games resemble programmes in the manner that the player approaches the game. The style I find most comfortable is the soft mastery approach where there is more give and take, more conversation. In navigating a conversation the participants can interrupt, query, summarise, rephrase and move backwards and forwards. The games at the Mine Games exhibit are not open to this interactive style because they were not programmed to have this kind of relationship with the player. "Although it has become cliche to speak of the video game as "interactive", players describe the experience of being with one as less like talking with a person and more like inhabiting someone else's mind. 'Conversation gives way to fusion' (Turkle, 1987, p.72).

For the Mine Games exhibit, this idea of "inhabiting someone else's mind" is a strategic tool for reinforcing the game's goal of character identification with an employee of the North Star company. Each game space asks you to take on the role of a specific character but in the game that character is not given any graphic
representation. Instead, the character is you the player: what you see and do is what the fictional company employee is seeing and doing. There is a double identification at work here. The player is not only identifying with the game's character but she is also attempting to decode the programmer's design of the game.

The connection between the fictional character and the programmer's design is crucial for the "lessons" of this exhibit. You, the fictional character's actor, can only win the game if you act according to the rules of a successful company employee. If you understand and internalise the rules of logic governing the game's programme, then you are acting for the success and profit of the North Star Mine.

The four hard-mastery games can be divided into two categories: knowledge-based games and challenge-based games. The High Stakes and Wild Things games are knowledge based games. The first asks you to learn the basic rules of exploration geology and the second is an exercise in species identification. The knowledge based games are slower than the challenge games. In actuality, you could run back to the concrete stations to check information before entering your decision in these games. Boulderdash and Blast It are quick response, danger or challenge focussed games. The experience of these games is one demanding immediate mastery: "... the program has no tolerance for error, no margin of safety. Players experience their every movement as instantly translated into game action. The game is relentless in its demand that all other time stop and in its demand that the player take full responsibility for every act, a point that players often sum up by the phrase 'one false move and you're dead'" (Turkle,
GAME LOGIC AND THE DECISION MATRIX

The game space has two components, a clipboard space and the computer game. In the clipboard space the children are given a recording sheet which is laid out as a grid or matrix. The station is organised as a set of clues which are to be recorded in the grid. For example, at the High Stakes station, the general problem is one of using fossil evidence to locate an ore body. The participant records the fossil evidence on the grid and thereby narrows the search for the location of the ore body to a particular space. Having completed the clipboard exercise the player moves on to the computer game where the 'paper' results are used to search and drill for the gold.

The game logic can be understood as a variation on the grid or matrix approach to decision making. Characteristically, a decision can be considered to have three components; issue, options and considerations. In the High Stakes game the issue is; find the gold. The options are the four geographical areas one can drill in. The considerations are the fossil evidence, the cost of drilling and environmentally sensitive areas. For example, in Table 3, we can represent a hypothetical decision matrix as follows (+ means yes, low cost, or positive whereas -- means no, high cost or negative):
Table 3:
CONSIDERATIONS

<table>
<thead>
<tr>
<th>Fossil Evidence</th>
<th>Cost</th>
<th>Environmental Sensitivity</th>
</tr>
</thead>
<tbody>
<tr>
<td>OPTIONS</td>
<td>Yes/No</td>
<td>High/Low</td>
</tr>
<tr>
<td>Iceman Glacier</td>
<td>+</td>
<td>--</td>
</tr>
<tr>
<td>Grizzly Valley</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Doubtful Creek</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>Hopeless Creek</td>
<td>--</td>
<td>+</td>
</tr>
</tbody>
</table>

In our example a positive assessment of the fossil evidence, costs and environmental sensitivity would lead us to the Grizzly valley exploration option. The successful player uses the clipboard knowledge to create a decision matrix that leads to finding the gold.

By playing the games the participants become familiar with the issue/options/considerations logic that is an everyday part of corporate and government decision-making. However, some options are not represented in the exhibit's games and some considerations are not part of the decision-making matrix. In 1992 the B.C. Commission on Resources and Environment prepared an analysis of Land Use options for the Tatshenshini-Alsek Area. One of the options identified was complete preservation. The Mine Games exhibit precludes consideration of that option. The games were designed to reflect the
second option in the Tatshenshini analysis; preservation and mining. The provincial government press release (1994) is clear: "This remarkable display shows visitors how choices and decisions are made in designing and creating a mine" (Province of British Columbia, Ministry of Energy, Mines and Petroleum). The exhibit's goal is "win-win solutions". In rejecting the preservation and mining option in the Tatshenshini case, the government acknowledged the significant economic benefits of complete preservation, benefits that the CORE analysis represents as greater than the economic benefits of mining. In short, the exhibit fails to consider an option which is part of any environmental assessment; the no development option. And it ignores a vital consideration; the economic benefits of wilderness preservation.

BLACK BOX PEDAGOGY

The use of the computer, as a vehicle for a game that is unalterable by students, is to present a black-box approach to education. The exhibit's computer games are not understandable or transparent. Students cannot 'look underneath the hood' and have contact with the material of the technological artifact. Thus, they lose sense of how their material world is being transformed by the technology. And they lose sight and understanding of how the science involved in the object constructed this present concrete reality.

Sherry Turkle (1994) reports on physics teacher, Martin Deutsch, who rejects the passivity of black box pedagogy in his junior physics laboratory.

Deutsch begins with the assumption that the most dangerous thing in a laboratory is a "black-box", an incompletely understood procedure or piece of equipment. Ideally, "each apparatus should be simple enough so that the student can open
it and see what’s inside.” For practical reasons, students can’t design all of their instruments for themselves, but they should be able to feel that they could have. Deutsch’s educational philosophy is based on his learning style: it emphasises intellectual ownership through working in a transparent environment.

As Deutsch sees it, his lifelong battle against the black box is a “rear-guard action” because “as techniques become established, they naturally become black boxes.” But “its worth fighting at every stage, because wherever you are there is a lot to be learned if you keep the box open that you will surely miss if you close it”. (p. 562)

The Mine Games exhibit has closed the boxes of computers for the purpose of an unalterable game logic.

CONCLUDING REMARKS

For the followers of Piaget, the best learning occurs in doing, creating and building. While Mine Game players may be involved in doing, it would be hard to construct a case for the claim that they build or create. The logic of the exhibit is one of role identification. Play a game in which you must learn to think like an exploration manager, wildlife biologist or mining engineer. Have fun while learning something serious about the considerations mining companies bring to their decision making process in siting a mine. Sadly in the black box pedagogy of Mine Games the kids can’t leave their ideas in the computer—they can’t interact with the data to change the matrix and add new considerations and options.¹⁴ The games are all one-way streets in which you either find the gold or spend all your drilling budget; you blast your way out of the mine or are buried in debris; you identify the wildlife or are fired; and, finally you win the

¹⁴ For an alternative vision of technology in the classroom see Goldman-Segall, 1992.
mountain bike race or crash into the river. From my standpoint Mine Games offers a limited way to represent controversial issues. The ideal exhibit would be designed as a conversation, in a soft-mastery approach, in which participants can "interrupt" the games and the exhibit. Rather than winners and losers, the space would encourage Goldman-Segall's notion of a collaborative community; the games would become sites for connectedness, interdependence, intimacy, cooperation and multiple points of view.
In 1989, James Clifford, the cultural critic and anthropologist, travelled to Vancouver Island and visited the Kwakiutl U'mista tribal museum. The Umista departed from the Western museum conventions to create an exhibit that challenged the viewer.

The display’s effect was of powerful storytelling, a practice implicating its audience. Here the implication was political and historical. I was not permitted simply to admire or comprehend the regalia. They embarrassed, saddened, inspired, and angered me -responses that emerged in the evocative space between objects and text. (1991, p. 240)

Walking through Mine Games with Clifford’s text in mind, I felt angry. But my anger was not the anger of implication, it was an anger directed at how Mine Games positioned me as a participant. In the techno-game logic of Mine Games, my task was to conform to the roles prescribed by the script developed by the exhibit design team. The exhibit left no space for participants to write back, in anger or even applause. At Mine Games, the audience is treated as passive readers positioned by a hidden narrative form.
Clifford's Umista story makes the point that the audience should not simply attempt to admire or comprehend the technical material served up in a museum exhibit. An exhibit should demand a reconsideration of one's values, commitments, and emotional responses to the museum's representations. Unfortunately, Science World only gives the visitor the highs and lows of games. Winning or losing are the two primary emotions animating the exhibit. The visitor passes through stations which stress the values of competing, winning and calculating profits and risks: all of which translate into the market values of mining companies.

The decision to empty the Mine Games exhibit of any historical references to mining companies and mining communities was based on a desire to create a space outside the real history of the mining industry's contested past and its contested present. There is a non-oppositional completeness in this exhibit. To identify the rock samples as simply copper is not the same as identifying a mineral as the property of a specific mine, mined by a worker, part of a community, and, perhaps the cause for the destruction of an ecosystem. This exhibit downplays the social and environmental costs of mining (pollution, accidents, crippling labour) and mining's contested meaning in the histories of many British Columbia communities. The Tatshenshini and the Faro mine projects are erased from our public conscience by their invisibility in the exhibit. The public is not allowed to see or consider how the Tatshenshini decisions and the Faro mistakes affect decision-making regarding mine developments. Instead, the exhibit highlights the technical accomplishments, financial profits, and career opportunities of the mining industry at a time when unemployment is high and job security seems to be a thing of the past. The Mine Games exhibit
offers students a controlled, optimistic and reassuring view of humans interacting with nature for profitable purposes.

Ivan Karp (1991) has noted that exhibitions have historically used two strategies to portray the other: exoticising and assimilating. "Assimilating strategies are less easy to read. They appeal to the audience's sense of the familiar and natural. They don't stop exhibition goers in their tracks and produce a 'what in the world is that?' response ... the result is assimilating because culture and historical differences are obliterated from the exhibiting record" (p.376). In order to assimilate nature as an "other", Science World has ignored any interpretation of nature that does not echo the scientific and economic values prized in mining culture. The Wild Things station displays how nature should be observed, quantified, and analysed for the purposes of the mine's development. Science World has not tried to present other interpretations (cultural or philosophical) of nature in this exhibit. Nature is assimilated and framed in the dominant language of science and economic profit. The colonial science temple of Science World has also assimilated the gains and struggles of First Nations and environmentalists (vividly apparent in the Tatshenshini case) by denying their existence and place in this government-sponsored exhibit. The effects of their exclusion and the unequal social universe portrayed by the exhibit are not recognised or felt by the audience in this mining comedy. All seems natural, fun, and properly ordered in this seamlessly smooth reconstruction of a mining controversy.

In this thesis, I have examined different mining stories within the genre of comedy. Comedy as a narrative form can be used to tell a variety of stories; a
happy marriage of mining company and community; lifestyle and mining; or, humans and nature. Narrative forms like comedy assign the values and meanings to the facts that make up the story. It would be simple to conclude that a story of environmental controversy that falls within the genre of comedy has a predictable political subtext: mining can continue in its present form, accepting some reasonable levels of regulation and, in fact, our lifestyle depends upon it and we should celebrate it. What David Orr’s and the Tatshenshini alternatives alert us to is that there is a new type of wedding possible in a comedy, but only if we change the partners and their roles of power in the marriage. Environmental stories and curricula need not be tragic, or merely marriages of humans and nature in which nature plays a subordinate role. What Orr and the Tatshenshini decision offer us is another way of telling a comedy in which we fundamentally change our relationship to nature.

Susan Vogel, in her article “Always True to the Object in Our Fashion” (1991), documents two exhibits that sought to empower the visitor to look critically at the conventions employed by the exhibit designer, and, at the same time, to heighten awareness of the degree to which what we see in an exhibit is a reflection of ourselves. Both exhibits examined the audience’s culture rather than the displayed African culture: the museum was the subject of the first exhibit, the audience the subject of the second. Instead of simply displaying African objects in one coherent museological method, the exhibits brought attention to the way these objects have been historically displayed by contrasting various styles; recreation of curiosity rooms (circa late 19th century), natural-history displays, life-size dioramas, and art museum plexiglass display cases. The visitor had to consider how these different methods affected their viewing of the
objects and what role they themselves had played in attributing value to these objects.

We can imagine how Science World could have employed its completely fictional scenario to present an exhibit that both makes apparent the museum's set of exhibition strategies and examines the audience's own perspectives of the environment and resource extraction. A more revealing exhibit could give license to different mining companies, environmental groups, First Nations peoples, and children (the intended audience), to control and present each one's own ideal fictional community. This is not to say that all mining companies or children or environmental groups will have a consistent ideal vision but it is to say that an exhibit of this controversial nature should present more than one unified vision. Science World might want to present this type of multiple, contesting visions exhibit because it would more accurately reflect the present Mine Assessment Review Process of B.C. (Bill 59) and better prepare students for how future mining decisions will be decided. In the present legislated review process, all groups are consulted and given equal representation in the decision-making process. At the culmination of the ideal (or more realistic?) Mine Games, visitors could register their preference of community/wilderness or voice an alternative (their ideal community). Instead, Mine Games has unfortunately obliterated any alternatives to the mine development solution. The only acknowledged problem to be resolved is where the tailings pond should be located. No problems regarding value of wilderness as opposed to the economic gains of mining are presented to the audience even though this is the axis of dilemma in most mine development reviews (e.g. the Tatshenshini project). The Mine Games exhibit has replaced the idea of an exhibit that
includes multiple options with the presentation of only one convincing and viable option: open the mine.

One exhibit that Vogel helped design invited many visiting co-curators to each give their subjective mini-exhibit on what African art means to them and the influence it has had on their lives. The responses from the participants were divided into two basic positions; arguments made for universal aesthetic criteria and arguments that one can only appreciate something from the cultural point of view of the artifact's maker (1991, p.194). Mine Games could have created a space for visitors to present their visions of the environment (or wilderness preservation) and resource extraction. Most British Columbians and North Americans would benefit from this examination because many of us feel torn between arguments for economic gains or maintenance of particular lifestyles and the need for protection or preservation of the environment. Mine Games has attempted to replace and oversimplify our real dilemma with one truth: mining is too good to refuse.

A controversial issue exhibit has to make apparent the story-telling practices that we have been subjected to and which frame our viewing. Mine Games, with its singular master narrative, has ignored the possibility that there are other stories or other ways of telling the story of Grizzly, B.C.. The exhibit has bracketed off an insular tidy world that omits dissenting voices such as those of the Kaska people and their painful history of displacement and losses due to the Faro Mine. And the exhibit has denied the changing messy world of environmental decision-making where the preservation of the pristine Tatshenshini triumphed over the high-tech $11 million wonders of the Windy Craggy mine.
The Mine Games exhibit showed no reflection on the degree of subjectivity that was involved in the exhibit's design. Neither the exhibit itself nor the design team has informed the public that what it sees and experiences in the Mine Games exhibit is not material that speaks for itself but rather an interpretation by one small elite group. The Mine Games exhibit neglected the need to communicate and acknowledge the partiality of its vision of a controversial issue. The museum has not yet admitted or tried to teach the public that Science World is not a universal window through which all controversial issues can be understood and judged, but only a tightly focused lens that shows the visitor one set of representational strategies for examining a fictional (unreal, dislocated) controversial issue. Mine Games remains omnipotent and conclusive as if it were a universal window for all mining decisions.

Mine Games does not encourage the formation of personal opinions. A personal reflective process is not introduced in the bulk of the exhibit. The basic reflective question of "How does it affect me?" is a distant thought, the far background to this exhibit concerning a fictional town, with imagined characters and an unreal mine. Ironically, the fictional setting and content of the exhibit is not made apparent in the simulated town meeting where the call for 'facts' and hard science determines the end of the story. Imaginative wonderings, fantastic ruminations, science fiction speculations which would open up creative possibilities for resolving the conflicts are discouraged as the speedy town meeting is supposed to reflect "real life."
By placing our teacher selves beside our students in an equal partnership where we construct a common curriculum together, we permit ourselves and our students a richer, more involved, and more democratic learning sphere than we ever imagined possible. I believe this way of thinking and interacting is one which respect for nature requires of us and one that is eclipsed by the Mine Games exhibit. Teachers, students and humans need to place themselves in a transformational position with nature where each is liberated yet profoundly connected to each other.

Significant changes to the Mine Games exhibit would help make the comedy narrative and exhibit strategies transparent to the visitor. Incorporating other voices, ways of seeing, and, reflections on our partial viewing of nature, the exhibit would become not only a more effective teaching tool for its primary audience, children and school group, but also a more enlightened presentation as the complexities of environmental decisions are broadened and diversified. As Carpenter (1992) points up, today, museums hope to make lifelong fans of school age children because presently close to half of museum audiences and admittance revenue are from schools:

Museums are reaching out to a broader public perhaps because funding is now coming more from public sources and education is a special corollary to all this. If a person enters a museum and is immediately confused, there is a barrier to education, so part of the education program becomes removing the impediments to learning. (p.93)

Critics like Elaine Heumann Gurian (1991) are demanding that the museum professionals, as teachers of the public, consider their assumptions regarding the audience/student and the effects these assumptions can have on the exhibit experience of the visitor.
If the audience, or some segment thereof, feels alienated, or out of place, I contend it is because we want them to feel that way ... the staff are partly in collusion with a segment of our audience that wants exhibition presentation to reinforce the aspirations and expectations they have for themselves. (p.177)

In terms of my own experience with the exhibit, I am not an expert or fan of computer games as entertainment. Anyone who feels uneasy or unfamiliar with computers would find these games an impediment to their learning and enjoyment of the exhibit. Secondly, the techniques involved in mining do not interest me on their own merit or as answers for controversial issues. At the end of the exhibit I felt alienated because it was a very gendered exhibit due to the technology and the lack of encouragement for personal and social reflection. As a result, intended or unintended, the exhibit is more likely to be appealing to a primarily adolescent male audience (as a Science World employee explained to me).

Mine Games employed games and computers as didactic devices to explain complexities of the techniques of mining and the steps of consensus building. The fact that the town of Grizzly is fictitious and that the human faces and personalities associated with this town are actors allowed the exhibit designers greater flexibility for the script and greater control over the games' successes. However, the human or social context of an issue, which has primarily been the focus of most women, was not represented in the majority of the exhibit. Gender socialisation has conditioned girls and women to be more concerned with the effects of the mine on the people and nature rather than with the techniques of mining or the competition of a computer game.
It is not surprising that the resulting Mine Games exhibit would target a young male audience. Computers are among the most popular interactive devices being used to provide fun for young visitors or to lure them into exhibits, and more than that, to hold their attention without boring them. Statistics show that boys are more attracted to and involved in computers that girls.\textsuperscript{15} The serious drawbacks to the computer games used in Mine Games include their gender bias, their inconvenience of being able to only interact with one person at a time, their software reliance on the mining technique text, and, their limits in getting at the ethical and value questions involved. Finally, when considering the mining industry (its engineers, miners, and, executive managers), the industry is still a bastion of male culture. The industry is concerned with its continued presence and acceptance by the public, it does not appear overly concerned with examining its cultural biases and gendered limitations for women. Mine Games did not attempt to make the exhibit a more female-friendly space because this was not a priority for their funders' message. The continued allegiance and trust of the public in mining company decisions, the aim of the Mine Games exhibit, was to be achieved not in altering or giving a false impression of the industry as a more female-oriented profession but rather as a sector concerned with environmental factors.

According to Gurian (1991), even the ways in which an exhibit is framed, the writing of the labels, and the accompanying text, can either include or exclude learners.

\textsuperscript{15}See the work by Buchman, D., & Funk, J. (1996) and Gillen, M. (1994) who both conclude that 75\% to 80\% of the players and consumers of video games are boys.
The label writer can assume the role of a teacher transmitting information. The audience is here viewed as a passive but obedient recipient. The audience's only choice is whether to read or not to read; to be willing or recalcitrant. The failure to read by the audience makes them immediately feel naughty; consequently, they feel guilty. (p. 185)

The Science World exhibit uses the computer games to reinforce the lessons of the previous activities. If the audience has not properly read or absorbed the lessons of search, locate, and retrieve the information, then they will not only feel guilty but also experience failure at the computer game. Gurian proposes another pedagogical approach in museum exhibits.

Oppenheimer and Spock introduced contextual, direct-experience interactivity to the exhibition floor and changed the face of museums permanently by inviting the audience to participate in their own learning. The reluctance by other museums to adopt these techniques comes from these exhibition strategies' inherent inclusionary assumptions about the audience, assumptions that are not universally shared. (p. 180)

In contrast, the teaching style of Science World in the Mine Games exhibit verges on the authoritarian. The learner/visitor's response is highly controlled by the exhibit creators: the audience's attention is focussed on winning the games. The learner's attention cannot stray from or contest the material because the games do not allow this variation in the learning experience. Even the Hotseat! experience, which is lauded as a democratic forum where visitors will be able to voice their ideas, permits limited choices, all controlled and chosen by the exhibit producers. The video clips also give the illusion of choice but they follow a predetermined script and agenda. Gurian challenges her fellow museum designers to reveal this lack of democratic choice for the visitor. "Seeming arbitrariness of an exhibit's choices might be ameliorated if the curator is an
identifiable presence who discusses his/her choices within the body of the exhibit” (p.186). The body of the Mine Games exhibit never reveals who the museum designers are, the process by which they determined the script, and, their reasoning for only including these particular learning outcomes.

The Mine Games exhibit does not attempt to change the pattern of the historical origin and reason for science centres as it could have attempted in this “innovative”, design award-winning exhibit. “Science and technology centres have been created by wealthy merchants to enlist the public’s concurrence about the progress and future of industry” (Gurian, p.178). The Mine Games exhibit’s patrons are wealthy mining companies, consultation firms, and speculation companies, all members of the mining industry. The other patrons of the exhibit are branches of the government concerned with teaching the public the rules and approaches of a consensus-building dispute resolution model.

One of the animating logics of the Mine Games exhibit is role identification. Play a game in which you must learn to think like an exploration manager, wildlife biologist or mining engineer. As I have argued in chapter 5, mastering video or computer games means having to think like the game designer. If the game designer was creating a game in which the goal is to understand the role/job/life of a mining company employee, then to succeed at the game means the player must think like the exploration manager or wildlife biologist. The game’s intent is to have the player inhabit the mining employee’s mind.16

To internalise the logic of another person’s mind in a computer game (whether the game designer or mining employee) is unlike most experiences available in

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16 For a more indepth discussion of the dynamic between player and game characters, see Turkle, 1984, p.7.
the classroom. Role-identification in the classroom is often thought of one where the teacher is the students’ role model. But, in reality, the teacher’s role is mainly unavailable to the students to inhabit. Though it can be argued that the student is immersed in the teacher’s views and ways of knowing through the teacher’s choices of pencil and paper activities ..., the boundary between the teacher’s role or position and the student’s role is heavily policed by many factors including the school culture, the social norms, and the expectations of participants. The only occasion when a student is able to more fully identify with someone else’s role or character is by participating in a non-directed, teacher-driven activity such as independently reading a book. Identification with characters through narrative can be powerful but it is distinctly different from the identification that occurs when mastering a computer game. The elements of excitement and submersion of thought due to the games’ flashiness and power of instant gratification are not as easily found in the classroom’s puzzles, worksheets, poetry, novels ... or teacher dialogue.

The computer game imbues a psychological dimension into a problem that is absent in the classroom. The problem of the “High Stakes” computer game is essentially a mathematical problem of probability and restricted options. To present a similar problem in a classroom would mean to tackle the math by means of pencil and paper and within a limited context (the need to finish the problem because it is assigned). In the classroom, the students cannot identify with a math problem on mining drilling in the same manner that they can identify with the computer game’s problem. The exhibit’s computer games entice the player to identify with a self who desperately wants to solve this problem (their job and income depends on it). Identifying psychologically with
this character's quest (player wants to win along with the exploration manager) results in the player internalising a certain way of resolving the problem: a logic of issues, options, and considerations.

As argued in chapter 5, a reader cannot impose their will on the character in a book but a computer player can use their will to force themselves to think like the game designer and beat or outsmart the game's programme. The video or computer game is a rule-governed world (Turkle, 1984, p.79) unlike the affective, emotional world of narrative. To follow the rules so successfully that the player can unlock the secret of the programme (i.e. win) means that the player has effaced his critical self during the game in order to become the exhibit's ideal of a game-mediated non-oppositional self. The player has had fun winning while learning something serious about the considerations mining companies bring to their decision-making process in siting a mine.

The computer games in Mine Games mimic the components which form the foundation of the mining industry's ideas of environmental decision-making: understanding and absorbing the scientific, rational facts given by the experts and answering the technological questions rather than questioning the authorities who are making the scientific claims about the environment. To conform to these structures in the game means identifying with a certain type of self. Can teachers and students accept the self that the games and the exhibit is promoting outside of the boundaries of the exhibit? Is it a self that is compatible with the students' understandings of wilderness? Sadly in the exhibit, the students are not asked these questions or given opportunities to express their opinions. The games are all one-way streets in which you either find the gold or spend all your
You blast your way out of the mine or are buried in debris; you identify the wildlife or are fired; and, finally you win the mountain bike race or crash into the river. Unfortunately, Mine Games thus offers a limited way to represent controversial issues.

In the black box pedagogy of Mine Games, the students cannot register their ideas in the computer or inscribe their opinions on the exhibit's text. For me the ideal exhibit would be designed as a conversation, in a soft-mastery approach (Turkle, 1984, p.104), in which participants can interrupt, interject, add, agree and deny the games and exhibit's positions, roles, or statements. Unlike the present exhibit, I would like to see the students interact with the data, change the matrix and add new considerations and options. Further, I would like to have the students be able to interrupt each element of the game. If the objectives of “winning the gold” or “finding the best location for the tailings pond” are not the goals of the student, the games and exhibit should be flexible and democratic enough to allow this change. If the specific situation and context of the game are too limited (i.e. in “Wild Things” the items allowed to be packed in the pack for the excursion or the factors involved in the assessment of nature), students should be able to broaden and include other factors. If the database of the game only provides enough information to answer the designer’s prepared questions, students should be able to access other experts, other people, or points of view that will answer their own questions. If the rules of the games and the Hotseat town meeting are not ones that the students wish to abide, they should have the right to revise and set the rules which they are willing to follow. Finally, the game should not dictate only one player at a time. The students should have the opportunity (the space should be flexibly designed) to decide if they want to play...
alone, in small groups or with consultation of a large number of people.

The Mine Games' computer games have been designed as monologues rather than conversations. The monologue is one spoken by the mining industry to be heard and absorbed by the *tabula rasa* student. Ideally, the exhibit’s games would be ones of soft-mastery computer design where a conversation is held between the programme and the user and where the programme becomes a medium for and reflection of the player’s self-expression, as well as an occasion to learn some scientific facts about mining. Soft-mastery is nonexistent in Mine Games: rational winners and emotional losers dominate instead of a collaborative community. The Mine Games exhibit has sealed itself off from a technological universe, such as that conceptualised by Ricki Goldman-Segall and other computer researchers, where interactivity between the programme(r) and the user is a given. Following Goldman-Segall’s interactive model, games would become sites for connectedness, interdependence, intimacy, cooperation and multiple points of view, and, the Hotseat! town meeting would be one where the audience shares video-texts and interpretations with other audiences (Goldman-Segall, 1992, p.257).

By now the industrialist’s perspective on nature has been sufficiently celebrated. Our British Columbian history is replete with examples where the industry’s way has decided how we will impact our environment. We need exhibitions that question the boundaries of nature and industry, an influx of truly “outside” points of view or conceptions that have not penetrated our story set. The relations of power whereby one portion of humanity can select, value, and produce products from a realm we all share, the environment, need to be
criticised and transformed. This is no small task. In the meantime one can at least imagine museum exhibits that feature alternative, 'unusual', imaginative representations of the environment and industry; exhibitions radically heterogeneous in their mix of museological styles and narrative frames; exhibitions that locate themselves in specific historical contexts; exhibitions in which relations between nature and industry remain contested. With $1.5 million and the support of many interest groups, it is hard to believe that an exhibit of the calibre of Mine Games could not rise to the occasion of some of these points. The students of British Columbia would have had much to gain from this kind of exhibit.

The great potential of the existing exhibit has been missed and this cannot be emphasised enough. While any curriculum must bracket the universe in order to tell a convincing, ordered narrative, it would seem that the Mine Games exhibit has attempted to construct a narrative that is air-tight. The student is to breathe only the air that the mining industry breathes and utter stories that only the mining industry would tell. The exhibit's sophisticated design and the impressive democratic promise of the Hotseat! simulated town meeting are important and valuable directions that need to be developed further by museums. There also need to be many more attempts by schools and museums alike to involve students in controversial issues that face us daily. Due to the contentious political nature of these issues, there will need to be many attempts in different forums and designs before a set of conventions emerge that will allow the audience/students more interactivity and impact on the given presentation. Unfortunately with the Mine Games exhibit, the political games
and stifled vault-like history of its container, the traditional museum, have eroded and thwarted the aspirations of the exhibit’s pedagogical design.
References


