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Dec. 2, '88.  
Ref: STS Education

Dear Mr. Lantz

Thanks for the Draft Article "A Descriptive Model For STS Science Education". As a way of expressing my support for the new direction of Science Education, I offer the following response.

1. The article by Jenkins stresses an Integrative Approach in Science Education. I think this is a significant move in contrast to "Professional Science Education" which has a marked tendency towards ever increasing Specialization/Fragmentation.

Specialization/Fragmentation reminds me of a Frontal Lobotomy. It is said that by a Frontal Lobotomy, the brain loses no "Knowledge" in the descriptive sense, nor "Intelligence" in the sense measured by an IQ test. What is lost is the ability to integrate/organize/ coordinate knowledge, to comprehend the relational complex of the situation/context in which a problem is located, and to perform "Problem Solving". It has a kind of intelligence to deal with unknown, not Just "knowledge". It is strange that we do "Frontal Lobotomy" to our students in the name of Education.

2. But the fragmentation of Science-Technology also creates a need for Integration. As much as "Science" is a "Social Enterprise" in its making and its consequences, we have need of an Infrastructure which acts as a "Frontal Lobe" in a social scale. That goes beyond the individualistic sense of Intelligence, to social scale intelligence which may be referred to as "the level of Scientific (Technological) Literacy" of a society and is related to "Competence in Communication" that J. Habermas et al talked about.

"Scientific Literacy" is recognized as an important aim of Science Education from a nationalistic point of view. The emphasis on Science Education that emerged out of Sputnik Shock in the U.S. was an example, and I suppose Trade Competition with Germany and Japan is now added motivation to it. It is interesting to note that Germany in the 19th century, and Japan and U.S.S.R. in the early 20<sup>th</sup> century introduced Science Education with a nationalistic urgency [\*1]. Traditional Japanese culture is not individualistic and the general level of Scientific (Technological) Literacy is higher in Japan than in the U.S. because of better communication. I am not a "Pragmatist" in a narrow sense and do not think of Science Education in terms of Trade Competition. But, if the intensity of the debates concerning Free Trade is an indication, Canadians are not indifferent to the issue and educators cannot ignore the implications of the level of "Scientific Literacy" in a society/nation.

3. More importantly, the concern about environmental degradation/pollution has come to recognize the importance of education in "Integrated Science/Technology/Social Consciousness". In a sense, the overall paradigm of science/technology has begun to shift to that of "understanding of complex web of relationships" from that of "knowledge of objects/materials to exploit them". This point is discussed by many authors, such as F. Capra [The Turning Point. Bantam 1982] etc. The last several issues of the Journal Physics Today contain interesting articles and letters indicating that even professional scientists are coming to some realization of the "crisis". Although the debates also show that the majority of scientists are reluctant to admit the "crisis", the change seems unavoidable. Yet, as far as we can see in text books for Physics and Chemistry, there has not been a major revision in Science Education.

4. The shift of the Paradigm in Science has been actually in the making since early 1900s when the Newtonian View of the World was broken by new physics. In this sense, the Physics Curriculum in the Secondary Schools is behind the times. The professional technicalities in Modern Physics may not be suitable for the Secondary School Curriculum, but the essential spirit/direction in the new "Way of Thinking" may be introduced in Science Education at early stages. I think Science Educators have been less than diligent in this.

5. As a way of looking at the "Nature Of Scientific/Technological Thinking", perhaps a Multi-Cultural perspective is advantageous as well as educational. In particular, I think of the Native American Heritage that all North Americans (ought to) share. For example, I have come to note a statement from Chief Sealth quoted by P. Ehrlich in a book The Earth. Chief Sealth was warning about environmental degradation as early as 1855. [A copy enclosed]. I think Secondary School students can (ought to) appreciate this. I imagine your office has good liaison with Native Education groups. I hope Chief Sealth's statement is included in the STS text.

6. Jenkins stated in the report that teachers can "make or break" any curriculum, however good in a planning paper. I wholeheartedly agree. But that made me think of the need of a "Supporting Network". I wonder how much encouragement, material/resource support, etc. are given to teachers who are at the forefront of education. Perhaps, there is a need of workshops etc. to get their input, as well as providing them with support. Another thing that is obviously needed is Teacher Training in the Education Faculty. I wonder if there is a plan for a "Science Teacher program". I ask this, because I myself have had a great deal of problem and difficulties in offering a course called "Physics and Society". My contact with an International Developing Group also made me aware of the problem in Science/Technology Education in the Third World. It is interesting to observe that Canada has the same problem internally. The difficulty is not just a matter of "teaching facts", but it goes deeper into questions such as Ideology, Epistemology, World View, Language and Cultures. I hope that Faculty of Education will strengthen programs for Science Education.

Yours sincerely

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[\*1. F.O. Ramirez and J. Boli, mentioned this factor in "The Political Construction of Mass Schooling". Sociology Of Education. vol. 60. no.1. Jan. 1987. p.2.]

## APPENDIX 1

### The Coming of the Green

...buffalo was no more, and the destruction of the North American environment has accelerated ever since.

We have no written record of Crazy Horse's view of the Europeans; his deeds must speak for him because he was murdered at the age of 35 by people who could never conquer him. But one might imagine that great Lakota Sioux leader would agree with Chief Sealth of the Duwamish Tribe of Washington State, who did leave a written opinion. Sealth, whose name lives on in that of the city of Seattle, wrote in a letter to President Franklin Pierce in 1855:

Every part of the earth is sacred to my people. Every shining pine needle, every sandy shore, every mist in the dark woods, every clearing and humming insect is holy in the memory and experience of my people. The white man... is a stranger who comes in the night and takes from the land whatever he needs. The earth is not his brother but his enemy, and when he has conquered it, he moves on. He leaves his father's graves, and his children's birthright is forgotten... all Things share the same breath—the beasts, the trees, the man. The white man does not seem to notice the air he breathes. Like a man dying for many days, he is numb to the stench... What is man without the beasts? If all the beasts were gone, men would die from great loneliness of spirit, for whatever happens to the beast also happens to man. All things are connected. Whatever befalls the earth befalls the sons of earth... The whites too shall pass—perhaps sooner than other tribes. Continue to contaminate your bed, and you will one night suffocate in your own waste. When the buffalo are all slaughtered, the wild horses all tamed, the secret corners of the forest heavy with the scent of many men, and the view of the ripe hills blotted by talking wires, where is the thicket? Gone. Where is the eagle? Gone. And what is it to say good-bye to the swift pony and the hunt, the end of living and the beginning of survival.

In spite of the exploitative 'there's always a new frontier' attitude developed by western societies, some members of those societies had begun to appreciate some environmentally negative aspects of the Western notion of 'progress' even before the time of Chief Sealth. Scattered attempts to preserve animals go back centuries before Christ to the time of the Assyrians - but they appear to have been attempts primarily to provide rich hunting for the aristocracy. In 1514, Parliament under Henry VIII, passed the first conservation legislation in the West - an act to protect the eggs of wild birds, in part to serve the interest of nobles in falconry. Sporadic attempts were made in various places, including Britain. To preserve dwindling forests (but not until the nineteenth century did widespread concern for diverse aspects of the environment begin to take shape...

*Chief Sealth, in a letter that in some ways anticipated the modern ecological movement, this Indian Chief rebuked the President of the United States for the exploitative behavior and attitudes of white men.*

*Charles Darwin, Darwin's coherent, heavily documented ideas on evolution inspired an interest in nature and an appreciation for it among many of his contemporaries in Western societies.*