Proposal for an Alternative Korean Science Curriculum Built Upon Community-Based Research and Education

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Introduction

In this paper, I criticize the overly discipline-oriented and centralized science curriculum of Korea and suggest a possible alternative curriculum derived from the theory and practice of community based research and education. Specially, I draw upon the epistemology of community based research (CBR) and I use the Raincoast Interpretive Centre in Tofino, British Columbia as an instructive example of a community based education program developed by a non-profit organization.

Epistemological issues (i.e., the nature and variety of knowledge and how it relates to notions such as truth and belief) should be one of the most important considerations in developing public school curriculum. Traditionally, epistemological issues in science have focused on problems such as which body of knowledge is more reliable and important than others based on how that knowledge can be acquired and validated. As there are so many kinds of knowledge in a society, public school curriculum can handle only parts of them. Thus, it is reasonable that a society identifies the most appropriate knowledge for educating the young generations belonging to that society.

In Korea, school science curriculum is developed by the government and mainly depends on the disciplinary knowledge produced in universities and other academic institutions. In addition to preparing future scientists or science-related workers, the curriculum presupposes that this knowledge will help students as citizens cope with many problems in their society.

Thomsen (2003: 63), however, argues that in order to solve complicated social problems of our time, more than traditional disciplinary knowledge is required. So called "citizen science" also should be employed, where ordinary peoples' expertise is emphasized in decision-making for community issues in addition to traditional scientific knowledge. Dunnett (2004), Strand, et al (2003) and Thomsen (2003) also suggest CBR is an appropriate alternative approach to many kinds of research to address current social problems. Therefore, if the aim is to develop a science curriculum that ultimately serves all citizens of Korean rather than only a few students who will become scientists or technicians in the future, the curriculum should help ordinary citizens to actively participate in the decision-making in a society. I learned of just such an alternative science curriculum at the Raincoast Interpretive Centre (RIC) when I enrolled in an undergraduate Environmental Studies course offered by the University of Victoria.[1]

In this paper, I briefly present my personal experience with Korean science curriculum that has raised my awareness of the issues and served as my academic and educational motivation in developing community based science education to date. Secondly, I describe the epistemology of CBR and compare it with the traditional view of disciplinary knowledge, emphasizing the implications for developing science curriculum. Finally, I examine the educational program of the RIC as an informative example of the community based science education that I envision could reform Korean science curriculum.

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[1] ES 481A: Community-based Research in Clayoquot Sound. Summer session 2005. School of Environmental Studies, University of Victoria.

Personal Motivation: Scientific curriculum in Korean education

> *I don't know why I have to teach these lots of difficult scientific concepts to all students; Rhyolite, granite, basalt, gabbro and the formation of these rocks and; Plasma, Membrane, Cytoplasm, Nucleus and the specific functions of a cell. Most students would start forgetting these concepts as soon as they finished school and would not use the scientific knowledge anymore in their future lives. I would like to find any alternative way to teach them science more meaningfully. How can school science be related more closely to students' everyday experience? (Excerpt from author's personal diary written in 2003)*

Through two years of experience teaching high school science in Korea, I realized that Korean school curriculum is overly disciplinary oriented. I concluded that the kind of knowledge being taught in schools would benefit only those few students who will study science in university or work in science-related jobs. To make the subject of science meaningful to most students' everyday experiences, I tried to create alternative science lessons that focused on the scientific issues happening in our community, such as ecological change in Do-rim River and chemical pollution in the textile factories in our city. It was, however, very difficult to change the educational culture of the school on my own because the content of school curriculum in Korea (summarized on Table 1) is determined by the Korean government and imposed on all Korean schools.

Table 1. Elements of Korean science curriculum[2]

<table>
<tr><th colspan="3">Mandatory curriculum for all people</th><th>Optional course only for academic high school</th></tr>
<tr><td>Grades 1 - 2</td><td colspan="2">Grades 3 - 10</td><td>Grades 11 - 12</td></tr>
<tr><td rowspan="3">Activities, games and experiential learning</td><td>Grades 3 - 5</td><td>Grades 6 - 10</td><td rowspan="3">Physics
Chemistry
Biology
Earth and space science</td></tr>
<tr><td>Basic</td><td>Advanced</td></tr>
<tr><td colspan="2">---------------- Energy -------------------
---------------- Material ------------------
------------------ Life ---------------------
------------------ Earth -------------------</td></tr>
</table>

As shown in Table 1 above, from grade 3 (G3) to grades 10 (G10), Korean science curriculum includes mandatory science courses for all Korean students. Although these courses are supposed to be designed for all young Korean students, they seem to be preparatory courses for university sciences. For example, the unit on "Energy" corresponds to Physics, "Material" corresponds to Chemistry, "Life" corresponds to Biology, and "Earth" corresponds to the Earth and Space sciences.

This structure of science curriculum assumes that a disciplinary approach to teaching science can directly contribute to understanding and solving students' everyday problems. Korean science curriculum defines the goal of science education as follows (The Korean Ministry of Education, 1997):

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[2] Information based on The Korean Ministry of Education (1997).

1) Students will be able to understand the basic concepts and method of science and apply them to everyday experience.
2) Students will have interests and curiosity in science learning and be able to solve everyday problems scientifically.

However, I reconsider the assumption that disciplinary science is the only resource to be applied to solve the everyday science-related problems students face in their lives. For example, when making policies about chemical pollution in the textile factories in Korea, citizens' critical opinions on the pollution should be employed. For example, questions such as to what degree the pollution is acceptable, or how the term pollution is defined are important complements to scientific-derived information such as measuring amounts of chemical substances in the smoke and waste water from the factories. Therefore, the science curriculum for educating able citizens who will take part in decision making on the science-related issues in their society should reflect concrete community based situations.

I have searched for an alternative epistemology, whereby I can justify my idea of making local community a source for school curriculum and developing science curriculum that specifically deals with social issues and local problems. The epistemology of community based research offers assistance in this regard.

The Epistemology of CBR and its Implications in Developing Science Curriculum

Coping with many problems arising in contemporary society requires different conceptions and additional kinds of knowledge than found in disciplinary science. CBR can be considered as offering an alternative paradigm wherein ordinary people's active participation in the decision-making should be supported. Broadly speaking, CBR includes a subset of research methods that have been defined to various degrees, such as action research, participatory research, popular education, and participatory action research, all of which, however, share common characteristics clearly contrasted with those of traditional disciplinary research.

Strand et al. (2003: 5) define the characteristics of CBR as follows:

> CBR is a collaborative enterprise between academic researchers (professors and students) and community members; CBR validates multiple sources of knowledge and promotes the use of multiple methods of discovery and dissemination of the knowledge produced; and CBR has as its goal social action and social change for the purpose of achieving social justice.

Thomsen (2003) states that CBR is the more appropriate way to approach the current complex issues emerging from the environmental management field in Australia and citizens' participation should be viewed as indispensable to this kind of research. Thomsen (2003: 2) states the following:

> Community-based research involves people as citizen scientists, whereby citizens actively participate in research on local issues. The inclusive nature of community-based research has the ability to produce auxiliary benefits uncommon in conventional research. These include the development of social capital and social learning as the practice of citizen science empowers communities with new skills, knowledge and social networks, thus building capacity within communities to take an effective role in natural resource management.

In addition, Dunnett (2004) argues that the epistemology of traditional science does not serve CBR. According to Dunnett (2004: 15), the typical characteristics of traditional research are clearly stated by Carnegie Foundation for the Advancement of Teaching as follows (Recounted from Dunnett 2004: 15):

- It poses significant questions that can be investigated empirically
- It links research to a relevant theory
- It uses methods that permit direct investigation of the question
- It provides a coherent and explicit chain of reasoning
- It is replicable and generalizable across studies
- It discloses research to encourage professional scrutiny and critique.

These standards for scientific research cannot be applied uniformly to CBR. Strand et al. (2003: 9) contrast the features of CBR with those of traditional disciplinary research, which are shown in Table 2.

Table 2. Comparison of Traditional Academic Research and Community-Based Research

Feature	Traditional Academic Research	Community-Based Research
Primary goal of the research	Advance knowledge within a discipline	Contribute to betterment of a particular community; social change, social justice
Source of the research question	Extant theoretical or empirical work in a discipline	Community-identified problem or need for information
Who designs and conducts the research?	Trained researcher, perhaps with the help of paid assistants	Trained researchers, students, community members in collaboration
Role of community	Object to be studied ("community as laboratory") or no role at all	Collaborator, partner, and learner
Measure of value of the research	Acceptance by academic peers (publication, for example)	Usefulness for community partners and contribution to social change
Criteria for selecting data collection methods	Conformity to standards of rigor, objectivity, researcher-control; preference for quantitative and positivistic approaches	The potential for drawing out useful information, sensitivity to experiential knowledge, conformity to standards of rigor and accessibility; open to a variety and combination of approaches
Beneficiaries of the research	Academic researcher	Academic researcher, students, community
Mode of presentation	Written report	Varies widely and may take multiple and creative forms (for example, video, theater, written narrative)
Means of dissemination	Presentation at academic conference, submission to journal	Any and all forums where results might have impact: media, public meeting, informal community settings, legislative bodies, and others

The epistemology of CRB has crucial implications for the community based science education that I have been aiming to develop for Korean schools. The following are my preliminary assertions in support of my vision:

Assertion 1: *Science curriculum should include local context as well as disciplinary knowledge for educating citizens.* As shown in Table 2, CBR seeks betterment of a particular community , social change, and social justice rather than advancement of knowledge within a discipline. In order to achieve these goals in CBR, the community should act as a collaborator, partner, and learner. Traditional approaches to research mainly searching for replicable and generalizable knowledge may not and would not be the only way to solve complex problems of local communities. Therefore, if we want to teach science that enables students to contribute to science-related issues in community, the specific local context should be included in the curriculum.

Traditionally, in Korean science education, students' social, cultural and historical backgrounds have been disregarded for fear of disturbing science learning and making appropriate scientific decisions. However, in my vision of a reformed curriculum, students' common sense and knowledge from their everyday experience are considered as important sources for coming up with appropriate solutions to the issues. Further, the students will be able to use scientific knowledge depending on their diverse situations because scientific knowledge is significant only if it contributes to solving their problems. For example, chemistry terms such as sulfur dioxide and ozone might be taught in the context of environmental pollution happening in the community rather than learned only through a lesson on the periodic table.

Assertion 2: *Issue or topic based curriculum should be developed for science education.* Korean school science curriculum has been organized according to the division of university sciences, such as Physics, Chemistry, Biology, and Earth-Space science, and this demarcation has been applied even to the elementary level of school science. However, as shown in Table 1, the research question of CBR is determined by "Community-identified problem or need for information" rather than "Extant theoretical or empirical work in a discipline". Therefore, community based education might be approached in the same way. The issues emerging in a community are likely to have very unique characteristics based on the contexts of the community and thus an inter-disciplinary approach would be a more fitting way to deal with most issues while separating disciplinary subjects is likely to be less successful (Dunnett 2004: 33). Accordingly, specific issue- or topic-based lessons where all other subjects are integrated should be developed. For example, "recovering Do-rim river's ecology" or "chemical pollution in the textile factories in our city" would be appropriate topics for science units.

Assertion 3*: The local community should become a main group to organize school curriculum.* Community based school curriculum requires community members to actively participate in the development process because the curriculum should reflect the context of their community. According to Blades (1997), this decision making on school curriculum is seldom done by impartial negotiation in a society, but is more like political warfare where more powerful groups' interests tends to be reflected to a greater degree. As such, the process of developing school curriculum can be criticized from the perspective of social justice and equality. Considering that Korean science curriculum has been developed exclusively by the government and university professors, to raise the degree of local communities' participation in developing school curriculum would mean empowering local communities to voice their opinions, which, consequently would contribute to social democracy. Also, it might be possible to link school science education to real community activity outside of school. For example, the Citizen Science Centre was founded in Korea in April 2005 and the Centre will contribute to promoting citizens' critical activities in science-related issues (Kang, 2005). In my opinion, grass-roots organizations should take part in school science education for community based education.

The case of Raincoast Interpretive Centre

The education program of the RIC serves as an informative example of community based science education and an alternative science curriculum. The RIC was founded and is operated by a local community group called the Raincoast Education Society (RES), not by the provincial or federal governments. The RES is an independent non-profit organization established in Clayoquot Sound in August 2000. The mission and vision of this society, as stated in the official pamphlet, are as follows[3]:

> … to encourage informed discussion of issues relating to social and environmental sustainability. Our aim is to enable citizens within and beyond Clayoquot Sound to participate knowledgeably, effectively, and responsibly in the work of shaping a sustainable future for our region and for our planet.

The program is clearly designed to educate able citizens rather than teach disciplinary science. The program coordinator of the RIC states the educational goals as follows[4]:

> We want people to be able to give people the information they need so that they can make well-informed decisions about issues that arise here. As many of the issues are very complex and people feel very differently about them, I think it is important that there are places where they can find a whole range of different perspectives, and information on these issues. Forestry and fish farming are examples of resource management issue that our communities are facing at the moment.

The RIC has thematic science lessons based on the local situations. To concretize their philosophy they have developed plenty of programs mainly for elementary students, for example: "Animal Tracks", "Everything is Connected", "Pacific Salmon", "Tree ID", "Rainforest Ecology", "All about Bats", "Inter-tidal Explorers", "Sea Otters" and "Mudflat Ecology". The program coordinator states the specific characteristics of the lessons as follows[5]:

> Regarding the program content as I mentioned previously the school programs are intended to help students learn more about the natural and cultural history of their region, and also to help develop the skills and capacity required for research, critical thinking and decision-making about the complex issues involved in sound resource stewardship. A program on Sea Otters for example would introduce them to the ecology of the sea otter - for example where it lives, what it eats, how it is adapted for life in the ocean, reproduction, predators, why they are endangered, threats they face, and what the students can do to help.

Science projects and research conducted in the RIC are directly applied to educational programs. For example, some researchers working with the RIC have carried out the SPLAT project for saving amphibians from traffic accidents, as well as a photopoint monitoring and shoreline vegetative survey of the Tofino Mudflats.[6] All these activities can be appropriate sources of science lessons for the local schools.

Although the educational program at the RIC has very rich implications for community based science education in Korea, it also has a shortcoming in my opinion, which is that it only plays a complementary role for school curriculum because it does not have major power to influence development of provincial public school curriculum. This is a major consideration when applying the case of the RIC to the Korea context.

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[3] See http://www.longbeachmaps.com/interp-center.html
[4] Personal communication with J. Pukonen, June 17, 2005.
[5] Personal communication with J. Pukonen, June 17, 2005.
[6] These activities were introduced to ES481A students in the field trip.

The centralized and standardized curriculum in Korean public schools is directly developed and controlled by government. The government makes school curriculum exclusively depending on university researchers' works and it presses all students in the country to learn the same contents, managing the outcome by standardized pencil and paper exams.

Developing community based school curriculum should accompany empowering local communities and increasing their autonomy, because power imbalances between government and communities might weaken the perception and appreciation of knowledge from local communities and, consequently, make community based science curriculum unattainable politically. Also, school curriculum developers working in universities should collaborate with the communities rather than just keep to the disciplinary science based curriculum. I proposed that, *Community based research for developing community based (science) education* should be introduced to the school curriculum development process.

Conclusion

In conclusion, I reflect on one experience from the field trip for the ES 481A course. When we visited the Ahousaht First Nations village, I asked one high school student working at the local Youth centre if they have any unique curriculum fitting their specific situation. The answer was "No". The school had almost the same curriculum as that of other BC areas. In my mind this raises some questions such as "What about making school science curriculum specifically for this village, such as improving youths' health conditions or finding better ways for recycling the garbage?"

I think school curriculum should reflect larger contexts surrounding the schools and consequently help the students continuously try to improve their social conditions as educated citizens. Also, to develop that kind of school curriculum requires community peoples' active participation. These ideas, I believe, are shared with the philosophy of CBR.

The educational program of the RIC in Tofino seems to have a community based science education program that is similar to my own vision, i.e., a program that appropriately reflects the unique circumstances of Clayoquot Sound and aims to educate able citizens to cope well with science related issues in that area. However, it plays a supplementary role to the province curriculum and in this regard has a significant drawback in its application to Korea. I continue to dream of reforming Korean science education according to the ideas I have described herein, and this paper holds significant personal meaning for the beginning of this future work.

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