Introduction

Circumpolar Indigenous Issues, Knowledge, Relations to Education, Science, and Mathematics

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The idea of compiling and editing a special issue of *Interchange* focused on Circumpolar indigenous issues and knowledge in relation to education, science, and mathematics was the result of several visits to The University of Tromsø by the first guest editor (Sriraman) in the period 2008-2010, and participation in the 2009 Symposium *Lessons from Continuity and Change in the Fourth International Polar Year Symposium* at The University of Alaska, Fairbanks. For Bharath Sriraman, exposure to indigenous issues in Alaska began as an undergraduate student, and subsequent travels in the American and Canadian Arctic led to a greater awareness of the cultural and political significance of this region of the world. It represented a region with a long present indigenous population that had for over a thousand year more or less sustained its traditional ways of life in spite of interactions with outsiders. However with the advent of colonization, then globalization, and now climate change, the region was increasingly on a collision course with forces from the outside that would determine its future. Anne Birgitte Fyhn had been engaged with the Sámi community in Norway, particularly the mathematics inherent in Sámi weavings and ornamentation. It dawned on us that we had a shared interest in Arctic education, particularly issues revolving around mathematics and science in the need to create culturally congruent materials for the indigenous communities present in the circumpolar regions.

Educational and social institutions play a non-trivial role in how the future of the polar region are shaped, and we thought it would be of interest to the educational community to learn more about issues from this region. We proposed the idea of a special issue to Ian Winchester,

Editor of *Interchange*, who was supportive of such an initiative. After a year and a half of work on this issue, we are pleased to present five articles that capture an essence of educational initiatives in the region in question and bring Inuit, Yup'ik, Athabaskan, and Sámi voices into the fray. The final article is a synthesis that tackles the notions of *indigenous* as stipulated by the United Nations versus the reality inherent in how the term is interpreted in a world carved by nation-states and vested interests. This issue as whole covers topics that include indigenous knowledge, autonomy, educational policy, cultural preservation, and developmental issues. The only voices absent in this issue are from arctic Greenland and Russia.

The opening article by Duffy and colleagues tackles the notion of place based education, that is, the local context determining what is taught in reform based science, particularly chemistry. This work brings into focus the value of including indigenous perspectives in a non-majors general chemistry course which covers topics in ice and water resources, genetic engineering, and so forth, as well as issues at the intersection of land stewardship and chemistry (e.g., uranium mining) in Alaska.

Rasmussen's article entitled "Forty Years of Struggle and Still no Right to Inuit Education in Nunavut" is provocative because it discusses the erosion of minority rights in an autonomous region of Canada, namely Nunavut. Inuit language (Inuktitut) and culture are given value in the legislation in place with rights to language preservation and education, however the reality of the situation is that 10,000 Inuit students do not have the same rights to be educated in their native language as their 40 or so Francophone schoolmates. The data presented in the form of teachers that populate the schools of Nunavut suggests that settlement or cultural colonization is still very much a reality for the Inuits in Arctic Canada.

Yup'ik cosmology and epistemology is brought into the light via the ethnographic study of everyday Yup'ik practice. Lipka and colleagues from Alaska demonstrate that notions from proportionality, measurement, and symmetry play an important role in the solution strategies used by Yup'ik elders in solving everyday problems, and argue that this provides an alternative pathway to the teaching of geometry and rational number reasoning.

We build on the Mathematics in a Cultural Context (MCC) work of Lipka et al., in the next article authored jointly with a school principal (Eira) and a mathematics teacher at a Sámi school in Kautokeino, Norway. Like the Inuits and Yup'ik, the Sámi are an indigenous people

of the Arctic, scattered in Norway, Sweden, Finland, and Russia. Through a United Nations resolution, Norway is bound to take care of the Si culture and language, and although the Sámi have a curriculum in place, there is no mathematics syllabus! We build on the importance of indigenous measurement concepts in mathematics and explain the unique way in which Sámi treat ratios with three illustrative examples. This particular paper took a substantial time to develop since it required the ability of putting into writing, concepts that are orally described and thought.

The article by Barbarán is more of a technical report that described a developmental cultural preservation project conducted with Athabaskan elders, with the goal of implementation in the Athabaskan villages of Central Alaska.

To conclude this issue, Bharath Sriraman uses a synthesis of themes arising in the five articles discussed in the larger scheme of indigenous issues confronting the world today. The political aspects of the label indigenous are discussed as well as topics related to two articles of the 2007 United Nations Resolution of Indigenous Rights, with implications for the future.

We hope this issue stimulates the interest of *Interchange* readers in circumpolar issues and initiates a larger dialogue on the value and role of indigenous knowledge within education and society.

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