

**From “what ought” to “what is”
Infusion of First Nations, Metis and Inuit Perspectives in Mathematics:
First steps on the journey in high school mathematics**

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Abstract

Academic and educational success for all students has become an international focus. In Alberta, Canada, there is concerted effort to increase high school completion rates, specifically within First Nations, Métis and Inuit (FNMI) populations. To this end, FNMI content and perspectives are being infused into all curricular areas to ensure the educational engagement of FNMI students and others. This paper traces the journey of the contextualized infusion of FNMI content and perspectives into the resources produced to support the *Common Curriculum Framework for Grades 10–12 Mathematics, Western and Northern Canadian Protocol*, January 2008

Introduction

The success of a child's education is of great concern for parents, teachers, education ministries and the community at large. Parents, family and community members initiate, nurture and accompany children on their educational journeys of cultural socialization (McLean, 2002), while other educational personnel are entrusted with the formal academic education of the child. A formal education, however, must be ethnoculturally relevant, inclusive and reflect contextualized aspects of ethnocultural content and perspectives to ensure that students are engaged and can relate to what is being taught.

Although student-focused ethnocultural activities can be easily integrated at the classroom level, educational authorities above the school jurisdiction level must consider all ethnocultural communities. In their efforts toward fairness and justice, they are able to address few, if any, ethnocultural concerns. Yet, with the attempt to establish an all-encompassing educational experience, the typical educational experience has been rendered ethnoculturally sterile. This sterility has led to opportunity gaps (Flores, 2007) between those able to assimilate into the dominant cultural framework and those who are challenged by it. Various educational authorities have experimented with different models in an effort to reduce this opportunity gap.

Alberta is working towards improving the high school completion rates and academic results of First Nations, Métis and Inuit (FNMI) students, in part, by ensuring the inclusion of FNMI content and perspectives in learning and teaching resources. The infusion of ethnocultural content and perspectives increases the engagement factors for FNMI students. For example, teacher resources such as *Our Words, Our Ways* (Alberta Education, 2005) and *Education is Our Buffalo* (The Alberta Teachers Association, 2006) acknowledge FNMI ethnocultural diversity and provide support in addressing ethnocultural and social awareness.

History of the Western and Northern Canadian Protocol

In 1993, the ministers of Education from of Alberta, Manitoba, Saskatchewan, and British Columbia, together with the Yukon and Northwest Territories, signed an agreement to form the Western Canadian Protocol for Collaboration in Basic Education. In 2000, the territory of Nunavut joined and the name was changed to the Western and Northern Canadian Protocol (WNCP) for Collaboration in Education (WNCP, 2000). Since the start of this initiative, Alberta has been the lead in the development of the common curriculum frameworks for Mathematics, Kindergarten to Grade 12. In 2005, the WNCP completed a review of the initial frameworks ((McAskill, Holmes & Pelton, 2005; Alberta Education, System Improvement Group, 2006) and published revised common curriculum frameworks for Kindergarten to Grade 9 in May 2006 (WNCP, 2006) and Grades 10–12 in January 2008 (WNCP, 2008a). One aspect of the philosophy expressed in the frameworks acknowledges that students come from diverse backgrounds and that “the learning environment should value, respect and address all students’ experiences and ways of thinking” (WNCP, 2008a, p.2).

Establishing First Nation, Métis and Inuit Considerations

The original WNCP agreement set goals about high-quality education for all students and expressed the wish to establish “greater harmonization in ways to achieve them” amongst the WNCP jurisdictions (WNCP, 2000). “Aboriginal (Native) education, including teacher education” (WNCP, 2000) was among the cooperative areas of focus listed in the WNCP agreement. The terms FNMI, Aboriginal, and Native are comparable and are often used to indicate persons and Peoples of indigenous or mixed indigenous ancestry. Over time, FNMI has become the accepted and dominant term associated with WNCP mathematics frameworks and resources.

Call for Proposals

The front matter of the revised *Common Curriculum Framework for Grades 10–12 Mathematics* (CCF) details the background of the framework, beliefs about and goals for students, consideration of FNMI perspectives, and the conceptual framework outlining the mathematical processes and course outcomes (WNCP, 2008a). Four Calls for Proposals (CFP) were developed to acquire high-quality breadth and depth resources to support implementation of the CCF across the western provinces and northern territories. Released in April and May 2008, each CFP addressed the resource requirements of the specific course sequence in the CCF. CFP–0802 outlined the resource requirements for the WNCP Foundations of Mathematics and Pre-calculus Grade 10 course, which is designed for students planning to take either the Foundations of Mathematics or Pre-calculus sequences in grades 11 and 12. CFP–0803 is for the WNCP Apprenticeship and Workplace Mathematics 10–12 courses, which are designed to meet the needs of students wishing to enter the majority of trades or who plan to enter the workforce directly from high school. CFP–0804 is for the WNCP Pre-calculus Grades 11 and 12 courses, which are designed for students who may require the study of calculus in their post-secondary programs. CFP–0805 is for the WNCP Foundations of Mathematics Grades 11 and 12 courses, which are designed to meet the needs of students whose post-secondary programs may not require the study of calculus. Each CFP specified the required elements to be contained within each resource (student and teacher) along with evaluation criteria, including content, instructional design, technical design, social considerations and fidelity to the CCF philosophy.

Resource Development Timelines

As of April 2010, only the Grade 10 resources are complete and are therefore the focus of this paper. In August 2008, proposals submitted by resource developers were reviewed and the

successful developers were identified. Three resource developers were selected based on their proposals; two to develop the resources for the WNCP Foundations of Mathematics and Pre-calculus Grade 10 course and one to develop resource for the WNCP Apprenticeship and Workplace Mathematics 10–12 course sequence. In March 2009, the first half of the resource (first deliverable) was reviewed. The second half (second deliverable) of the resource was submitted in October 2009. Then, in April 2010, the three completed Grade 10 resources were authorized by the WNCP partners. Grade 11 resources will be completed in April 2011 and Grade 12 in April 2012.

Review Teams

Three review teams were formed: one to address the resources for the WNCP Foundations of Mathematics and Pre-calculus Grade 10 course, one for the WNCP Apprenticeship and Workplace Mathematics Grade 10 course and one to validate the resources for both courses for FNMI content and perspectives. Each review team contained at least one representative from each WNCP jurisdiction.

Ethnocultural and Social Considerations

Fidelity to the philosophy and outcomes of the CCF was the guiding principle for all reviewers. Component 7 of the CFP (WNCP, 2008b, 2008c, pp.1-4) explicitly outlined the criteria for the development and authorization of the final resource products. Ethnocultural and social considerations are elements of this component (Part 7.4, WNCP, 2008b, 2008c). The “resources must promote respect and understanding for all members of society as listed in the *Canadian Human Rights Act* and in the *Canadian Charter of Rights and Freedoms*” (WNCP, 2008a, Component 7, p 3). In addition, the resources are not only to reflect the ethnocultural diversity of FNMI Peoples across western and northern Canada, but must have a balanced

representation of all ethnocultural groups of western and northern Canada. Visual and textual imagery must reflect the unique context and the geopolitical regions of western and northern Canada. The criteria that specifically address FNMI content and perspectives are the following:

- represents males and females equally and in a variety of roles
- reflects ethnic and cultural diversity, including FNMI and Francophone perspectives
- and, includes visuals and text incorporating contexts that reflect western and northern Canada, including FNMI and Francophone perspectives.

(WNCP, 2008, p 3)

Review Processes and Protocols

Each proposal and resource review began with a meeting of all reviewers in order to achieve a common understanding of the goals of the review. Adherence to the confidentiality agreement and the philosophy and outcomes of the CCF was explained. The review teams then met separately to focus on each team's particular task. The gathering of the First Nations, Métis and Inuit Content Validation Committee (FNMI CVC) began with an opening prayer and tobacco ceremony, soliciting the wisdom and experience of each reviewer for the benefit of all students and teachers throughout the WNCP jurisdictions. This was followed by a Sharing Circle where reviewers exchanged information about significant personal events and relevant happenings within their jurisdiction.

The review model used by the FNMI CVC provided opportunity for whole group discussions leading to a consensus of opinion among the reviewers. The FNMI CVC review began with a general review of each resource, flagging items which contained FNMI content and perspectives. The team then discussed the merits of each identified item, with appropriate,

accurate, authentic and contextualized inclusion of FNMI perspectives as the goal. Discussions included a range of considerations: cultural appropriateness, balanced jurisdictional representation, overall applicability to student realities, ethnocultural or socioeconomic status, as well as locale (rural versus urban). Group discussion determined how best to address any concerns; reviewers most familiar with the concern and its cultural ramifications lead the discussion to consensus. The review report was written as a group, commenting positively on items as well as constructively criticizing items in need of change. In this review team, the FNMI CVC team leader holds no greater influence than any other member of the team. The primary role of the team leader is to develop the review reports and communicate the results of the review to the resource developer.

The FNMI CVC review report is incorporated into the overall review report which is forwarded to each specific resource developer. A meeting is then held between the review team leads and the resource developer's project team to discuss the report. For the FNMI CVC team leader, these meetings provide an opportunity to share additional background information where needed. The developers then make any required changes and resubmit the resource for approval.

FNMI Content and Perspectives in WNCP Mathematics Resources

The infusion of FNMI content and perspectives in the WNCP mathematics resources demonstrates how ethnocultural infusion can be successfully achieved in ways that honours all students. In the three authorized resources for the WNCP Foundations of Mathematics and Pre-calculus Grade 10 course and the WNCP Apprenticeship and Workplace Mathematics Grade 10 course, there are many authentic, contextualized examples of FNMI infusion. Examples run the spectrum from subtle and non-intrusive to overt full-feature profiles. Each profile is typically a half or full page spreads which connect to the mathematics concept in that section. In the profiles

that contain FNMI content and perspectives, often a specific group or region is featured. Subtle and non-intrusive examples can be found throughout the practice questions and discussions of the resources. FNMI content and perspectives are not highlighted, but infused in such a way as to make a connection with FNMI students without being obtrusive. While profiles highlight and promote specific FNMI content and perspectives, it is through non-intrusive infusion that learning is truly contextualized for all students. Successful infusion should have an almost undetectable presence. The ethnocultural aspects of the presentation, while discernible by analysis, do not detract from the mathematical content. Rather, they enhance the learning opportunity by making connections to the mathematics for all students.

WNCP Apprenticeship and Workplace Mathematics Grade 10

MathWorks 10 (Borgen, Edwards, Harrysingh-Klassen, Healy, & Yuill, 2010), was developed by Pacific Educational Press to support the WNCP Apprenticeship and Workplace Mathematics Grade 10 course. One way the resource increases the engagement of FNMI students is through the “Math on the Job” feature, which begins each chapter. Four of these features focus on persons of FNMI heritage in real-life situations. Another feature, the “Roots of Math” addresses historical aspects of mathematics, including Canadian currency and a discussion of the Haida symbols on the current Canadian twenty-dollar bill and other historical symbols of wealth in FNMI communities. As an introduction to currency exchange rates, this feature illustrates the diversity of value within economic systems. There are also less intrusive examples of historical content: for example the sport of lacrosse is used to illustrate parallel, non-parallel and transverse lines.

Contextualization in practice questions can often result in contrived situations. Yet even here, there are examples in which infusion is achieved with apparent ease. For example,

agriculture is a theme in a series of questions about mass. In particular, the cultivation and production of wild rice by the Lac La Ronge Indian Band is featured with a brief history of wild rice and its current economic importance as a world export. In this instance, the past is honoured while placing the question in a contemporary context.

WNCP Foundations of Mathematics and Pre-calculus 10, Pearson Canada Inc.

Pearson Canada Inc. has developed a resource to support the WNCP Foundations of Mathematics and Pre-calculus 10 course, entitled *Foundations and Pre-calculus Mathematics 10* (Davis, et al., 2010a). A prominent feature, “World of Math,” appears throughout the resource. One “World of Math” profiles renewable energy and acknowledges the Piikani First Nation’s commercial venture into harnessing wind energy. In this feature, the historical and contemporary significance of the Sun Dance (Okan), an annual ceremony of renewal, is credited as the inspiration for the name of the wind generator, Weather Dancer 1.

Photographs containing identifiable persons of FNMI heritage are featured in some of the section openers. FNMI students will relate to the pictures of these individuals and be able to see themselves in the situations depicted. These photographs respectfully present FNMI persons in situations involving the real world application of mathematics.

FNMI contextualization is also achieved in the practice questions throughout the student resource. Questions which address significant ethnocultural concepts have additional background information contained within the teacher’s resource. The construction of a jingle dress is used as an example in a question about linear equations; additional information in the teacher resource addresses the spiritual and communal significance of the Jingle Dress Dance (Berglund, R., et al., 2010b). For a question about the Pythagorean spiral, the teacher resource makes reference to Ermineskin Junior Senior High School, located on the Ermineskin Cree Nation just south of

Edmonton, Alberta, as an example of the architectural application of this concept (Berglind, R., et al., 2010a). The subtle ethnocultural characteristic of the various FNMI identified items contextualizes them as natural non-intrusive additions to the resource, not as isolated insertions of ethnocultural content.

WNCP Foundations of Mathematics and Pre-calculus 10, McGraw Hill-Ryerson

Mathematics 10 (McAskill, B., et al., 2010), developed by McGraw Hill-Ryerson, also supports the WNCP Foundations of Mathematics and Pre-calculus Grade 10 course. A notable characteristic of this resource is the inclusion of informative sidebar entries. These sidebars consist of vocabulary, definitions, web links and further interesting information. Two of the “Did You Know?” features include FNMI perspectives showing the reliance of many northern Canadian communities on potable water, which needs to be hauled in by tanker trucks, and another a brief history of the Métis sash and its modern significance. In one section of the resource, a traditionally inspired teaching story, rather than the actual teaching, is incorporated into the presented content, honouring indigenous traditions and practices.

The use of traditional teaching stories and images of artifacts requires adherence to local and regional protocols. A noteworthy example of infusion and observation of protocol in this resource is the use of drum images. Traditional drums hold a significant ceremonial and spiritual quality in FNMI communities and they must be treated with the appropriate respect and protocol. Each drum photograph is accompanied by a statement regarding the significance of traditional drums. In the case of a photograph of a Tlingit hand drum used to illustrate a question about area, the caption reads: “Traditional Tlingit hand drums are used in ceremony, cultural and social events, and as artwork. Traditional drums should always be handled with respect following appropriate protocol (McAskill, B., et al., 2010, p. 250).” The inclusion of indigenous traditional

instruments provides a powerful connection for FNMI students to the mathematical concept being presented.

Overt items such as the chapter opener which features the astrophysicist Rob Cardinal from Siksika First Nation, contextualizes mathematics for FNMI students in a contemporary setting. Other items are contextualized in less intrusive ways. The Veterans Pole, an 18 foot totem pole honouring Canadian Aboriginal war veterans commissioned by the Tillicum Veterans Care Society in Victoria, BC, is the setting for the determination of angles of elevation. FNMI contextualized questions are found throughout the student resource.

In Closing

As the ethnocultural diversity of western and northern Canada continues to increase due to high birthrates among FNMI populations and increased immigration from other countries, it is important to address the mathematical engagement and achievement of all students. As has been voiced by developers and reviewers during development of these resources, the inclusion of ethnocultural materials, specifically FNMI content and perspectives, is extremely challenging, not because it does not exist, but because it has not been a typical consideration in traditional mathematics resources. The strength of the FNMI contextualization of content and perspectives in these resources demonstrates that ethnocultural infusion can be successfully achieved, honouring not only students of FNMI ancestry but all students regardless of their ethnocultural identity.

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