Socially-based Curriculum Unit: You Make the Choice

Unit Title: You Make the Choice

Time Frame: 5 lessons

Unit Developer(s): Anthony Persaud

Developed for Course Name and Course Code: Foundations of Mathematics, Grade 9, MFM1P

Strand(s) and Curriculum Learning Expectations Addressed:

Number Sense and Algebra Strand:
NAV.01 • solve problems involving proportional reasoning
NA1.02 – represent, using equivalent ratios and proportions, directly proportional relationships arising from realistic situations
NA1.03 – solve for the unknown value in a proportion, using a variety of methods (e.g., concrete materials, algebraic reasoning, equivalent ratios, constant of proportionality)
NA1.05 – solve problems involving ratios, rates, and directly proportional relationships in various contexts (e.g., currency conversions, scale drawings, measurement), using a variety of methods (e.g., using algebraic reasoning, equivalent ratios, a constant of proportionality; using dynamic geometry software to construct and measure scale drawings)
NA1.06 – solve problems requiring the expression of percents, fractions, and decimals in their equivalent forms (e.g., calculating simple interest and sales tax; analysing data)

Linear Relations Strand:
LRV.01 • apply data-management techniques to investigate relationships between two variables
LR1.02 – pose problems, identify variables, and formulate hypotheses associated with relationships between two variables
LR1.03 – carry out an investigation or experiment involving relationships between two variables, including the collection and organization of data, using appropriate methods, equipment, and/or technology (e.g., surveying; using measuring tools, scientific probes, the Internet) and techniques (e.g., making tables, drawing graphs)
LR1.04 – describe trends and relationships observed in data, make inferences from data, compare the inferences with hypotheses about the data, and explain any differences between the inferences and the hypotheses (e.g., describe the trend observed in the data. Does a relationship seem to exist? Of what sort? Is the outcome consistent with your hypothesis? Identify and explain any outlying pieces of data. Suggest a formula that relates the variables. How might you vary this experiment to examine other relationships?)

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Desired Results

Unit Description:

Three social issues are investigated to show that math is a valuable tool for critical thinking. First Nations influence, salary gender gap and racism in the death penalty are all analyzed using ratios and percentages with bar, line and pie graphs. The misuse of numbers is discussed throughout the unit.

Enduring Understandings / Learning:

- Students will learn that Proportional Reasoning can be used to solve problems.
- Students will understand that Proportional Reasoning is a valuable tool for critical thinking.

Assessment Tasks

Performance Tasks and Other Evidence That Will Demonstrate the Knowledge and Skills Acquired:

- Small groups work together to calculate percentages and make graphs during each lesson
- Individuals answer discussion questions to demonstrate critical thinking during each lesson
- Summative quiz to evaluate calculation of percentages and critical thinking

Assessment Criteria:

- Summative work will be assessed with a marking scheme for calculations and rubric for critical thinking skills – the rubric should be shown to students in lesson 1 so that they understand what will be required of them
- Formative knowledge and understanding work will be assessed using a marking scheme
- Formative and summative application and communication work will be assessed using the same rubric:
    - Lesson 1 gives students an opportunity to demonstrate level 2 thinking
    - Lesson 2 gives students an opportunity to demonstrate level 3 thinking
    - Lessons 3 and 4 give students an opportunity to demonstrate level 4 thinking
- Small group work will be observed to ensure students are all sharing in learning

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Unit Planning Notes

Prior Learning Necessary:

Students should be able to calculate simple percentage given two numbers. For example, "What percentage of marbles is red if you have 5 red marbles out of 7 total marbles?"
Students should be able to prepare a bar graph and line graph from a table of data.

Preparation Notes:

- Teachers may wish to update statistics on First Nations population, gender gap and death penalty to keep lessons as current as possible. References for the sources of the data are included in the lesson plans.
- In some cases, the teacher will either need to insert the relevant graphs (as indicated in the handouts) or book a computer lab so that the students can look them up directly.
- The following information may be used to answer student questions that may arise in the discussions in lessons 3 and 4 about the Death Penalty, and whether it should be implemented in Canada: http://ccadp.org/deathpenalty-canada.htm

Learning Plan

Lesson 1: That's Not Our Problem!

First Nations Influence – students determine where First Nations people have the most influence politically and see if that matches where most First Nations people live. This is a percentage review lesson.

Expectations
- Review calculation of percentage
- Understand what percentage means in a real-life situation

Materials Needed:
- Graph Paper
- Graph Chart Paper

Opening
Teacher Question
- What are First Nations people? Put appropriate student definition on the board.
Think, Pair, Share
- Individually, then agree in pairs, then as a class: list three provinces or territories with the most First

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Nations people living in them.
- Does most mean the most people, or the biggest proportion of people?

Instructional Input
Pairs or small groups
- Work together to complete handout (**Appendix 1**) and bar graphs on chart paper.
- Individuals answer the final question themselves after discussion.

Closure
Class Discussion
- Would it be reasonable to say that First Nations issues can be dealt with by the elected government in all parts of Canada?
- Discuss current First Nations concerns – this matters to Ontario most of all!
- Discuss fairness of influence and population distribution.
- How did math help you to look deeply at this issue? Discuss use of proportions instead of raw numbers.

Reference
First Nation Profiles from the Government of Canada's Department of Indian and Northern Affairs, 2001 Census, http://www12.statcan.ca/english/census01/Products/Analytic/companion/abor/canada.cfm

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Lesson 2: But Things Are Better Now, Aren't They?

Gender Gap – students determine the difference in salary between males and females and see if there is a difference over time.

Expectations
- Calculate percentage
- Understand what percentage means in a real-life situation

Materials Needed:
- Graph Paper
- Graph Chart Paper

Opening
Teacher Questions
- Do you agree that women make more today than they ever have before? Do men and women make the same salary? Discuss meaning of Gender Gap.
Placemat
- Students complete a placemat with the phrase "Gender Gap" in the centre. They consider jobs or careers

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where they think men and women receive different pay and brainstorm reasons why salaries can be different between men and women.
- Readings are available on sports salary gaps, women and industry during wartime, etc. in lieu of or in addition to placemat activity

Instructional Input
Pairs or small groups
- Work together to complete handout (**Appendix 2**) and line graphs on chart paper.
- Individuals answer the final three questions themselves after discussion.

Closure
Class Discussion
- How would someone use proportions to maintain unfair situations? How can numbers be manipulated to make unfair situations seem better?

References
- *Earnings of Men and Women*, Statistics Canada, catalogue number 13-217-XIB, 1997.
- *The Persistent Gap: New Evidence on the Canadian Gender Wage Gap*, prepared by Marie Drolet, Statistics Canada, 75F0002MIE-99008, December 1999.

Lesson 3: Math in Life or Death Decisions (Part 1)

Death Penalty – should Canada have it? Students will explore data from the US in terms of ethnic proportions on death row.

Expectations
- Calculate ratios
- Understand what percentage means in a real-life situation

Materials Needed:
- Chart Paper

Opening
Teacher Question
- Should Canada have the death penalty? Stand up for your choice – have all students stand at one end of the room. If they believe that we should have the death penalty then move to the other end of the room. If they need more information then they move to the middle. If they believe we should not then stay where they are.

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Brainstorm
- In the three groups, students use chart paper to explain either why they think the death penalty should be in Canada, why it shouldn't be, or explain in detail what more information they need to make an informed decision – list names of students in each group.
- Post responses on board.

Group Discussion
- Definitions and misconceptions – list following words and discuss definitions:
  Death Penalty, Victim, Defendant, Hispanic, Executed, Interracial, Race, Death Row
  Be cautious to clearly state that data to be shown is based on US information and "Race" is only used as a term because US government data is broken down along ethnic lines.

Instructional Input

Pairs or small groups
- Work together to complete handout (**Appendix 3**).
- Individuals answer the final question themselves after discussion.

Closure

Class Discussion

Execution information is accurate as of March 17, 2006 following execution in North Carolina.

"In 82% of the studies [reviewed], race of the victim was found to influence the likelihood of being charged with capital murder or receiving the death penalty, i.e., those who murdered whites were found more likely to be sentenced to death than those who murdered blacks."
- United States General Accounting Office, Death Penalty Sentencing, February 1990

A study of racial discrimination in capital cases in Georgia showed that "the average odds of receiving a death sentence among all indicted cases were 4.3 times higher in cases with white victims."—*American Civil Liberties Union.*

References
- http://www.deathpenaltyinfo.org/race-death-row-inmates-executed-1976
- *American Civil Liberties Union*
- *Amnesty International*

Lesson 4: Math in Life or Death Decisions (Part 2)

Death Penalty Part II – Compare ethnic proportions on death row with ethnic proportions in general population and consider statistics about the death penalty.

Expectations
- Calculate percentage

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- Understand what percentage means in a real-life situation

Materials Needed:
- Chart Paper

Opening
Group Discussion
What does discrimination mean? Yesterday we found that the death penalty may be biased based on the ethnicity of the victim. Is racism the only form of discrimination?
<u>Sexism and the death penalty</u>
During the 1980s and early 1990s, only about one percent of those on death row were women. (Women commit about 18 percent of all criminal homicides.)—*American Civil Liberties Union.*
Of those executed since 1976, only one has been female—*"Capital Punishment for Female Offenders," Cleveland Marshall College of Law via the Kentucky Department of Public Advocacy.*
<u>Poverty and the death penalty</u>
Approximately 90 percent of those on death row could not afford to hire a lawyer when they were tried.—*American Civil Liberties Union.*

Instructional Input
Pairs or small groups
- Work together to complete handout (**Appendix 4**).
- Individuals answer the final question themselves after discussion.

Closure
Class Discussion
Students should have realized that blacks are 3.4 times overrepresented on death row compared to in free society. One way that this data could be misrepresented is to state that there are more whites on death row than there are blacks so the death penalty does not have a racial bias. Discussion should focus on misuse of numerical data.
- According to a study of death penalty judgments over 23 years, the rate of error nationally was 68%. In other words, more than two thirds of those sentenced to be executed were later determined to be innocent.
- States having the death penalty do not have lower crime rates or lower murder rates than states without the death penalty. In other words, the theory that the death penalty stops people from committing crime is highly doubtful.
- Should Canada have the death penalty? Stand up for your choice – have all students move to the part of the room where they feel they belong now. Does anyone still need more information? What more information is required? Did anyone change their position? Did a detailed mathematical analysis of the data help them to make an informed decision?

References
- http://www.naacpldf.org/content.aspx?article=297

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- http://www.censusscope.org/us/chart_race.html
- *American Civil Liberties Union*
- *Amnesty International*

Lesson 5: Summative Evaluation

Analyze a government website, with calculations involving ratio and proportion and using mathematics as a tool for critical thinking. Based on the four previous lessons, students should be able to demonstrate their critical thinking skills when analyzing this website. The rubric is included directly on the summative evaluation so that students are aware of the marking scheme.

The summative evaluation (**Appendix 5**) for this unit is three pages.
1. Information sheet from U.S. Department of Justice website (reference included). The teacher will need to print the chart for the students or insert it into the handout as indicated.
2. Knowledge and understanding questions for calculations with ratios and proportions
3. Application and communication questions for mathematics in critical thinking

The four knowledge and understanding questions cover
- Calculation of percentage given discrete numbers
- Calculation of percentage from a fraction
- Calculation of percentage after manipulation of data

Each question was given equal weighting.

Appendices

Appendix 1:   Lesson 1 Handout
Appendix 2:   Lesson 2 Handout
Appendix 3:   Lesson 3 Handout
Appendix 4:   Lesson 4 Handout
Appendix 5:   Summative Evaluation, including rubric

Other Possible Course Applications

MAT 1L
MAT 2L

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MEL 3E
MEL 4E
This real life math unit is applicable to basic students. Most field testing was done in basic classrooms and student interest was much higher than when rote learning or worksheets were used to teach ratio and proportion. Students may need extra assistance when completing full sentences for discussion questions, and this may be done orally.

Lessons may be spread out over a longer period to allow inclusion of additional reading in math assignments suitable to basic level.

The unit may lead into analysis of newspaper graphs and tables to include current affairs.

CROSS CURRICULAR
Because this unit has applications of math to real life situations and current affairs, it is applicable to history or English classrooms as well. This is an opportunity to include numeracy across the curriculum in a meaningful way.