Anoka-Hennepin Secondary Curriculum Unit Plan

Department:	Mathematics	Course:	Statistics and Probability	Unit 4 Title:	Data Collection	Grade Level(s):	10-11
Assessed Trimester:	Trimester A	Pacing:	6-8 Days	Date Created:	1/29/2014	Last Revision Date:	1/26/2014

Course Understandings: *Student will understand that:*

C. Well-designed and well-conducted surveys and experiments are necessary to make valid conclusions or predictions and can identify when statistics are presented in a misleading way.
E. Outliers and lurking variables can have a significant impact on data and how we collect and analyze it.
H. Technology can be used to assist with calculations, simulations, and data analysis.

DESIRED RESULTS (Stage 1) - WHAT WE WANT STUDENT TO KNOW AND BE ABLE TO DO?

Established Goals

Minnesota State/Local/Technology Standard(s) addressed (2007):

- **Standard (9.4.2.#):** Explain the uses of data and statistical thinking to draw inferences, make predictions and justify conclusions.
  Benchmark:
  9.4.2.1 Evaluate reports based on data published in the media by identifying the source of the data, the design of the stud, and the way the data are analyzed and displayed. Show how graphs and data can be distorted to support different points of view. Know how to use spreadsheet tables and graphs or graphing technology to recognize and analyze distortions in data displays.
  9.4.2.2 Identify and explain misleading uses of data; recognize when arguments based on data confuse correlation and causation.
  9.4.2.3 Design simple experiments and explain the impact of sampling methods, bias and the phrasing of questions asked during data collection.

- **Standard (9.4.3.#):** Explain the uses of data and statistical thinking to draw inferences, make predictions and justify conclusions.
  Benchmark:
  9.4.3.4 Use random numbers generated by a calculator or a spreadsheet, or taken from a table, to perform probability simulations and to introduce fairness into decision making.

Transfer

Students will be able to independently use their learning to: (product, high order reasoning)

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Meaning

Unit Understanding(s):	Essential Question(s):
Students will understand that: • In order to collect data you need to be aware of sources of bias and how to limit errors in your data collection process. • In order to design good samples and experiments there are specific elements that need to be present (ie. randomness, large enough sample sizes, etc.) • In order to determine meaning from a sample you need to calculate and interpret confidence intervals, margins of errors, etc. • To be able to properly design a study it is essential to identify the population, parameter, sample, and statistic of interest.	**Students will keep considering:** • What can we really conclude from a given confidence level and margin of error from a poll? • How do you know if you can trust the statistics being presented in a news article? • How do you set up a proper experimental design to determine whether or not a medication is truly effective?

Acquisition

Knowledge - Students will:
- How to read various graphs
- Identify the source of data
- Ways of collecting data
- Understand what bias is and the sources of bias
- Different experimental design
- Different sampling methods

Reasoning - Students will:
- Distinguish which graph is appropriate when
- Analyze if an appropriate data collection method was used
- Analyze distortions
- Predict the effect of how wording of questions influences responses and bias to surveys and experiments
- Analyze data collected through an experiment or survey

Skills - Students will:
- Use spreadsheets and graphing technology to make data displays
- Outline an appropriate experimental design
- Outline appropriate methods for carrying out a sample survey

Common Misunderstandings
- Students incorrectly believe there is no difference between accuracy, reliability, bias and validity.
- Students cannot distinguish between the sample and population.
- Students think that counts are rates.
- Students incorrectly believe that an individual person can choose items or people at random without bias.
- Students incorrectly believe that results from sampling are the same.
- Students incorrectly believe that polls and surveys are always accurate.
- Students incorrectly believe that you have to have a placebo in every experiment.
- Students incorrectly believe that randomization is not necessary.
- Students incorrectly believe that you don't have to compare your results in context of the problem.
- Students incorrectly believe that observational studies are experiments and vice-a-versa.
- Students cannot take a sample of a certain size multiple times (repetitions).

Essential new vocabulary
- Bias
- Blind, double blind
- Census
- Confidence statements
- Control
- Experimental design
- Experimental study
- Margin of error
- Observational study
- Parameter
- Placebo
- Population
- Random digits table
- Reliability
- Sample
- Sampling methods
  - (SRS, convenience, voluntary, etc.)
- Sources of bias
- Statistic
- Treatment
- Validity
- Variability