A THANKSGIVING SURVEY	**Student/Class Goal** Students wanted to have a Thanksgiving dinner in class. The teacher used this opportunity to incorporate math into the party planning.
Outcome (*lesson objective*) Students will be able to design and conduct a survey and translate that information into a basic bar graph.	**Time Frame** 3 hours and a party time
Standard *Use Math to Solve Problems and Communicate*	**NRS EFL 2-4**

Number Sense	Benchmarks	Geometry & Measurement	Benchmarks	Processes	Benchmarks
Words to numbers connection		Geometric figures		Word problems	
Calculation		Coordinate system		Problem solving strategies	4.26
Order of operations		Perimeter/area/volume formulas		Solutions analysis	4.27
Compare/order numbers		Graphing two-dimensional figures		Calculator	
Estimation		Measurement relationships		Mathematical terminology/symbols	
Exponents/radical expressions		Pythagorean theorem		Logical progression	3.24, 4.30
Algebra & Patterns	**Benchmarks**	Measurement applications		Contextual situations	4.31
Patterns/sequences		Measurement conversions		Mathematical material	
Equations/expressions		Rounding		Logical terms	2.21, 3.25, 4.32
Linear/nonlinear representations		**Data Analysis & Probability**	**Benchmarks**	Accuracy/precision	3.26, 4.33
Graphing		Data interpretation	4.20	Real-life applications	2.22, 3.27, 4.34
Linear equations		Data displays construction	2.16, 3.17, 4.21	Independence/range/fluency	2.23, 3.28, 4.35
Quadratic equations		Central tendency			
		Probabilities			
		Contextual probability			

Materials
Seven Immortal Principles of Surveys
Overhead
Paper, pen or pencil, graph paper and colored markers

Learner Prior Knowledge
Students are familiar with tally marks and how to create a bar graph. Some experience with survey design and samples.

Instructional Activities
Step 1 - Most adults have experienced taking a survey. Take some time to brainstorm with students what kind of surveys they have taken, what kinds of questions they were asked, and what makes a good survey. List their ideas on the board or chart paper. Use the *Seven Immortal Principles of Surveys* Overhead to compare lists.

Step 2 – First, have the group consider the goal or what they want to learn from the survey. As students design their questionnaire, they will need to know their own favorite foods from Thanksgiving dinners in the past or what they think others would enjoy. Then determine the sample or who they will interview. They will also need to consider how they will design the survey or the interviewing methodology. Now, begin to create the questionnaire – determine what questions will be asked.

- Everyone should have all the questions on their sheet. In this scenario everyone could ask people the same questions. If they did this they would have to be sure the same person was not interviewed twice or their data would not be accurate. Discuss importance of reliability when collecting data.
- Another way would be to have each student take a different category of food and only interview people about that particular food. Would this be a better choice? Why?

The survey can be completed on the computer using a word processing software or questions can be entered into Survey Monkey, if Internet access is available.

Step 3 – After they have designed their questionnaire, they need to begin to survey people according to the guidelines the class has set. Discuss how to approach people and how to record their answers with tally marks.

Step 4 - After all the data have been collected, they need to develop a system to tally the responses on chart paper and decide how best to display this information on a bar graph. Analyze the data as a group and then form pairs or triads to create bar graphs.

Review parts of a bar graph (axis, scale, title) as demonstrated by student's prior knowledge and experience with graphs. Teacher may need to step out of the lesson to teach these concepts to the group.

Step 5 - Students will use the information on their bar graphs to determine the menu for the party.

Step 6 - Party!

READING/WRITING EXTENSION Discussions centered on bias during the development of the surveys may prompt additional research on this topic. The information outlined in *Biases Commonly Found in Surveys* can act as a springboard for further study.

Assessment/Evidence (*based on outcome*)
Teacher observation
Questionnaire
Collected data
Completed bar graphs
Completed menu
Successful party

Teacher Reflection/Lesson Evaluation
This was a class that met 4 days a week in a community center. They were a particularly close group of people and liked to find excuses to party. It was amazing and very interesting to see how the conversation developed during this project as they began to realize and understand that data can be manipulated

Next Steps
Because of the awareness created, we looked at different political polls and had students look closely at how the data were collected, sample size, etc.

Technology Integration
 Survey Monkey http://www.surveymonkey.com/

Purposeful/Transparent
It was a very purposeful and transparent lesson because the students knew exactly why they were doing the tasks. It was also during elections so we could transfer what we were learning to other "real-life" situations.

Contextual
The lesson was contextual because it arose out of a classroom conversation and helped to plan their Thanksgiving party.

Building Expertise
This task helped to build expertise in math computation, comparison, understanding graphing and enlarging their world view.

Seven Immortal Principles of Surveys

Basic principles of good surveys

1. Brevity
   - o Avoid long introductions.
   - o Try to simplify the grammar used throughout.
   - o If a question and its answers are too long, there is a bias for respondents to answer the last answer presented.

2. Clarity
   - o Use very common, unambiguous terms.
   - o Avoid questions with double meanings.
     (e.g., "Have you stopped beating your wife? o Yes o No")
   - o If an uncommon term is used, make sure to define it in the survey form.
   - o Do not use technical or specialty jargon.
   - o Be careful using the word "you"; it can be singular or plural.

3. Reality
   - o What people say and how they respond doesn't always represent how they will behave; assume natural biases in their responses.
   - o For the general public, do not rely on hypothetical questions.
     (e.g., "If such and such, then would you...?")

4. Unidimensionality
   - o Don't combine two questions in one.
     (e.g., "Do you shop downtown or do you shop at malls?")

5. Completeness
   - o If multiple alternative responses are included, they should be mutually exclusive. Also, they should include all possibilities.
   - o Try to avoid questions that can be answered "I don't know."

6. Evenhandedness
   - o Avoid leading questions, "loaded" words, and authoritative statements.
   - o Questions should ask for opinions, rather than fact.
     (e.g., Don't ask, "Is downtown a dangerous place at night?"
     Instead, ask, "Do you think downtown is dangerous at night?")

7. Dignity
   - o Take respondents and their answers seriously.
   - o Avoid condescending slang.
   - o Don't present challenging questions.
     (e.g., "Why don't you go back to school?")

Biases commonly found in surveys

It is common for surveys to have biases. These should be thought of beforehand, and methods found for minimizing their impact. If such biases are too great, the legitimacy of the survey findings could be called into question. Three of the most common types of biases are the following,

Hawthorne Effect
One bias commonly found in survey research is the Hawthorne Effect, which says that respondents tend to respond differently simply because they have been selected for a survey. Because of the special recognition which has been given them, it is sometimes found the respondents tend to answer in the way which will most please the researcher. To minimize this bias, the questioner should be as neutral as possible in presenting the survey.

"Self-lifting" bias
Closely associated with the Hawthorne Effect, the "self-lifting" bias recognizes respondents want to make themselves appear in a positive light, and will respond accordingly. This bias can be minimized by positioning personal questions about respondents at the end of the questionnaire, where they would tend not to affect other, more substantive responses.

The "Habit" bias
If given a series of similar questions, respondents will fall into a habit of answering them similarly without considering each on its merit. This bias can be minimized by changing the format of questions throughout the questionnaire. The format may range from simple "check the box" questions to one-word responses to open-ended responses to completing information on simple graphs and maps. Through these variations, each question is given its own personality, avoiding the "habit" response.

Non-respondent bias
One type of bias often found in surveys is based on the assumption that individuals who haven't responded in a survey tend to feel the same as those who have responded. However, studies have found that non-respondents generally have a more negative outlook, which may not be otherwise represented in the collected data.

Stopping Rule
A bias sometimes found in survey research is based on the fact that the survey procedure is terminated when a researcher has obtained the desired results, and the amount of data collected is determined by results. This was avoided by establishing survey parameters beforehand.