

# What Life is Like in Our America: Statistical Investigations about Teens by Teens

7<sup>th</sup> grade  
Problem Solving/Data Gathering Unit  
TEED 521  
March 14, 2004  
Ami Pendley

**Thematic Framework:**

**The Central Question:** What are the important issues confronting middle school students and how do they feel about them?

**Rationale:**

This unit will engage students in investigations about themselves and their peers. They will learn key concepts and skills in statistics and data analysis through an exploration of issues of importance to middle school students. I chose this unit for two reasons. First, I am convinced that students will learn best when they are engaged in investigations that are personally meaningful to them.

Middle school students are intensely curious about themselves and how they fit in or not with their peers. They are also extremely social. This unit will capture their imagination and their interest by being firmly grounded in the topics they care about most. Secondly, even though I will be teaching Reading and Language Arts, I have integrated all of my units with the intention of teaching all of them. Research on effective middle school teaching tells us that integration is a critical element for student success. One outcome I hope to reach is the understanding that learning doesn't occur in carefully delineated blocks of 50 minutes but rather it is a multilayered and complex process that includes many modes of thinking.

Knowledge and understanding of statistics and data analysis is a critical life skill. Students encounter statistics constantly. They require experience in interpreting and evaluating the information they receive. Throughout this unit they will engage in process of creating statistics by posing questions, collecting data, analyzing data and interpreting results. They will use their results as part of a larger project described at great length in my Social Studies, Literature, and Service Learning plans.

There are a number of moral and ethical considerations inherent in this unit. Each of them provides an opportunity for a teachable moment. What kinds of questions are appropriate to ask peers? How can one ensure confidentiality? How does one's own opinion shape the way data is interpreted and reported? Can statistics be manipulated to prove a point one way or the other?

This unit addresses the following EALR's

1.4 Collect a random sample of data that represents a described population.

1.4 Organize and display data in appropriate forms such as frequency tables, circle graphs, and stem-and-leaf plots.

1.4 Calculate and appropriately use range and measures of center to describe data.

1.4 Identify how statistics can be used to support different points of view.

4.1 Develop and follow a plan for collecting information.

5.3 Recognize the widespread use of mathematics in daily life and the extensive use of mathematics outside the classroom.

**Learners:**

I will be teaching this unit to 82 students in 2 block classes of reading and language arts and a singular language arts class. There are 43 boys and 39 girls ranging in age from 11 to 14 years old. The student population is diverse but predominately White. There are students from a wide variety of cultural and linguistic backgrounds in my classes including Somali, Ethiopian, Eritrean, Honduran, Filipino, Mexican, Guatemalan, Japanese, Samoan, Cambodian, Thai, Chinese, Vietnamese, African American, Native American, and Biracial. Many of the students are bilingual but only 3 are in ESL classes. The students have a

wealth of talents, abilities, and interests. Ten students have I.E.P.s, but are not pulled out of class for special instruction. They receive individual accommodations in class in addition to support from the special education teacher.

Years of working with low-income students has taught me how to be mindful of what we ask of students. All of the materials and resources the students need will be available at school. The unit project will present a number of academic challenges for many of the students. I am going to give the option for the students to work in pairs. This will allow students to support each other. Furthermore, I will be available during team time at the end of each day to provide further assistance to students. During the project, I will meet with each student to check on their progress and identify any difficulties they are having. Mr. Anderson, the math teacher on my team and a MIT graduate, has agreed to help reinforce and review the math skills in his class. He will also provide additional support to students who need extra help.

As a whole, the students enjoy reading and writing. There are only a handful of kids who are reluctant readers or writers. To generalize, their interests are fairly representative of teenage culture; the kind of things you know they like and don't need to ask about. They listen to music, play videogames, talk on the phone, go snowboarding, skateboard, surf the net, write notes, shop at the mall, dream about cars and independence, and watch T.V. As individuals they are more intriguing. I have talked to students who love chess, medieval history, Magic, poetry, punk rock, World War II history, creating comic books, knitting, motorcycles, and jazz.

During the second week in my student teaching classroom, I asked them to answer a number of questions including what I needed to know about each of them as a learner. The responses I received were invaluable. Students told me they had ADD, had dyslexia, needed quiet to work, were visual learners, needed lots of examples, hated to write, loved to write, hated to read, were bad spellers, needed me to be strict with them, needed me to give them choices, and a wealth of other information that will help me work with them individually throughout the time I have with them. One student wrote simply, "please help me learn." Based on my informal interviews, I know some students enjoy working with others while some prefer to do independent work. Allowing students the choice of how to conduct their project will address these varying social needs.

In the past 3 weeks, I have assigned two projects to gain a deeper understanding of my students. In the first assignment, I asked the students to bring in an object that represented something important about them along with a written description of the object and its significance. There were instructional goals involved but my real intention was to learn about the students. The second assignment was to choose a song that spoke to them and again write a paper about the song and why they chose it. I am compiling all the songs into class CDs. Music is a window into a person's soul. Listening to their songs and reading their papers has given me a great deal of insight into what matters to them and what is on their minds. At this point I feel like I have a good sense of my students as individuals which will give me a richer context through which to understand them as learners.

My 7<sup>th</sup> graders need to feel competent, valued, and important. This project will develop their sense of self-worth, connect them with each other, and

demonstrate to them the power of their minds. It will bring much needed relevance into the curriculum at a time in the school year when the WASL and the imminence of summer tend to override all of our best instructional goals.

**Communication to Families/Students:**

Dear Families and Students,

I am writing this letter to let you know about another part of our integrated unit of study. As you all know we are reading Our America: Life and Death on the South Side of Chicago and beginning our research on issues that affect youth in the community. The students have already identified topics that they want to investigate. In order to make their research more meaningful, they will be conducting surveys of their peers to gather information about their issues. After the students create and administer their surveys, they will organize, display, analyze, and interpret their data. Specifically, the students will learn to translate their data into line plots, bar graphs, and stem and leaf plots and to recognize and interpret patterns in these displays. They will also be reviewing how to compute the mean, median, mode and range of a set of data. Most importantly, they will be drawing conclusions from their data and using these to support their proposals. Their results will be an integral part of their final presentations at our community forum.

The students may find it unusual to be engaged in mathematical investigations in their Reading and Language Arts class. I hope that the novelty of this experience will help the students understand that learning doesn't occur in categories and that real understanding comes from using a wide variety of

methods and modes of thinking. Over the next two years, the 7<sup>th</sup> grade teams are embarking on a project to integrate content across several classes. This unit will be a first step in our efforts to make the curriculum more coherent and meaningful for the students.

I am very excited about this unit. Statistics are a fact of everyday life. By having first hand experience with data collection and interpretation, the students will be better able to understand and evaluate the statistics they encounter daily. There are a number of ways you can support your child during this unit. Point out statistics in the newspaper and TV. Look for examples of graphs to talk about. I also encourage you to take a look at the data your child collects. It should provide an interesting glimpse into their world. You can ask questions about their results and look over their calculations.

If you have any questions, ideas, or concerns I would love to hear from you. Please feel free to e-mail or call me. I am looking forward to seeing you all at the community forum the second week of June.

Sincerely,

Ami Pendley  
Student Teacher  
Seattle University MIT Program

<p style="text-align: center;"><b>Please See Separate Document for All Assessment Materials</b></p>
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**Unit Outline:****Unit Overview**

This unit is embedded in a larger integrated unit in which students identify and research an issue that affects youth in the community. As part of their research, they will design and conduct a survey of their peers about their issue. They will organize their results, represent them in bar graphs, line plots, and stem-and-leaf plots, calculate range and measures of center, and draw conclusions from their data. Each lesson begins with an exploration of the concept or skill addressed with guided practice followed by independent practice with the student's own data.

The sequence of lessons follows the four components of statistical investigation (Graham 1987).

- Posing the question: Formulating the key question(s) to explore and deciding what data to collect.
- Collecting the data: deciding how to collect the data as well as actually collecting it.
- Analyzing the data: organizing, representing, summarizing, describing, and looking for patterns in the data
- Interpreting the results: predicting, comparing, identifying relationships and using the results from the analyses to draw conclusions about the original question.

Over the course of the 9 days of this unit, students will develop their understanding of statistics and data investigation through first hand experience. Their investigations will provide another level of depth to their research and add

credibility to their proposals. They will also have the opportunity to interact with their peers and deepen their understandings of one another.

### **Outlines of Lessons:**

#### **Day 1: Introduction and asking good questions**

##### *4.1 Develop and follow a plan for collecting information.*

The students will be 1.5 weeks into the integrated unit when I launch this piece. We will have already asked questions like, What do strength and courage mean? What are some issues affecting youth in the community? The students will have already chosen an issue to research. This is just another layer in a larger process of investigation.

Posing a question is the first step in a data investigation. When we want to find out more about something, we begin by asking questions. The way we ask a question has a huge impact on the kind of answers we get. To begin this exploration, I will have the students rearrange their desks in a circle. Then each student will write a question on the top of a sheet of notebook paper. I will give certain parameters for the questions i.e that they cannot be embarrassing or intrusive but otherwise impose no other conditions. The students will pass their papers clockwise and answer each question on the paper until their own paper has returned to them. They will have a few minutes to look over their results and discuss them with a partner considering whether the data generated by their questions is what they intended. As a whole class we will generate a list of questions that worked and those that tried but failed and discuss the characteristics of successful questions. The students will look for commonalities

and construct categories to classify the questions. At the least, I want students to identify numerical and categorical questions. I will collect the sheets to use as examples in future lessons.

## **Day 2: Creating the survey**

### *4.1 Develop and follow a plan for collecting information.*

Students will look at a compiled list of their questions and think about how they would respond to each. Would they answer with a word, a number, or a measure of degree? Working independently, they will generate one example of each type of question.

To conclude, students will draft their survey question(s) identifying what kind of data they want to elicit. They will share their question(s) with their pod members to ensure they are asking the right kind of question. They will all be handed in to me at the end of class.

## **Day 3: Conducting the survey**

### *4.1 Develop and follow a plan for collecting information.*

#### *1.4 Collect a random sample of data that represents a described population.*

Students will have 3 days to conduct their surveys. We will discuss the logistical details including when it is appropriate to administer the survey such as not in the middle of class and how many students need to be surveyed (at least 15).

Then the students will look at 2 examples of survey results and draw conclusions about how many students were surveyed and the diversity of the sample. They will think about how their results will be influenced by who they survey. They

will have time in the computer lab to type up their surveys and give them to me to copy.

#### **Day 4: Organizing Data: Line Plots and Bar Graphs**

*1.4 Organize and display data in appropriate forms such as frequency tables, circle graphs, and stem-and-leaf plots.*

Students will write their birthdays on large note cards and arrange them along one wall in chronological order. I will give them 5 minutes and instruct them to create any kind of organizational tool of the data they would like. After the students have created their organizational tools, they can come up to the document camera and explain how they approached the problem. Many of them will use familiar methods. If no one uses a line plot or bar graph, we will create one as a class by reorganizing the cards vertically. Questions that get at range and mode will be asked. To practice students will create a line plot and a bar graph with data from our original exercise.

#### **Day 5: Stem-and-Leaf Plots**

*1.4 Organize and display data in appropriate forms such as frequency tables, circle graphs, and stem-and-leaf plots.*

Students will make predictions about how long they can balance on one foot with their eyes closed and record this on a card. In pairs they will conduct the experiment and record their results on the other half of the card. To organize the whole class's data we will use a stem-and-leaf-plot. We will find the lowest and the highest times and use those to create the stem. The students will plug their actual balancing times into the right hand side. Then I will ask how we could

display the estimates. Once the plot is complete, the students can look for patterns in the data. In the discussion, students should talk about what kinds of data are suitable for stem-and-leaf-plots and compare them to line plots. Students practice with data from our original exercise. Again the students will look for the range and the mode.

**Day 6: Finding Measures of Center: Median or why I need a section on classroom management.**

*1.4 Calculate and appropriately use range and measures of center to describe data.*

Students will go outside for this exploration. They will be instructed to line up in order from youngest to oldest. The exercise on birthdays should help facilitate this. Once they are lined up, I will challenge them to use two different methods to find the person in the middle. Once safely back in the classroom, they will write a statement about what median is and how to find it. They will practice by writing data values on big square graph paper strips and folding them in half. Then they will work independently to find the median from their stem-and-leaf plots.

**Day 7: Mean**

*1.4 Calculate and appropriately use range and measures of center to describe data.*

Students will explore mean as “balancing” or “evening out” by using cube towers. We will generate class data on number of hours of television watched each week and display it on a line plot. In their pods the students will represent the data with cubes. I will model evening out and then ask the students what

measure we are creating by engaging in this process. Then they will practice in their pods using data from our ever generous original activity. Many of them will already know the algorithm for mean. They will answer a series of questions describing and relating the concrete process to the method of calculation.

### **Day 8: Drawing conclusions**

*1.4 Identify how statistics can be used to support different points of view.*

I will show students examples of polls from two websites:

[www.gcpl.lib.oh.us/teens\\_pollsasp](http://www.gcpl.lib.oh.us/teens_pollsasp)

This is collection of surveys from a local library in Ohio. Each month they ask different questions. The sample size is very small. I will ask the students if we can generalize the information from these surveys to teens in other places. We will discuss what kinds of statements we can make about this data.

[www.internetjunk.org/users](http://www.internetjunk.org/users)

This is an enormous site. In one section teens can post their own surveys and read responses. Some surveys have hundreds of responses. Some are organized and some are not. I chose a few examples. One has large sample sizes and many esoteric questions which should amuse the students greatly. Can any general statements be made about these results? The second example has a large sample size and just one question. The data is organized by percentages in each category. Again, I will ask the students to make some statements about these results.

To summarize, I want the students to create some guidelines for drawing conclusions about their data.

## Day 9: Student Survey Data

*1.4 Organize and display data in appropriate forms such as frequency tables, circle graphs, and stem-and-leaf plots.*

*1.4 Calculate and appropriately use range and measures of center to describe data.*

*1.4 Identify how statistics can be used to support different points of view.*

Students will receive a sheet that outlines what they are expected to do with their survey data.

- Represent data in two kinds of graphs
- Make statements about the range, mode, median, and mean as applicable.
- Draw 3 conclusions about your original question based on your data
- Assemble your work on a poster suitable for use in your final presentation.

I will show the students examples of surveys that have been represented, analyzed, and interpreted from two websites.

[www.ucsb.on.ca/athens/surveys](http://www.ucsb.on.ca/athens/surveys)

[www.smartgirl.org/speakout/archives](http://www.smartgirl.org/speakout/archives)

I will also show them an example of a completed poster (made by me or my cooperating teacher). They will have class time to work on this, but some of it will have to be completed at home. Students will have the option to use Excel to create their graphs. Most of them have already had experience using the program in 6<sup>th</sup> grade. They will not have designated class time for this, but can use the class computers at lunch or during team time.

**Classroom Management:**

My students have a lot of experience working in cooperative groups. They sit in pods and rotate often. Each member of the pod has a specific role; manager, collector, cleaner, and helper. This structure is invaluable for tasks such as gathering and returning materials or simply designating one person to complete a certain task. I have used it successfully in the lessons I have taught. Nearly every lesson in this unit requires students to talk with their podmates and work together to complete a task. The biggest management challenge in my classes is students talking at the wrong time about the wrong things. Like my cooperating teacher, I will make my expectations about the level of talking clear before setting the students free. I circulate around the class and redirect students who are off in the nether regions of being 13. Making smooth transitions between whole and small group work is another challenge. I have used several strategies to call students back together, the most frequent being "I need your attention". I am taking over the 6<sup>th</sup> period singular language arts class on March 23<sup>rd</sup>. I intend to hold a classroom meeting where I can communicate my expectations and establish simple routines like calling them back together. Otherwise, I will following the procedures that have been in place all year and which are very effective.

**Community Resources/Collaboration**

The Safe Futures Youth Center in High Point has conducted 2 extensive surveys of teens. One was related to the 40 developmental assets and the other was related to the redevelopment of the community. Both surveys were administered by teens from the center. I have asked the Teen Coordinator to

use some of the surveys as examples and also if he could come in and talk to the students briefly about how to conduct surveys. I have also asked one of my students who attends Chief Sealth and just completed his senior project to come in and talk to the students. He also did a survey of teens in High Point and made a presentation to the Community Council based on his findings. I was his mentor for the project so he owes me more than one favor.

### **Annotated Bibliography:**

Lappan, Glenda et.al., (1988). Data about us: Statistics. Menlo Park, CA: Dale Seymour.

This is the Teacher's Edition for this unit which is taught in the 6<sup>th</sup> grade as part of the Connected Mathematics series. This series is used as the middle school math curriculum for nearly all Seattle Public Schools. I have had a lot of experience working with students in these books. They use an exploratory method, followed by summarizing. The activities are very discussion oriented. Algorithms are always generated from experiences. I drew many of the activities from this book but adapted the content.

[www.ucdsb.on.ca/athens/surveys](http://www.ucdsb.on.ca/athens/surveys)

This is the website for the Global Teen Survey. The GTS was a project conducted by high school students. They surveyed teens from all over the world, used technology to create databases, and constructed this site to display their results. There is a section for teachers with helpful hints about surveying and using technology.

[www.smartgirl.org/speakout/archives](http://www.smartgirl.org/speakout/archives)

This site has great examples of survey questions and graphs for student reference. It is obviously geared towards girls which addresses equity issues.

[www.gcpl.lib.oh.us/teens\\_polls.asp](http://www.gcpl.lib.oh.us/teens_polls.asp)

This site contains archived polls and examples of survey questions and results.

[www.internetjunk.org/users](http://www.internetjunk.org/users)

This site contains an enormous storehouse of awful surveys to use for educational purposes, and a few good ones to use for the same purposes.