“China’s Population Growth”

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Lesson: China’s Population Growth with the start of misleading statistics

Length: 48 minutes

Class Intended: 7th Grade Math

Academic Standards: Standard 6 Data Analysis and Probability

Students collect, organize, and represent data sets and identify relationships among
variables within a data set. They determine probabilities and use them to make predictions about
events.

7.6.3 Describe how additional data, particularly outliers, added to a data set may affect
the mean, median, and mode.

Example: You measure the heights of the students in your grade on a day
when the basketball team is playing an away game. Later you measure the players
on the team and include them in your data. What kind of effect will including the
team have on the mean, median, and mode? Explain your answer.

7.6.4 Analyze data displays, including ways that they can be misleading. Analyze ways in
which the wording of questions can influence survey results.

Example: On a bar graph of a company’s sales, it appears that sales have
more than doubled since last year. Then you notice that the vertical axis starts at
$5 million and can see that sales have in fact increased from $5.5 million to $6.2
million.

Performance Objectives:

All students, given a set of data, will be able to solve for the mean, median, and mode
with 100% accuracy.

All students, given a set of data, will be able to tell which out of the mean, median, and
mode would be the best way to represent each data set, as un-skewed and accurate, by means of
the homework worksheet with 80% accuracy.

Assessment:

The first assessment is the bell ringer. They will receive 2 points for it if they had well
thought out ideas, and answered all of the questions I asked. They will receive 1 point if they at
least tried it. They will receive 0 points if they did nothing.

The second assessment is students coming back to the next class with a name of a candy
bar and the total fat percentage. Each student will receive an extra point on their homework
worksheet for completing this.

The last assessment is the homework worksheet. Students will be given a worksheet for
them to complete and turn in the next class period.

Advanced Preparation by Teacher:

• Find online a chart of China’s population change over the years.
- Create a blank graph for every student so they can fill it in with a line graph of China’s population
- Create the homework worksheet for the students and print off enough for every student to have one.
- Create the PowerPoint for the bell ringer and have it on the screen when the students come into the classroom.
- Write on the board the schedule for today and the homework.

Procedure:

Introduction/Motivation:

When the students come into the classroom I will have the bell ringer PowerPoint slide up on the overhead. That way, students will be busy as I do the attendance and such. It will also get them started on thinking about the main topic for the day.

Step-by-Step Plan:

1. After I collect the papers from the front corner, I will ask them what they had replied/wrote on their paper.
   a. What different factors can affect your day and why? – just ask a few different people, answers will vary
2. Well today we are going to talk about different factors that can change a graph. Certain things can change the mean, median, and mode of the set of data we have.
3. First, we are going to do another line graph. (Hand out the sheet with the blank graph on it.) Yesterday, we learned of some different countries growth populations. Today, we are going to focus just on China.
   a. Looking at the graph, what is the first year that has a population for China? (Knowledge) – 752
   b. Who can tell me where the first dot on the graph is going to be? (Application) – (0, 0) or (752, 60,000) be acceptable
   Good! Let’s continue plotting the points on the graph. Don’t forget we will be making a line graph with this, and not a bar graph. (Now I can walk up and down the rows helping any students that need it) After all of the dots have been plotted, connect the dots to finish the graph.
4. Once the graph is completed I do a quick review of mean, median, and mode. It is something that they already know, but some will need a review.
   a. Who can tell me what mean is or how to find the mean out of a set of numbers? (Knowledge) – the average obtained by adding the values and dividing by the number of values
   b. What about the median? – (Knowledge) the value that divides a set of data, written in order of size, into two equal parts
   c. Then lastly the mode? (Knowledge) – the most common value in a given data set
5. After that, I will split them up into groups of four students, which I have already set up. Now in your groups, I want you to find the mean, median, and mode of China’s population. Write out your group answers and work to get the answers. Make sure to label your answers, so we know which one is
which. (Let them have time to work on this together. Also, I can walk around to see how each group is doing.) Then once that is done, have one person go up to the board to put the answers on the board.

a. mean = \((60+80+110+140+410+1321)/6 = 353.5\) million people  
b. median = \((110+140)/2 = 125\) million people  
c. mode = none because no value is repeated

6. Then after all the groups are done, I will have them answer a few questions. When asking these questions I will just pick any random group. A general description of the steps taken would be suitable answers for the following questions.

a. Explain how the group came up with the median? (Evaluation)  
b. Explain how the group came up with the mean? (Evaluation)  
c. Explain how the group came up with the mode? (Evaluation)  
d. Is there ever a mode when it comes to populations? (Evaluation) – most likely not because the population is never the same

7. Now everyone can see the big difference between the mean and median.

a. Who can tell me why there is such a large difference? (Application) – the data really jumps up and because of that it increases the mean

b. Which of the two (mean and median) is the better one to determine the growth of China’s population over the years and why? (Evaluation) – median because it isn’t changed by the large change in population in the recent years

c. How can the mode help determine the average of a set of data? (Application) – if the majority of the numbers were the same with a few outliers then the mode would be better at the average

8. Depending on which of the three someone uses will determine a different average. If someone didn’t know that the mean was 353.5, but they knew the mode was 125 that is a huge difference.

a. Who can guess as to why the population has grown so much? (Evaluation) – any reasonable answer would be fine here, there is no right answer it is just critical thinking

9. Actually in China they have a one-child policy. It started in 1979 because they have been growing so much and so fast. They are starting to outgrow the land, and space is becoming limited.

a. What will this one-child policy eventually do to the population? (Evaluation) – decrease it or stop it from rising so fast

10. Statistics can be misleading by not providing all the information. Even though the population is still growing they are limiting the number of children people can have. Usually statistics of a set of data are misleading are seen in the form of a percent.

a. How many of you have seen a bag of candy or something else, and on the package it says 20% more? (Knowledge) – yes or no

Sometimes companies will talk of an increase in profits. They don’t tell which year they are comparing the profits against.
11. In light of Halloween just occurring let’s go back to the candy example. I have here a bag of Raisinet. On the bag it says that they have 30% less fat then the leading chocolate brands.
   a. Who can give me a chocolate brand or a candy bar? (Knowledge) – just about anything that you know of will work, Mars, Reese’s, Snickers, Milky Way, etc

Closure:
Homework tonight is going to be to look up a candy bar and write down on a piece of paper the candy bar name and the total fat percentage. Also, there is a worksheet that you have (I will start passing it out now). You are getting it now and it is over what we talked about in the first part of class. You have to look at the different data sets and say if the mean, median, or mode would be better to use and give justification.

Gardner’s Multiple Intelligences:
- Mathematical/Logical to be able to solve the mean, median and mode of a set of data.
- Spatial since we are graphing. It becomes very visual to that student and they have to rely on themselves for it. Also, they are putting up solutions and work on the board. This person will be able to see what all was going on and understand it better.
- Verbal/Linguistic because the mean, median, and mode are terms whose definitions explain how to use them. That way they can help out the group by knowing what you have to do for each term.
- Interpersonal because the students are working in groups. They have to work together to solve different problems and answer any questions. This way everyone can learn from each other and help out with someone’s weakness with someone else’s strength.

Adaptations/Enrichment:
The Gifted and Talented can help out other students in the review part. They are most likely to already know what mean, median, and mode are, so they don’t need the review. They can help others in their groups know what they are.

Students with mild Autism will recognize that I have a pattern that I tend to follow everyday. By keeping that pattern they will remain much calmer and less outbursts and problems can occur. They will also benefit by having the schedule on the board, so they won’t be surprised. By me asking a lot of knowledge questions will help them out, by allowing them a chance to participate in the classroom.

For the ADD and LD students I wrote an outline on the board of what will be going on for the day. It will keep them more on task because they will know what is going to be happening next, which is something that they need help on is remaining on task. They won’t be surprised or confused by anything that is coming up.

Self-Reflection:
- Did the students have too much or too little time to complete the writing assignment?
- Was there a point that everyone got lost?
- Did the students grasp that the mean, median, and mode tell them different things?
- Are they able to justify which one is better to represent a set of data?
- Did talking of candy lead to distractions or did it make it more interesting for them?
References


China’s One Child Policy. About.com: Geography
  http://geography.about.com/od/populationgeography/a/onechild.htm

  http://www.iiasa.ac.at/Research/LUC/ChinaFood/data/pop/pop_21_m.htm

Indiana’s Academic Standards, Grade 7 Mathematics. Indiana Department of Education.

Indiana’s Academic Standards and Resources. Indiana Department of Education.
  http://www.indianastandardsresources.org/standard.asp?Subject=math&Grade=7&Standard=6

Factors

• Sit in your seat and get out a clean sheet of lined paper.

• On the paper write one paragraph on: “What different factors/things affect your day?”
  – The factors can include: sports, having a test, getting good grades, being sick, etc.
  – Are there certain factors that affect your day more than others? If so, then state them and why these factors affect your day more.

• You have 10 minutes to complete this assignment. Then, bring up your paper to the front left corner, so I can pick them up.
Blank Graph

Directions: Plot China’s population as a line graph on the chart below. Don’t worry about precisely getting the year and population correct, estimation is fine.

China’s Population:

<table>
<thead>
<tr>
<th>Year</th>
<th>Population</th>
</tr>
</thead>
<tbody>
<tr>
<td>752</td>
<td>60 million</td>
</tr>
<tr>
<td>1110</td>
<td>80 million</td>
</tr>
<tr>
<td>1570</td>
<td>110 million</td>
</tr>
<tr>
<td>1700</td>
<td>140 million</td>
</tr>
<tr>
<td>1910</td>
<td>410 million</td>
</tr>
<tr>
<td>2007</td>
<td>1,321 million</td>
</tr>
</tbody>
</table>
FAR OUT POINTS

Which measure or measures of central tendency should you use to describe the sets of data below? Record your answers in the blanks with an explanation of why you made that choice.

### Hourly Wage for Waiters
- $4.00
- $5.50
- $7.00
- $6.25
- $7.50
- $7.00
- $15.00
- $6.85

### Period 5 Test Scores
- 85 95 84
- 80 88 70
- 45 72 95
- 81 65 95
- 100 78 72
- 86 87 81
- 72 68 89
- 99 82 69

### Ages of Children at the Playground
- 12 15
- 12 12
- 17 12
- 12 12
- 11 17
- 13 12
- 12 12
- 15 13