

TITLE: GRAPHING LIFE AND DEATH				Student/Class Goal Students want to interpret the information contained within charts or graphs and decide whether the information is trustworthy.	
Outcome (lesson objective) Using the TV ADD strategy, students will create and evaluate line graphs, stacked bar charts, and frequency histograms.				Time Frame 2 hours	
Standard Use Math to Solve Problems and Communicate				NRS EFL 5-6	
Number Sense	Benchmarks	Geometry & Measurement	Benchmarks	Processes	Benchmarks
Words to numbers connection	5.1, 6.1	Geometric figures		Word problems	5.25, 6.26
Calculation		Coordinate system	5.7, 6.7	Problem solving strategies	5.26, 6.27
Order of operations		Perimeter/area/volume formulas		Solutions analysis	5.27, 6.28
Compare/order numbers		Graphing two-dimensional figures		Calculator	
Estimation	5.4, 6.4	Measurement relationships		Math terminology/symbols	
Exponents/radical expressions		Pythagorean theorem		Logical progression	
Algebra & Patterns	Benchmarks	Measurement applications		Contextual situations	5.31, 6.32
Patterns/sequences		Measurement conversions		Mathematical material	5.32, 6.33
Equations/expressions		Rounding		Logical terms	
Linear/nonlinear representations	5.17, 6.17	Data Analysis & Probability	Benchmarks	Accuracy/precision	
Graphing	5.18, 6.18	Data interpretation	5.21, 6.22	Real-life applications	5.35, 6.36
Linear equations	5.18, 6.18	Data displays construction	5.21, 6.22	Independence/range/fluency	5.36, 6.37
Quadratic equations		Central tendency			
		Probabilities			
		Contextual probability			
Materials TV ADD Strategy Sheet Task Handouts 10 Leading Causes of Death Handout Teacher Answer Sheet Vocabulary Sheet					
Learner Prior Knowledge Students should have had basic exposure to bar graphs, line graphs, and frequency histograms. Students should know the difference between percentage of total and absolute total , and be able to convert between the two.					
Instructional Activities Step 1: Brief review of bar charts, frequency histograms, and line graphs. Step 2: Explain the TV ADD strategy. The strategy can be used in almost any situation where the student needs to read a graph or chart, and can even help in constructing graphs and charts. It is particularly helpful for deciphering both the message and the validity of the message for the numerous graphs and charts we are exposed to in the media every day. Pass the TV ADD Strategy sheets to students and then go through each step with students, taking time to discuss why each step is important. Encourage students to share and discuss examples (real or imaginary) they might encounter in common media outlets. Step 3: (I do) Teacher models the TV ADD strategy through Task 1 using the Talk Aloud technique. Pass out the Task 1 handout to					

each student and give the students approximately 30 seconds to look over the line graph. Read through the TV ADD strategy one step at a time. With each step, read the word (e.g., "Title"), as well as the text following the word. Whenever there is a question on the Strategy sheet, pause to answer it out loud. Remember that you are **modeling the process** for the students, so do not skip anything. Even if a question seems inapplicable, read it out loud and then talk to yourself (thinkaloud technique) why it does not apply in this case. Do not limit yourself to the suggested questions on the *Strategy* sheet; at the end of each step, ask yourself if there is anything else important to consider before moving on to the next step. After you have finished analyzing the graph with the TV ADD strategy, continue using the talk aloud technique as you answer the seven questions. Answers are provided on the *Teacher Answer Sheet*.

Step 4: (we do) *Teacher and class use the TV ADD strategy together to work through Task 2.* Note: Task 2 asks questions based on the *10 Leading Causes of Death* handout, so each student will need a copy of this chart. Have students take turns reading the five steps of the strategy, and then attempting to answer each question within the steps based on the chart. If a student ever does or says something incorrectly, make sure that you correct it immediately. Allow the students to provide as much information as possible first, and then contribute your thoughts on anything you think they may have overlooked. Try to give the students as much **ownership** as possible in the solution process, but remember that the goal of Step 4 is to do the problem together. After they finish analyzing the chart, work your way together through Questions 2 through 6 on the task. For Question #4, give students 5 minutes to construct a graph, and then put examples of both on the board for everyone to see. Encourage discussions that go beyond the mathematics into the meaning behind the data.

Step 5: (you do) *Students independently use the TV ADD strategy to work through Task 3.* Depending on your class dynamics, either partner students together or have them work individually. Before you pass out Task 3, explain that you want the students to tackle this problem as independently as possible. After passing out the handouts, walk around the room silently monitoring the students' progress. When you see them run into difficulties, try not to answer their questions directly; instead, remind them of similar situations from the first two tasks.

Step 6: Have each student (or pair) share their answers for Task 3 with the entire group. Encourage discussions that go beyond the mathematics into the meaning behind the data.

Step 7: Making it relevant. Have students brainstorm specific examples from their lives of when the TV ADD strategy might be useful. This is somewhat redundant with Step 2, but by now the students will be more familiar with the TV ADD strategy and may have more specific examples.

Assessment/Evidence *(based on outcome)*

Steps 5 and 6 will serve as evidence of student mastery. During Step 5, the teacher should actively listen to partner discussions for signs of understanding or of misconceptions. If students are working alone, the teacher should have students speak out loud as they solve the problem (similar to how the teacher modeled the TV ADD strategy out loud in Step 3). During Step 6, allow students the opportunity to modify their solutions based on what they learn from watching others present their solutions.

Exit Slip: Using the line graph on female cancer rates (the same one you used in Task 1), create a meaningful bar graph that shows the rates of female stomach cancer over time.

Teacher Reflection/Lesson Evaluation

Not yet completed.

Next Steps

Have students find two or three examples of charts or graphs in the newspaper, in a magazine, or on the internet. Ask them to work through the TV ADD strategy and then bring the best example in for a class discussion.

Technology Integration

This interactive link offers practice in reading a bar graph, a pie chart, and a grid chart (with feedback).

<http://www.tv411.org/lessons/cfm/reading.cfm?str=reading&num=10&act=1>

The New York Times is highly respected for its graphical displays. This link allows students to explore interactive graphics.

<http://www.nytimes.com/packages/html/newsgraphics/2009/ona/index.html>

This site, compiled by the British Broadcasting Channel, provides training in deciphering graphs with misleading messages.
<http://www.bbc.co.uk/schools/gcsebitesize/maths/data/representingdata2rev5.shtml>

Purposeful/Transparent

Graphs and charts permeate our daily lives in the form of news, advertisements, and academic tasks. In many professions the adult learners may enter, it will be useful—or even essential—for them to be able to read charts and graphs. This lesson teaches the TV ADD strategy, and then uses it to analyze three graphs.

Contextual

Actual charts and graphs related to the health field are used throughout the lesson. Questions are posed to encourage discussions relevant to issues facing students (and thus to underscore the importance of mathematical reasoning).

Building Expertise

Students will likely have exposure to reading basic charts and graphs before this lesson. However, they will learn to apply the TV ADD strategy in this lesson in order to analyze the various types of information contained within a graph. The final couple questions in each task are designed to be thought-provoking and call for a blend of quantitative and qualitative reasoning, which will help adults on standardized tests and in their daily life decisions.

Graphing Life and Death: Teacher Answer Sheet

As with any graphical interpolation, answers are approximate and may not match the answers provided below exactly.

Task 1

1. Cancer type, year, female death rate
2. In 1975, approximately 16 out of 100,000 U.S. females died of lung or bronchial cancer.
3. From 1930 onward, the rate of U.S. female deaths from stomach cancer declined.
4. $(41/100,000) * (290,000,000) - (5/100,000) * (160,000,000) = 118,900 - 8,000 = 108,900$ more deaths.
5. Lung and bronchus. Although rate and number are different, since all types of cancer are being measured as rates out of the same population, the cancer with the highest death rate will also have the greatest number of incidences.
6. Although U.S. female death from cancer has decreased for most types of cancer over the past century, the death rate from lung and bronchial cancer has increased significantly in the last few decades. Ask the class for opinions on why this is.
7. Answers may vary. However, in general, the National Center for Health Statistics would be considered a reliable source of information and the graph is not misleading.

Task 2

2. Pros: You could easily make comparisons both within causes and between causes. Cons: Plotting all of these causes would create a cluttered graph. Also, you would need to be careful about the scale for the x-axis (age groups).
3. Pros: You could easily see the highs and lows for each cause. Cons: It would be hard to plot more than one cause on a single frequency histogram. This would be possible with a stacked histogram, but would be chaotic.
4. Check individual student work.
5. For the youngest three age groups, this was probably to show the variability in cause of death. Several of the causes before 1 year old do not appear anywhere else on the chart and so they might get buried if this age group didn't have a separate category. The 5-9 group is likely separated from the 10-14 group to show the appearance of suicide as a major cause of death among the 10-14 group. Answers will vary on the second part.
6. Answers will vary. (For example, Unintentional Injury would be $(14,588 + 16,065) / (\text{total deaths by unintentional injury})$).

Task 3

1. Income level, risk factor, percentage of DALY
2. Just under 1% (~ 1.5 million DALYs) of the total global years of healthy life lost in 2009 was experienced by people of average income due to high cholesterol.
3. $(1/3) * (.01) * (1.53 \text{ billion}) \approx 500,000$ DALYs

4. Alcohol use, followed by tobacco use and high blood pressure (you may want to make the point that the first two are completely controllable, and the third is somewhat preventable).
5. Answers may vary. One interesting point is that most of the DALYs in the middle- and high-income categories are preventable, while most of the DALYs in the low-income bracket are not.
6. Answers may vary. One key bit of information would be the breakdown for the income bracket separations. Another would be how they determine how many healthy years a person loses when they “die early.” Both of these could be investigated by doing a Google search to find the chart itself, and then checking with the World Health Organization (which organized the study).

Graphing Life and Death: Vocabulary Sheet

Absolute total – the total number, without respect to a percentage. For example, if three out of eight people favored a candidate, the absolute total in favor of the candidate would be three.

Modeling the process – a teaching practice where the instructor first shows a student an example of what is expected. This is one component of explicit instruction.

Ownership – in education, ownership is the perception that one is responsible for accomplishing a task or process. If a student takes ownership in solving a math problem, they feel they have personal stake in contributing towards the answer.

Percentage of total – the percent form of parts of a whole. For example, if three out of eight people favored a candidate, the percentage of total would be 37.5%.

Validity – the degree of truth that something contains. In cases where it is impossible (or impractical) to verify the truth, validity is the degree to which something is trustworthy and reasonable.