

IT and Me Works

Lesson Plan for Programming Strand

Strand: Problem solving and critical thinking skills
Teacher: Karen Olmstead

Subject: IT & Me Works
Grade: 9th
Time: 2 hours

Objectives: At the end of this lesson students will:

- Demonstrate her/his knowledge of the basic steps to problem solving.
- Demonstrate mastery of the basic steps to problem solving by actively applying them to a problem.

Standards:

- Students will use problem-solving strategies to investigate and understand the natural world.
- Students will be able to use science and technology to creatively address issues in their personal and social lives and careers.
- Students will be able to apply rational, creative-thinking, and investigative skills and use scientific knowledge in their roles as citizens, workers, family members, and consumers in an increasingly technological society.

Setting: Classroom

Materials: None

Note –This activity can be used at any time to reinforce problem solving techniques.

Teacher's Role:

Ask your students what they think of math word problems. What types of problems do they experience on standardized testing, for homework, etc. Find out if they enjoy solving problems and if they have developed methods for figuring out problems.

Write a simple math problem on the board. Walk through how to solve the problem using the five steps to problem solving:

1. Define the problem
2. Analyze the problem
3. Establish criteria for evaluating solutions
4. Propose solutions
5. Take action – test the solution

Then, set the stage by explaining the purpose of this story problem to the student. Orient students as to expectations. Review with the students the basic strengths of a good problem solver. Emphasize a student's ability to think critically; to identify, group, and classify information in an order and form that makes it relevant and applicable to a given solution. Alert them to the fact that one's ability to solve daily problems, simulated or real, depends on one's ability to separate

useful from useless information; separate necessary from unnecessary information and then apply the pertinent information to the problem/task at hand. Remind them that their success in this unit of study heavily depends on their attention and critical thinking skills/habits. Tune-in; tune-out habits will result in low quality solutions to assigned tasks while critical listening, critical thinking, and assertive problem solving processes will result in high quality solutions to any problem they solve. Tell them that the story problem you are about to share with them contains many fabricated distracters together with the pertinent and necessary information that they will need for solving the problem that the story posts for them as listeners.

The Story: The Shepherd and the Harvard Boys

A few years ago, not counting those that came later, two Harvard sophomore students decided that they would spend their summer break traveling across the United States of North America, the same country that they had studied for years in books. In preparation for this long journey they were careful to pack the necessary credit cards, which their generous parents provided for them, maps, some light casual traveling clothes, and the friendliest Harvard smile they could muster. Their mode of travel was to be by way of an old 1961 Chevy panel truck that one of the boys had gotten, as a gift, from an uncle upon graduating from high school. The vehicle had made many trips between Newport, Connecticut, their hometown, and the Harvard campus in Cambridge, Mass., therefore, the two agreed that the panel truck would make it to the west coast and back. All due caution was taken in preparing the vehicle for the trip also. Once all of these preparations were in place, their journey was underway.

Traveling through the mid-west and southwestern states did not provide much in the way of entertainment or challenge to their superior Harvard trained mind. The real fun began when they reached the far west coast in California. They spent four weeks in Hollywood, two weeks in the San Diego Zoo, a few days in San Francisco, and many days in Disney Land. All too soon, it appeared, their summer had ended and it was time for them to start back to more familiar territory. So after picking up some supplies for the trip in Sacramento they headed east on Interstate 80. On the second day the panel truck made only 150 miles during a ten-hour day. Repairs had taken up most of that day. On the third day the two decided to abandon the vehicle and hitch a ride home after having to stop six times for repairs within a sixty-mile stretch of I-80.

The hour was marching on to four o'clock in the afternoon when they had bid their panel truck goodbye. Both boys were silent for the first hour of walking but each was thinking of the night ahead and having to round up a meal or go without. The more timid of the two was re-experiencing fears that he thought he had left behind at the age of twelve when he was in seventh grade. He began envisioning attacks by wild lions, tigers, panthers, and the like. When he spoke up his first question to his partner was, "Where are we going to sleep tonight and what are we going to eat?" "Fear not my good friend," responded his partner, "I shall teach you how the pioneers of the frontier survived in these desolate plains long before there was even a highway through here. Just keep your eyes alert for sheep and when you spot some and hopefully their shepherd let me do the talking for I fear that in your condition you might jeopardize our chances for an evening meal and perhaps even a bed to sleep in."

Our timid friend did not speak up but he did not much fancy chasing and wrestling a sheep down for their dinner not to mention having to butcher and prepare it over an open fire. He was deep in his thoughts when his traveling companion's shout of glee brought him back to reality. "There,

there, by those trees on that other slope!" he shouted as he pointed with excitement at some white spots that, in Mr. Timid's eyes looked like rocks. "Those are nothing but rocks," he retorted with the air of certainty that he often used on the Harvard campus. Nonetheless, he was very happy to accept his error when they approached the white spots and they turned out to be sheep as his companion had predicted from the opposite side of the valley.

No sooner had they arrived at the herd's northernmost edge when out of a scrub oak thicket came two Australian Shepherd dogs. Both stopped and assayed the valley for the whereabouts of the shepherd and sure enough, from under the tallest pine tree there emerged what looked like a person. As they got closer they could recognize him as the lone shepherd of this large herd. The man looked as if he had needed a shave, a haircut, and probably a bath for several weeks but they left all that aside and decided that here was a good opportunity for them to cash in on that evening meal they so badly needed and perhaps even a place to spend the night if they applied their best manners and savvy.

Mr. Timid's partner took a quick glance over the entire herd and in his mind made the best estimate of the number of sheep in the herd that his bright mind could compute in the time he had and when they were a dozen or so yards from the shepherd he greeted him. "A very good afternoon to you Mr. Shepherd of two thousand sheep," he offered, not knowing the man's name. "Your greetings are kindly accepted my traveling friends but you error Mr. Bright Boy. I am not the shepherd of two thousand sheep. If I had that many sheep out there plus another herd as large as that then again half as many as I have out there I should be the shepherd of two thousand sheep."

Mr. Timid immediately set his mathematical mind to the problem and by the time they had arrived at the shepherd's tent, which was a few hundred yards away he had figured out how many sheep the shepherd actually had in that herd.

Problem and Solution:

Question to students: How many sheep were in this shepherd's herd?

1. Direct the students to apply the basic steps to problem solving in solving this problem. To do so, students must list each step and next to it or immediately following they must list the information from this story that applies and is pertinent to that particular step. Remind students that the point of the story was to see how well they can separate useful information from useless information given a particular task/problem to solve.
2. You may wish to accept a solution that is arrived by guess and test (trial and error) method or you may direct the students to apply their algebra skills and produce an algebraic formula/equation: Example: $1X + 1/2X = 2,000$ sheep.
3. You may wish to have students attempt the solution to this problem on an individual basis or on a small group basis. If you feel the group is very unfamiliar with the basic steps to problem solving you may want to use this story problem to establish familiarity with these steps and do a total group problem solving exercise. This problem lends itself well to any of the above approaches in arriving at a solution.

4. A reward may be offered to the person or group that produces the most complete and well-formulated solution first. Extra points are a good reward for this problem or physical objects may also be offered.

TYING IT ALL TOGETHER:

1. Review by having students restate and review the purpose (objectives) associated with this story problem.
2. Be sure to review the best solution (problem solving process) with the students before this story problem is set aside for the day or the week.
3. Remind students that there will be constant reference to the process followed in solving this problem as other problems of similar character come up during the course of the year or unit, whichever applies.
4. Use this story problem to introduce or review the problem solving process with any lesson, unit or course. Remember you can vary it by level. Example: the number of sheep that Mr. Bright Boy, as the shepherd calls him, may be 20; 200; 2,000; etc.

See Course Outline for resources that will provide additional problems to use for students to practice problem-solving techniques (web resources and books).

School to Career Connection: Guest speakers and/or community tutors/mentors

Employability: Problem solving, critical thinking skills, analyze/interpret info and draw conclusions

Adapted from “Problem Solving – A Part of Everyday Thinking by Octaviano Garcia, Cuba Elementary School, Cuba, NM found at <http://www.col-ed.org/cur/math/math29.txt>.