Take Me out to the Ball Game…

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"The only real game -- I think -- in the world is baseball." – Babe Ruth
Delivered April 27, 1947, Yankee Stadium, New York

INTRODUCTION

The subject of word problems is without a doubt a very interesting topic because it allows us to introduce and practice new problem-solving strategies with the students. With effective problem-solving activities and strategies, students can understand very quickly the concept presented. It is important to mention that problem-solving tasks related to prior knowledge and real life situations or students' past experiences help the students to relate to the problem easily as well as to search for the answer or solution with a better comprehension of the problem. If we can find a way to train students to recognize mathematics problems in an everyday situation, this training will allow them to transfer the acquired knowledge to the academic environment and approach the solution of the problem from different points of view. Stephen Krashen, a researcher in second language acquisition, affirms that in order for the subject matter to be learned, fundamentally, the subject must be interesting and fun at the same time (Schütz). I will approach the development of my unit based in both of these principles.

As mentioned above, my intentions are for my students to recognize word or mathematical problems in everyday situations. If we can also find the fun and interest in these everyday situations, we are on the right track to find, in an easy way, the solutions to these problems. At the early elementary age, games and sports are the more important, if not the only themes, in the kid's minds. So, I'll present my unit based on common games and sports. We all know that baseball is the number one pastime in America. The game of baseball on its own is an amazing source of statistics, history, and game situations that give us the opportunity to obtain problem-solving situations at various grade levels.

I teach in an inner-city elementary school with a demographic index of 87% Spanish, 6% African American, 5% White, and 1% Asian. All of the students are from low income families. I teach a 4th grade bilingual class. In most cases my students have very low English language proficiency due to the fact that they came from an all Spanish 3rd grade class. This presents a challenge with introducing new vocabulary and terms in the new language. So, in my unit I will try to use more common mathematical language in order to ease the learning of my students.

CURRICULUM OBJECTIVES

A good number of objectives related to Problem Solving are presented in the Houston Independent School District's Project CLEAR curriculum. Although my objectives are concentrated on the 4th grade level, the unit can be adapted to different levels as well. Two of the most important ones from my point of view are:

MATH.4.14A. Identify the mathematics in everyday situations.

MATH.4.14C. Select or develop an appropriate problem-solving plan or strategy, including drawing a picture, looking for a pattern, systematic guessing and checking, acting it out, making a table, working a simpler problem, or working backwards to solve a problem.

The following objectives are also an important part of the curriculum and what the district considers "Power Objectives." These objectives were introduced in the district curriculum during the '07-'08 year. The school district is planning a full implementation of the mentioned objectives for the year '08-'09. I believe it is important to try to include them in the development and teaching of the unit.

MATH.4.16B Justify why an answer is reasonable and explain the solution process. (Power Objective).

MATH.4.11A. Estimate and use measurement tools to determine length (including perimeter), area, capacity, and weight/mass using standard units SI (metric) and customary units. (Power Objective).

MATH.4.8C. Use essential attributes to define two- and three-dimensional geometric figures, such as number of edges, number of faces, number of vertices, types of angles, and shapes of faces and base. (Power Objective).

MATH.4.5B. Use strategies including rounding and compatible numbers to estimate solutions to multiplication and division problems. (Power Objective).

MATH.4.8A. Identify and describe right, acute, and obtuse angles.

MATH.4.8B. Identify and describe parallel and intersecting (including perpendicular) lines using concrete objects, pictorial models, and formal geometry vocabulary.

MATH.4.9C. Use reflections to verify that a shape has symmetry and describe the two halves of a shape for each line of symmetry.

MATH.4.14D. Use tools such as real objects, manipulative, and technology to solve problems.

MATH.4.15A. Explain and record observations using objects, words, pictures, numbers, and technology.

MATH.4.15B. Relate informal language to mathematical language and symbols.

I would like to explore teaching students the relationship between the subject matters in the school, especially math, and their everyday life by bringing every day situations to the classroom. These would be analyzed and strategies would be used to solve the given problem or situation. I would like to find a way to make students see their problems from as many points of view as possible. Having a background in architecture has taught me to look for a solution everywhere. Sometimes solutions may seem absurd, but the choices should not be discarded before being tried. This will help them understand and find the solution to a problem in a faster way. With the focus on the instruction of the mentioned objectives, I am very sure I will be able to point my students in the right direction. All of these objectives present a direct correlation with the Texas Essential Knowledge and Skills (TEKS) Objectives. The mentioned correlation will be presented later as the unit is developed.

RATIONALE

As mentioned above, two main components are the base of the development of the unit. Both of them are clearly identified in the CLEAR curriculum as two main strands and power objectives to be taught through elementary school and through middle and high school as well. These strands are directly correlated with the TEKS objectives. Strand 3: Geometry and Spatial Reasoning and Strand 5: Probability and Statistics.

The main concepts for Strand 3: Geometry and Spatial reasoning are:

Identify types of angles and lines.

Use attributes to describe two- and three dimensional figures.

Identify lines of symmetry in two-dimensional figures.
Demonstrate and use transformations including rotations, reflections, and translations.
Use appropriate, formal geometry vocabulary.

The main concepts for Strand 5: Probability and Statistics are:
Determine all possible outcomes or combinations of a situation.
Collect and record data of experiments.
Create and interpret bar graphs.

By teaching the listed basic concepts from both strands, I intend to develop in my students a clearer concept, and in a fun way, of spatial reasoning and probabilities and statistics. We should start a mathematical concept development based on prior knowledge. It is also important to introduce this concept development in an everyday situation context, like playing a game or a well-known sport. To do this, the creation of teams is needed. In the academic aspect, the lessons are focused on the development of a better understanding of basic concepts like probabilities and spatial reasoning. The game of baseball – its rules, history, physical aspects, and even the social aspects – enables us to create a series of fun and interesting lessons, easy to teach, easy to assess, and easy to extend, in search of our students' academic development of these two necessary and important skills.

In the Tamar Lewin article, *Report Urges Changes in Teaching Math*, he mentioned that "American students' math achievement is at 'mediocre level' compared with that of their peers worldwide." The article also talks about research presented to the education commissioner by a panel of researchers, presenting solutions to the issue. Specific goals were presented for students in different levels. For example, it said that "By the end of the third grade, students should be proficient in adding and subtracting whole numbers." Although I agree with the goals to be taught to students, I also believe that the goals could be more challenging. Another important idea from the article mentioned is that "Math curriculum should include fewer topics, spending enough time to make sure each is learned in enough depth that it need not be revisited in later grades." In my experience this "Less is more" theory is true. The extended time I spend on a particular topic allows me to approach all my students in a better way according to their abilities. To me it is important to revisit the concepts at different levels and then expand from there.

The revision of a mathematical term or concept is always imperative because we as teachers need to base our instruction in previous knowledge. Also, after the basic concept is taught, it is necessary to expand the lesson in order to achieve and also develop high order thinking strategies for our students. "Extended analysis, is to look beyond the initial features of a mathematics task and try to reveal a deeper mathematical structure underlying the task," is presented in the Stanley and Sundstrom paper "Extended Analyses: Finding Deep Structure in Standard High School Mathematics." Although their paper is aimed at high school teachers, I believe that the theory could and should be applied at any school level.

Students as any individuals have personal learning abilities and tendencies. Every individual has a mind and learns and reacts to situations differently. In his paper "La Biblioteca de Babel," Jorge Luis Borges compares human beings with books in a library. "No two books are identical," he said. He also mentions that most general rules or solutions for any situation exist, and sometimes a simple solution can be found easily on any book shelf, and sometimes on the same shelf no solution can be found. The way I interpret his analogy and try to relate it to the world of math is by thinking, as I mentioned before, that we are all different and perhaps that everything to know is there on a shelf. We all are not capable of reaching the book shelves of the library (of life) the same way. Some of us are not even able to find them. Math needs to be taught the same way. The concepts are there. It is just a matter of teaching them in a way that everybody is able to reach them or at least locate them.

UNIT BACKGROUND

The Game

Baseball is the major pastime in the United States. Many situations that take place on a baseball field can easily be carried over and analyzed in an academic environment in search of a fun, interesting academic goal. Even real-life situations can be associated with the game of baseball. The development of a thematic unit with word problems based on the popularity of the game is going to help us implement strategies for the better understanding of "worl (d) problems" in everyday situations. The game of baseball is a world in itself. It has its own time, its own history. Introducing the history of the game in the unit will provide us with the opportunity to study and compare different eras of the game through time, along with the statistics of each period. Comparisons of many kinds can be established graphically or in any other form from the beginning of the game until now. Later on in the unit and as a lesson extension activity, or extended analysis, more word problems are going to be presented in search of higher order thinking responses from the students. These high order thinking problems could be derived from the history of the game. In the book *The Timeline History of Baseball*, by Dan Jensen, a very detailed timeline of the game is presented. By following this timeline, a series of extensions for the lessons could be developed. Furthermore, according to *Baseball Library* (http://www.baseballlibrary.com/baseballlibrary/chronology/), we may enclose the game of baseball in seven major key eras:

- The Early Years (1845-1900): Shows a record of the first game in 1845 through the creation of professional teams and leagues in the 1870s.
- The Dead-Ball Era (1901-1919): Called like this due because of the dominance of pitchers like CY Young and Christy Mathewson who made run-scoring very limited.
- Baseball between the Wars (1920-1941): Babe Ruth, Lou Gehrig, and Joe DiMaggio are the well knows names of this era. Other features present in today's baseball were also born in these years, like the minor league farming system.
- The War Years (1942-1945): Many star's careers, like Di Maggio's, were interrupted by WWII.
- Baseball in Transition (1946-1960): Significant era this allowed the game to become an interracial game. Jackie Robinson was the first African American to play in the big leagues.
- Owner-Managed Growth (1961-1975): Era of expansion in both National and American leagues. Pitching, again, represented the strength of the game. The figure of the designated hitter is introduced.
- The Free-Agent Era (1976-present): Players auction themselves in the free agent market and obtain skyscraper salaries. New baseball parks are built evoking old park nostalgia.

Baseball has its own language and society. It is a society with a diverse cast of characters, ranging from players and umpires on the field to younger children and old grandpas in the audience and everybody in between. Imagine then, the game of baseball as an immense source of everyday situations transforming the pastime into mathematical problems.

The game of baseball lends itself perfectly to statistical analysis. Thousands of jobs related to the game depend on these numbers. Thousand of game situations vary according to the previous study of these statistics. As a consequence, many times the study of past trends has a direct impact on present game. The probabilities will give us a very good and close idea of a result, according to statistics, but external factors sometimes are present given an unexpected outcome. In the unit we will be able to study these probabilities as a required part of the curriculum for elementary grades. This part of the unit can be extended up to almost any school level and its respective curriculum, due mainly to the extension and varieties of statistics that can be found in the game of baseball. Some other everyday situations can also

be presented in order to relate the game to mathematics, for example, the food that is consumed at any given game or a season. See video "Popcorn, Peanuts, Hot Dogs" from *The Futures Channel* (www.thefutureschannel.com). The number of food items presented in the video is going to be without a doubt an enormous number, perhaps, too big for the elementary level. In his book *Death by Black Hole*, Neil deGrasse Tyson talked about an unfounded fear of the human for big numbers. He also mentioned the fact that "Counting at the rate of one number per second, you will require 12 days to reach a million and 32 years to count to a billion" (301-302). If he can confirm the facts, then I find contradictory the unfounded fear for large numbers. Can you picture yourself counting one by one for thirty plus years? Whatever the case may be, I don't see large numbers used in everyday situations, much less at elementary level. While it is important to teach to the students the existence of huge numbers, so they can not be ignored, it is also important to recognize that they're simply uncommon numbers. In any case the scale can be reduced and adapted to any grade level. Working on a thematic unit for mathematics gives us the opportunity to work with small and huge numbers. We can even work on an abstract way with no numbers at all to teach a mathematical concept. It is important to be careful and conscious in our teaching in order to work at the levels required by the students to perform at their best and to have the best understanding of the concept to be taught. For example, we may even talk about exponential numbers at middle or high school level.

How can we use word problems and creative problem-solving strategies to increase students' higher-order thinking? As mentioned previously, it is important to teach students to recognize problems in everyday situations. Once this particular goal is achieved, the teacher and students may work together in setting the level to a higher scale of thinking. How can creative problem solving integrate basic skills in multiple content areas? By teaching the students to find and solve problems, then every content area across the curriculum becomes a source for word problems to solve. Furthermore, a more extensive analysis of almost any mathematical concept can be applied in the other subject matters, searching for an across the curriculum concept development. Following the curriculum of HISD, CLEAR is part of my life inside my classroom. I'm very positive about the possibility of finding ways of adapting newly acquired knowledge to accomplish the teaching of these objectives. We must think about a task and then plan problems that may incorporate several learning proficiencies, for example: motivating students to want to excel, reinforcing communication and collaboration skills, encouraging decision-making, encouraging time management, incorporating problem solving and critical thinking skills, applying organizational skills and responsibility, allowing students to formulate questions and test solutions, reinforcing interpersonal skills, and incorporating content area concepts and skills.

This unit is planned to study two main areas of the mathematics. These two main strands are not necessarily derivative from each other, although its relationship is suggested. The first part of the unit will be based on Learning Focus 3.4 Geometry: Two- and Three-Dimensional Figures. The use of simple geometric two-dimensional and three-dimensional figures is present in almost every situation in our daily lives. The student will learn to recognize the use of geometry in all scales,starting with a simple baseball game on a playground or baseball field, which, of course, is presented as a square. I will also teach them to recognize two- and three-dimensional figures in places as close as our own classroom and our school (building), even in their houses. For example, doors as rectangles and windows as squares, circles in the kitchen or classroom's clock. I will explain to my students that our classroom is a huge rectangular prism. I will also involve teachers from other subjects during the teaching of the unit. For example, the physical education teacher in the development of the first and second lesson. The science teacher could also be involved in the unit, for example as an expansion in teaching natural symmetry as a mathematical and scientific concept in plants, animals, and even in human beings.

Literature as well as other subjects are involved with the world of math problems. During our seminar a whole list of books was examined for these subjects. All these books present specific mathemathical concepts to be taught in a not necessarilly mathematical way. I particularly found a very interesting connection with one of the most famous books of all times, *Cien Años de Soledad*, by Gabriel García

Marquez, winner of the Nobel Prize for literature in 1967. In his famous book, now considered a literature classic, García Marquez narrated the story of the Buendia family through hundred years of time and five generations. Forty-four characaters are developed in the extraordinary saga of the Buendía's family. Now, mathemathicaly speaking, what are the probabibilites of two members of the family getting together during one hundred years and five generations? Amazingly at the end of the story two members of the family do get involved. Probabilities are everywhere. We find them in almost any everyday situation. Furthermore, it is also a very important strand in the state curriculum that needs to be taught. As part of one of the lessons (lesson 3), after students complete the scoring card, an extension activity could be derived from the collected data, in which a comparison of different situations could take place. For example, the number of balls and strikes thrown by a pitcher in one inning compared to the following inning. What are the probabilities of that the two innings will be the same?

Many other books also suggest various strategies in which literature is the way to teach mathematics. Whatever we can do to motivate the students to read will definetely help the children with the understanding and solution of a word problem. A word problem is a short history or passage with a question or two to be answered. The last lesson of the unit is based on the reading and analysis of a book. The book to be analyzed would not necessarily be a mathematics book, but a literature book. The idea of the analisys is to find the relationship between literature and mathematics.

Books like *How Much is a Million?* by David M. Schwartz introduce the concept of knowing and understand big numbers for small children. In the game of baseball we don't find many big numbers in the game itself, but around the game, we do. For example, we can mention the player's salary, which now days are in the millions. We can also talk about fans all over the country or the world for that matter. If we want to extend the lesson at the high school level, we may introduce problems related to the amount of money generated by a single game, including tickets, souvenirs, food, employer's salaries, etc.

Now, as a conclusion we may ask a question, is there a formula or recipe to teach words problems? Is there a magic, flawless strategy which will guarantee a high rate of success in solving mathematical problems? Again, are we all programmed in our brains the same way and capable of learning in the same manner? Some of these questions are answered in the article by Jim Holt, "Numbers Guy." Research based on the neuroimaging of the brain is explained. The book reveals how a thought process like calculation unfolds in the brain. "Since the brain's architecture determines the sort of abilities that come naturally to us, a detailed understanding of that architecture should lead to better ways of teaching children mathematics and may close the educational gap that separates children in the West from those in several Asian countries." To try to understand how the human brain does work will move us into a very difficult and complicated matter.

Another complete universe can be the world of statistics in baseball, although you may hear sometimes that in baseball nothing has been written. If this is the case, why do we need the statistics? Baseball is a game of probabilities. With the use of all these numbers, the study of probabilities becomes one of the main tools to make a decent and many times very assertive prediction on a game. The study of probabilities helps us understand possible outcomes in an event. It also helps us understand risk and percentages of risk to be taken. We need to teach the students the importance of the understanding of probabilities and how we find them in everyday situations. For example, how can they use this tool in many circumstances? Going back to the game of baseball and its universe, two important aspects can be touched on here. In the 1941 season Joe DiMaggio fascinated the nation with his 56 game-hitting streak. The streak began on May 15th, 1941, and lasted until July 17. "A feat that has never come even close to being matched," believed Arbesman and Strogatz in their article "A Journey to Baseball's Alternate Universe." These two mathematicians created 5,295 baseball universes in a computer trying to study the probabilities for the record to happen again. The result varies on their computer, but in real life, the streak is still untouchable. I personally compare DiMaggio's record to another amazing event. "In 1938, Johnny Vander Meer of the Cincinnati Reds pitched two consecutive no-hitters. A no-hitter is a game in which

one of teams is unable to even hit a single in a game. In order to break this record, a pitcher would have to pitch three consecutive no-hitters — simply impossible!" (Young).

Furthermore, we can explain to students how statistics are calculated. Perhaps, we can watch a video of a baseball game and keep record of it as is been played. We can give an explanation as to how a batting average is obtained for any player. Tell them that a player who can hit a ball three out of ten times is considered a good hitter. Now, a player who can hit the ball only two out of ten times is not a good hitter. In one of the lessons is an activity in which students must follow a baseball game, either on TV or live, for one or two innings and make their own statistics from it. It will be a very participative way of integrating the home in the school work. At the end of the lesson, many word problems may be derived. For example, what were the outcomes of ball and strikes against the number of pitches? Can we graph that? Can we graph the number of hits against the number of outs? Can we make a prediction for the rest of the game? The activities extension in a lesson like this is endless. We may think again about the broadening or expansion in the teaching of math that was mentioned above.

So, let's "Play ball" in this journey of teaching and learning word problems. Let's get the two- and three-dimensional shapes, analyze the probabilities, and study the statistics of the game from the field and into the classroom.

LESSON PLANS

Lesson 1: A Field of Dreams

Objectives

MATH.4.8A. Identify and describe right, acute, and obtuse angles.
MATH.4.8B. Identify and describe parallel and intersecting (including perpendicular) lines using concrete objects, pictorial models, and formal geometry vocabulary.
MATH.4.8C. Use essential attributes to define two- and three-dimensional geometric figures such as number of edges, number of faces, number of vertices, types of angles, and shapes of faces and base.
MATH.4.9C. Use reflections to verify that a shape has symmetry and describe the two halves of a shape for each line of symmetry.

Key Terms

Angles and lines
Two- and three dimensional figures
Symmetry in two-dimensional figures
Transformations including rotations, reflections, and translations
Appropriate, formal geometry vocabulary (examples: perimeter, area, vertices, sides, symmetry)

Introduction

Present, define, and explain to the students a picture, drawing, or a video of a baseball field. Using the image, define and explain the concept and characteristics of a two-dimensional figure. Introduce the concept of quadrilaterals as a group of two-dimensional figures. Discuss its characteristics as a group and as two-dimensional figures.

Concept Development

Take the students to an open area, such as the playground or a baseball or softball field. Divide the students in two or three groups of at least seven students. Use Major League teams' names or encourage the students to create their own. If you are on a baseball field, use a tape measure to measure the distance between the bases and around the infield. Review the concept of perimeter. Compare the basic concepts to the actual situation. For example, the sides of the infield are the lines, the bases are the vertices. Count four sides and four angles as characteristics of quadrilaterals. The introduction or review of measurements, both in the metric and standard systems, can be mentioned and compared.

Student Practice

Each team must name a reporter, a recorder, and a team's captain. Also, each team must measure the distance between the bases and record them. Ask each team to find the perimeter of the infield according to their own measurements. Students must also count the angles and the sides of the infield. At this point ask them to identify and describe any other characteristics pertaining to two-dimensional figures, especially quadrilaterals.

Assessment

For the assessment the students need to present as a team to the rest of the class, a drawing of the infield, its dimensions, its perimeter, and at least three characteristics of the figure as a two-dimensional figure. Place all drawings on the wall and compare them.

Closure

Explain to the students that almost all two-dimensional figures have similar characteristics. These characteristics are different from the ones for the three-dimensional figures. For example, compare terms like faces versus sides. Explain to students how we can find and analyze two-dimensional figures in almost any everyday situation or place like a baseball field. Name other examples like a soccer field, inside the classroom, or other areas of the school. Students will try to develop observations skills which will enable them to recognize geometrical figures.

Materials

Tape measure
Equipment Overhead projector
Supplies/Materials
Chart paper
Markers
Transparencies

Modifications

When working on teams, please make sure that each group has students with different levels of English. Special education students could help in the measurement of the field. Gifted and talented students can try to find more than one geometric figure in the field or introduce the variable of size as a different activity.

Lesson 2: Three strikes you're out…part 1

Objectives

MATH.4.16B Justify why an answer is reasonable and explain the solution process.
MATH.4.14D. Use tools such as real objects, manipulative, and technology to solve problems.
MATH.4.15A. Explain and record observations using objects, words, pictures, numbers, and technology.
MATH.4.15B. Relate informal language to mathematical language and symbols.
MATH.4.14C
Select or develop an appropriate problem-solving plan or strategy including drawing a picture, looking for a pattern, systematic guessing and checking, acting it out, making a table, working a simpler problem, or working backwards to solve a problem.
Sci.4.2D- Correlation with Science.
Communicate valid conclusion using written statements that include pictorial and numerical representations.

Key Terms/vocabulary

Addition	Mental math	Digit	Equalizing	Count back	Equation
Sum	Round	Doubles ± 1	Take away	Joining/combining	
Estimate	Comparison	Subtraction	Balls	Innings	Thirds

Strikes	Base on balls	Strike out	Out	Compatible numbers
Pitcher	Catcher	Umpire	Zone	Home plate

Introduction

Present to students a video of a recognized pitcher like Nolan Ryan or Johan Santana. Introduce the concept of "count," in baseball, as the numbers of strikes and balls given a batter. Explain that pitches called strikes are considered good, and pitches called balls are considered "bad" pitches.

Concept Development

While watching the video with the students, explain to them the importance of the jobs of the pitcher and the catcher in the game of baseball. Whenever a new batter comes to the plate, a new count begins. For the next batter, students must keep their own count. At the end of the batter's turn, compare the count from the students to verify the understanding of the concept. After an initial modeling by the teacher, a video game can be presented with the purpose of introducing the idea of a real game situation.

Student Practice

Watch the video of the game for a complete inning. Make sure both teams took turns at bat (three outs each). Count the strikes and balls thrown by each pitcher. Also tell students to keep individual count for each one of the hitters and compare them. Explain to students what happens when a hitter connects a hit or gets a walk on balls, as well as any other event or situation created on the game. In the video game, time permitting, play two or three innings of a game with the students. Emphasize with the students the need to keep an accurate count of the pitches.

Assessment

For the assessment the students need to present as a team to the rest of the class the results of the previous game played. Place all results on the wall and compare them. Emphasize the comparison of the numbers obtained during the game: balls, strikes, runs, and any other important numerical information.

Closure

After comparing the numbers from the different games, show students the individuality of each game. Talk to them about the almost impossible situation of having two equal games. Explain to the students that it is very difficult to predict the results of the game, but by studying the given numbers, a very close educated guess may be completed.

Materials

Computer or video game
Score box page. (Can be obtained from the following link:
http://www.baseballscorecard.com/downloads/pcscorecard.pdf)
Equipment Overhead projector/ Computer
Supplies/Materials
Chart paper
Markers
Transparencies

Modifications

When working on teams, please make sure that each group has students with different levels of English proficiency if you working in a bilingual classroom. Special education students could help in keeping of the scores. Gifted and talented students can try to create word problems from the different scores posted.

Lesson 3: Three strikes you're out…part 2

Objectives

MATH.4.14D. Use tools such as real objects, manipulatives, and technology to solve problems.
MATH.4.15A. Explain and record observations using objects, words, pictures, numbers, and technology.
MATH.4.15B. Relate informal language to mathematical language and symbols.
MATH.4.14C. Select or develop an appropriate problem-solving plan or strategy, including drawing a picture, looking for a pattern, systematic guessing and checking, acting it out, making a table, working a simpler problem, or working backwards to solve a problem.
MATH 4.13B. Interpret bar graphs using verbal and numerical data to summarize and answer questions.

Key Terms/vocabulary

Gathering and organizing data.
Constructing and interpreting bar graphs.
Describing the relationship between two sets of related data in a table, chart, or t-table.

More	Vertical/Horizontal Scale	Less than	Greater than
Related number pairs	Compare	T-table	Survey
Ordered pairs	Same as	Title	Table
Chart	Intervals	Predict	Fewer
Horizontal, Vertical, or Double Bar graphs		Growing patterns	

Introduction

Provide a score card like the one from the previous lesson to each student. If possible, show the students a completely filled score card from a game. A game from the video or computer game can be scored on the card while it is being played. Tell students to pay special attention to the way the data is obtained.

Concept Development

Explain to the students that every piece of information obtained and marked down on the score card has a special importance. It is also important to not be overwhelmed with all the data collected. Now, because all the information is collected one piece at a time, we can take the opportunity to explain the origin, the concept, and the importance of the data that is being scored. All this information will be used later to create word problems of many types, for example problems of data interpretation, problems involving probabilities, and a series of extensions that can be derived from all these pieces of information.

Student Practice

After the initial explanation the students should be able to follow the teacher guidance on obtaining the data straight from the game as is been played in the video game. As the game is played, the students should be taking notes and filling in the score card carefully. Students could work individually or work in small groups keeping the score of the game. Teacher should monitor whether to play nine innings or a shorter game. Perhaps the game could be played between two different teams while two others keep score.

Assessment

After the students finished scoring the game with the teacher guidance, the score card needs to be presented to the rest of the class and compared with the others from all the games. This part of the lesson can be done in two or more parts depending on the length of the class period.

Materials

Computer or video game about baseball.
Score box page. Can be obtained from the following link:
http://www.baseballscorecard.com/downloads/pcscorecard.pdf

Equipment Overhead projector/ Computer
Supplies/Materials
Chart paper
Markers
Transparencies

Closure

Explain to the students that after all this data is obtained, a large group of problems can be created and analyzed. All this information can be used separately to create or to predict many situations from a baseball game to the next. How can we relate all this data to everyday situations? How can we use it or establish a connection?

Modifications

When working on teams, please make sure that each group has students with different levels of English proficiency if you working in a bilingual classroom. Special education students could help in keeping of the scores. Gifted and talented students can try to create word problems from the different scores posted. Many lessons can be adapted from the obtained data. According to the grade level, extensions on the analysis of the information could allow the students to create more high-order thinking situations. These situations could bring more mathematical concepts or simply everyday situations.

Lesson 4: The problem of writing

Objectives

MATH.4.15B. Relate informal language to mathematical language and symbols.
MATH.4.14A. Identify the mathematics in everyday situations.
MATH.4.14C. Select or develop an appropriate problem-solving plan or strategy, including drawing a picture, looking for a pattern, systematic guessing and checking, acting it out, making a table, working a simpler problem, or working backwards to solve a problem.
MATH.4.14B. Solve problems that incorporate understanding the problem, making a plan, carrying out the plan, and evaluating the solution for reasonableness.
MATH.4.14D.Use tools such as real objects, manipulatives, and technology to solve problems.

Key Terms/vocabulary

writing short story	plot	characters	history line
strategies	question	solution	cast of characters
setting	dialogue	cause and effect	one-step problem
two-step problem	planning		

Introduction

Provide the students with a graphic organizer used for pre-writing or a history map. On the board and with the help of students, write down some ideas about a possible topic or theme to write about. The topic must be closely related to a familiar situation for the students, like going to the grocery store or to the mall. Perhaps it could also be related to a soccer or baseball game previously played by the students. Concepts like fiction and reality could be taught or reviewed with the students. The main reason for this is that the stories to be written can be both, past events or fictional stories. Some topics may be: I went shopping with my mom," Let's go to the mall! "Shop, shop until you drop," " I got $25.00 for my birthday," "Christmas shopping," "My team won on Saturday," or "The Rockets lost a close one."

Concept Development

This lesson can be planned and carried out with the language arts teacher as a partner. In my case I have a self-contained classroom, so I'll be able to carry out the lesson as a multidisciplinary activity. After the topic has been selected, the teacher should model the planning stage of the writing. At this point, a review of the writing process could take place. In this planning stage, emphasize the importance of recognizing the mathematics concepts present in everyday situations. In at least three of the paragraphs, the students should plan for a short problem involving a mathematical concept or problem. The teacher could model an example showing how in a story a math problem can be included as part of the plot. For example, with an old sales receipt a clear example of a two-step problem could be presented.

Student Practice

For the first part of the lesson, an entire language arts period may be necessary because the planning stage in the writing process is the most important one. Students should be able to plan the whole story. Depending on the plan taught to the students, the whole period may be needed just for the planning stage. For the following class period a complete first draft from the students is expected. During the math period, emphasis on the strategies to solve the problems should be made. A review or introduction of new mathematical concepts should also take place during the math class period and should be applied to the writing project.

Assessment

On each of the stages of the writing process, the students could be assessed. The most important assessment will be the completion of the project, the final draft. Two important parts of the whole project should carry the heaviest load: the writing process as a whole and the introduction of the mathematical concepts identified in everyday situations.

Materials

Equipment Overhead projector/ Computer
Supplies/Materials
Chart /regular paper
Markers
Transparencies
Pencils
Graphic organizers

Closure

Explain to the students that after the project is complete, a large group of problems can be created and analyzed. It is important to explain to the students how we can relate everyday situations to math and establish a connection. Almost any situation involves or is related somehow to mathematical concepts.

Modifications

When working on teams, please make sure that each group has students with different levels of English proficiency if you working on a bilingual classroom. Special education students could require more time to complete the project. Gifted and talented students can try to create more complicate word problems, for example two-step problems. According to the grade level, extensions on the analysis of the projects could allow the students to create more high-order thinking situations. These situations could bring more mathematical concepts to everyday situations.

Appendix A

Key vocabulary for the unit:

Square corner	Congruent	Pyramid
Paris of lines	Octagon	infield
Cube	End points	bases
		perimeter
Point	Rectangle	Rectangular prism
Face, base	Trapezoid	Square
Cylinder	Less than, greater than	Right, Acute, and Obtuse angles
Ray	Parallelogram	Line
Triangle	Hexagon	Rhombus
Polygon	Equal distance	Parallel, intersecting, and perpendicular lines
Regular	Pentagon	Line segment
Quadrilateral	Cone	Edge
Vertex, vertices		

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