

Explanations- Problem Solving with the Kindergarten Student

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Introduction

There are no conditions of life to which a man cannot get accustomed especially if he sees them accepted by everyone. A famous quote by a Russian writer Leo Tolstoy is quite appropriate for this unit.

In today's world students everywhere should be able to solve a mathematical problem in a systematic way. Most mathematic programs want students to show their work. This work has to have substance and should be relational to the problem. The process can be inductive or deductive. Brief explanations of these two are induction is a process of drawing a conclusion of an event that has yet to be observed (Encarta2003). Deduction is a process of reasoning in which reasons are given in support of a claim. Both of these processes are learned behaviors. As for this unit I will be including this process in its elementary form by giving all needed information to answer a question. .

With the kindergartener solving problems starts with daily practice and routine. To be specific, routines teach habits and learning skills. These learning skills help students to be successful. While using routines I would ask myself what ways most people solve problems that they come upon or how do you solve a problem. Everyone has a way of doing this. The scientific way of doing this would be the deductive or inductive way. Both methods are used to solve problems. I myself like to look at the whole and pick it apart to see what fits. This I presume is the inductive method. In this unit, we, my students and I will be developing mathematical thinking through routines that involve daily problems that will be in the form of a riddle to teach problem solving.

I am proposing to write a unit for kindergarten students at Pittsburgh Faison Primary. I teach at a comprehensive arts academy in Pittsburgh, Pennsylvania in a school from pre-kindergarten to fourth grade. The student body is predominantly African American by ninety- eight percent to two percent. The students in my classroom come from Head Start or private preschool programs. The majority of my students come from low-socio economic neighborhoods. I enjoy teaching them and they enjoy learning. I have twenty-

five students. The students are grouped in four different groups based on their academic scoring at several points within the year. The groups are below basic, basic, proficient and advanced in my classroom. These groups drive the instruction in my room. When I teach my lessons, I modify the instruction to target each group. The concepts skills and processes will be evaluated by using the supporting evidence that will be provided to each student. I will be fostering the arts in each of the problems through the use of a portfolio. I will be also following my district's excellence policy on effectiveness and rigor by using challenging information in the unit.

Overview

This unit will be about how to solve problems. In writing about problem solving I will look at the basic fundamentals of developing the process. As I research this unit I will be looking at three content areas.

- * Math

- * Writing

- * Early childhood cognitive development

The mathematics will be looked at through routines and processes. Routines will be done daily to promote a pattern of solving problems in a systematic way. This systematic way will be explored by set up and approach to the problems. The set up is a verbal prompt and the approach will be the form of a riddle. I will be looking at five categories of math. (The foundational ideas that mathematical concepts are built on, this can be significantly seen in basic skills such as identification of a pattern.) Mathematical thinking and reasoning will be explored through making conjectures and developing sound argument concerning the conjecture or problem. We will also look at concepts and processes that will include strategies for solving the problem. This will include a problem on symmetry and making generalizations concerning other problems. The mathematical relationship of real life situations to my students' lives will add to this unit. I will approach this with a daily problem in riddle form using attributes that are relational to the mathematic standards. The attributes are application, reasoning, predicting and testing and choosing an operation.

The problem solving aspect that this unit is based on, will be requesting a task from my students and for them to think on a level that requires training. Although there are many approaches to problem solving I will use the basic way. I will give a clear description of the problem, then have the students interpret the problem through a drawing and then complete a sentence with the vocabulary provided. They should assess the drawing and write the answer. Each mathematical problem will be looked at using some or all of the previous processes discussed. In my research of problem solving I find it very interesting that there are so many different ways to approach a problem. One I found to be interesting but of no use to this unit but can be used in other problem situations. It was called appreciative inquiry. In use of this you would have to identify your problem based on a past situation and wishing and thinking about what worked and envisioning what the future would be concerning the problem. That caught my attention because it has nothing to do with math, but often I could see students who have not been exposed to problem solving wishing for an answer.

The writing portion will be of showing your completed work. The writing can be in symbols or drawing, but each must be accompanied with a writing that has specific points.

Those points are:

1. To restate the problem through rebus writing or words. This will be with my help.
2. How to solve the problem. This can be seen through the drawing portfolio.
3. The answer to the problem. A vocabulary word will be provided.

The writing process as well as the math will be put on a rubric and will be part of the evaluation process. I will base it on their ability to complete a sentence frame and the drawing.

In our district we use Write Tools. It is a curriculum that teaches students to give details, revise and edit and add more details. Actually it is in the form of a paragraph. This paragraph begins with a topic sentence. This is giving the main fact or reason related to the main details. The main detail is supported by supporting details. This I think would be a good way to teach explaining your answer, because our students in the upper grade levels are required to show their work. They have somewhat of a difficult time doing that. This process also helps develop structure. It will teach writing skills as well as the way of showing evidence of working through the math problem process. This is done several times and finally the conclusion is reached. My students use this in the classroom and it does help.

The problems will be introduced as I stated in a riddle format. A riddle is as stated by Encarta Reference Library (2003) a question or statement requiring analytical thought to answer or understand. This is to catch the student's interest. My students and most kindergarten students enjoy excitement and intrigue. There are as well several books that use a variation of this format when teaching young students. I will include those in my resources. I will wear a jester's hat as the riddles are read (math problem). This will be done after the regular math lesson and it will include seventeen riddles.

The last content that will be used involves development.

In early childhood students develop in a certain way. A leading Swiss psychologist, Jean Piaget's theory provides a basis for my students to be involved with problem solving at a young age, because of his theory on developmental steps. This basis is that, if problem solving is provided students will succeed with higher thinking skills. He was concerned with growth of intelligence. His growth of intelligence is based on how a child perceives the world in developmental stages and how they deal with the world at these stages. This theory is considered to be constructivism. Children construct their cognitive abilities through self motivated action in the world. The self motivated actions will be helped with the riddles as a motivational device to solve math problems.

Piaget put this in four developmental age groups.

- Sensor motor period (0-2 years old)
- Preoperational period (2-7 years old)
- Concrete period (7-11 Years old)

- Formal operational (11- up)

The preoperational/concrete period is what we will look at for my students' age group. This developmental stage involves mentally engaging objects. The child starts to use mental thought to solve problems. This stage supports the fact that kindergarten students can solve complex problems. (More than one step problems) In this area there is a great deal of growth going on. The pre-conceptual stage is one of them where there is a great deal of egocentric behavior going on and imaginary play. The intuitive part of this is when the students begin to solve problems and use mental activities. They often come up with the answers but may not fully understand the logic of that answer or process. In the concrete stage there are some important processes that are developed; seriating is one of them. This is the ability to sort objects related to color, size, shape or other characteristics. Another is classification and this is identifying sets of things. De-centering a relatively new concept, this is when multiple things are taken into account to solve a problem. The multiple things are the events or objects in the problem. There are others such as conservation and reversibility. All of these processes will be use to build my students' ability to solve problems. I will attempt to choose problems from all over the spectrum of mathematics.

The unit will be taught on a daily basis over a period of three months. The lesson will take up fifteen minute at the end of my math period which is usually 45 minutes long. Some expenditure may be needed for crayons, paper and other things that will help the students show their work.

Rationale

My rationale is based on the premise that everyone has an interest in learning. I want to spark my students' interest with this unit using the jester and the riddles.

As in using Piaget's stages of growth I will hope to naturally assist my students to grow. This is called constructivism when applying the pre-operational/ concrete stage. I want to tie the problem to the interest of my students by using real life situations or maybe some of their famous cartoon characters to be in some of the riddles. This will enhance the kindergartener in learning skills of the math process; this will also give them a foundation to build upon. One of the very important keys of engaging my students is to relate the problem to real-life situations. So I will be talking about daily events such as riding the school bus or cleaning your room in the scenario. The stages I have spoken about are very supportive of the lessons in this unit. The advantage of teaching this unit to kindergarteners is that they will absorb every moment of it. They tend to want to learn something new and they want to understand how to do things. This is crucial because in our math curriculum it is important for students to use rigor daily in their application of problems.

The book I currently use has a problem of the day. That problem may be in the form of a question or may be acted out for the students. So this unit will be building on the current curriculum. I would like to use it as enrichment. With problem solving the student will be using recursive actions to solve them. I mean they will use the same method of explaining

their answer. That will be through the established strategies and method of answering the problem.

It is imperative that I take into account the support of manipulation of objects in this unit such as blocks or cubes. This manipulation will be through the use of objects to have hands on experiences. Research supports having these types of experiences for this grade level and I find in my present school's math curriculum that each new concept has some form of on hands lesson-Harcourt Math Pennsylvania Edition-RS-14 (2006).

The students can use this unit as a connection to the skills in the regular math and writing curriculums. In the writing portion my students can examine the question. This will also give my students a chance to examine their answers and they will gain the skill of indirectly hypothesizing. I will use this approach as much as possible. Getting the student to manipulate objects and to write or draw their findings, will make understanding it easier. They will begin to recognize the intricacies that exist in the framework of problem solving. This has given me a greater appreciation as I participate in this seminar for the concept that has often escaped my grasp. Now I will try to make it part of my students' everyday use by the forming of a habit. Routines are taught as we grow with our education. Education usually is like a ladder; it builds on previous knowledge, (Just as an analogy eating healthy food you will develop the habit of eating healthy all of the time, which is good for your health.) So as in the practicing of problem solving it will make you better in solving problems.

There is also a way of approaching a problem as I briefly discussed in the overview. There are two ways; inductive and deductive. The way that we want to approach our problems is not quite either one but will give a foundation in both, by exposing the students to different ways to answer a problem. These types of problems lend themselves to the scientific process of inductive and deductive thinking. For example some of the problems can be explained by the conclusion based on generalizations such as a specific proposition; the water is boiling on the stove and the inference would be therefore it is hot. This is the most common one used in mathematical situations. I think this may be due to math being absolute in its answers. There are two approaches to problem solving first to select a problem that requires practices of specific methods. The other is to do a problem that elicits creativity and insight. I plan to have my students work on problems that are similar in structure and to let them use the routine method that will be provided in the unit and I hope to incorporate both of these approaches. My approach will be bridging the gap between pre-operational and concrete stages that are in the developmental stages of Piaget.

Math has a definite answer for just about everything. In some instances it may have several answers for the one problem but it is definite in any case. An example is the Soma Puzzle Cube that we have done in the seminar; there are ways to make different ones but certain ways are just not going to work. We have also done the counter logic activities. The puzzles tease the brain and keep it actively engaged, always thinking. Problem solving is most definitely a high level thinking process and requires participation of the person doing it. I tend to be more pull back I guess because when I came through school it was more rote learning. I specifically enjoyed the Pentomino Patterns. I thought that

they lend to on hands application through making them and the different ways to apply them. Let me say it takes time to do them as I need just an extra push to understand problem solving but after working with them at home, I found it to be helpful in the least to have a template and a suggested plan of what was to be expected.

In solving the problems my students will use carefully monitored ways of attacking the problems and will use the facts given to them for the use of their answers. The key to the success of this unit will be to have control of the process. A successful plan is the only way that a problem can be attacked.

Objectives

The objectives for this unit will involve several different ways that the student can grasp this unit and make it productive to their lives. The objectives will use multiple models in developing the initial understanding that numbers represent amount. An example of this is one to one correspondence. Another will be to understand the effects of adding and subtracting whole numbers. This is so basic for an older student but very complex for my students. The student will be able to use a variety of methods and tools to compute including, objects, mental computation, estimation, paper and pencil. They will be able to recognize, describe and extend patterns such as sequences of colors and shapes or numeric patterns and translate from one representation to another. This will be when they explain the work. They will also be able to use concrete pictorial and verbal representation to develop an understanding of invented and nonconventional ways of communicating. They will be able to formulate questions that can be addressed with data collecting, organizing and displaying relevant data. They will apply and adapt a variety of appropriate strategies to solve problems. They will recognize proof as a fundamental aspect of math. They will make mathematical conjectures and develop and evaluate mathematical arguments. They will explain their work through writing out an explanation. They will have a fundamental understanding of problem solving. They will be able to demonstrate the use of a specific format for answering questions. They will be able to explain a process through a drawing or writing. My students will be able to meet the standards through this unit via the entire objectives that will be taught. They will be using math vocabulary and comparison terms when making predictions regarding a problem. They will be able to identify what information is needed to identify the problem through examples in the activities. They will be able to use various strategies throughout the unit to solve a problem. Comparing sets of data that can be used to discuss a problem such as a tally graph or pictograph will give this unit more flexibility for the students to experience different ways of targeting a skill. They will be able to explain the likelihood or not that an event occurred. These objectives are part of this unit and will help my students.

Pennsylvania Standards included are:

- All students use numbers, number systems and equivalent forms to represent theoretical and practical situations.

- All students compute, measure, and estimate to solve problems using appropriate tools including modern technology.
- All students apply basic concepts of algebra, geometry, probability and statistics to solve problems.
- All students evaluate, infer, and draw appropriate conclusions from charts, tables, and graphs showing the relationships between data and real life situations.
- All students apply the concept of patterns, functions, and relations to solve problems.
- All students will verify predictions about quantity size and shape of objects by drawing, pictures and or concrete objects
- All students will state and justify an opinion on whether a given statement is reasonable based on comparison.
- All students write for a variety of purposes including informing.
- All students compose and make oral presentations for each academic area of study that are designed to persuade, inform or describe.

Numbers and appropriate content area that they represent will be in the appendices.

Strategies

While solving problems is a learned encounter it is important that it is refined through the use of the different teaching strategies. The strategy is applied in a particular context. That context can be in the form of a routine or not. A routine will be used in this unit as a strategy. Problem solving can be used in mathematics as well as real life situations. With problem solving the students can test their answers and use creative thinking through drawing out the problem. In every problem solving there has to be problem related information. John Dewey, a famous sociologist wrote the book How We Think and in it outlined five steps to problem solving. These steps are:

1. A problem has to exist.
2. Identify the problem.
3. Use your prior knowledge.
4. Testing to see how to answer the problem.
5. Evaluating the problem.

In management this is used as well. How it will apply to this unit will be explained in much the same way but using a creative way. This creative way will be through doing a riddle.

The way you teach this will be important. I want to look at how my students are engaged throughout the process. I will be using stories, pictures and real life context to explore problem solving. The stories will help with dramatizing the riddle. The student drawing the picture will give a visual view to the problem. I want to have multiple ways of representing my riddle. Charts, and hands on demonstrations will be used. This will

make the unit have variety and allow for differentiated instruction. The riddle can be expressed by the student through the portfolio drawing. The assessment will be through the drawing. We are required to build a writing portfolio with the writing related to several different genres, one being a personal narrative with another being a response to literature and selections of other forms of writing. In kindergarten writing an illustration of the response is developmentally appropriate because they can explain best through illustrations. The writing will be done in a systematic way by using a sentence frame. Also the use of what is called stoplight writing. This is the curriculum that is used throughout our district along with the Write Tools. The curriculum emphasis is on detail. The detail is done through using details of the main idea. To write a sentence, first the sentence has to involve several steps to make it a good sentence. It should state in this order what actions took place. It should state the main idea. It should have the correct punctuation. The writing should be neat for the reader to read. The words are spaced and spelled correctly for the student's grade level. The sentence will be provided with the riddle. The process is also called Stoplight Writing. It goes in this order:

- * Title
- * Topic sentence
- * Main idea
- * Explain main idea
- * Explain main Idea
- * Conclusions

This is used to get the most out of the writer and to get more detail. The student will be required to follow a given format. This will allow for the routines that I discussed earlier. This format will be used as a form of a routine. This will help with the students with developing skills in writing. My students will express, justify, reflect, refine and publish. The program Write Tools will help with the refinement of writing. The sentence frame provided is the first step to the kindergarteners writing development. This provides them with proper sentence structure. The sentence frame will be used with all of the riddles. A math word bank will be provided. Before answering any questions the student should learn to ask several important questions.

1. What does the problem already tell me?
2. What do I want to find out?
3. Have I seen a problem like this before?
4. What was all of the information?
5. What strategy will best help me answer the problem?

After all of the questions are answered as a group, I would model how to answer the riddle. I would let the students see the riddle and all relevant information about the riddle. For example if the riddle is, Jester Cooper has ten pencils and seven sheets of paper. How many more pencils does he have than paper? It can be illustrated by how many pencils and sheets of papers. Then the sentence should state the answer. There are three pencils

without a sheet of paper. It will be as simple as- There are three. The underlined word will be left blank. The illustration with the sentence should support the fact.

Classroom Activities



The Jester has repetitive dialogue that will act as a cue for the students and for them to put on their thinking minds and listening ears. Listening will be of high importance because if they miss one detail they could give an incorrect answer. The cue is *thinking minds listening ears*.

Riddle I

Jester Cooper says- *Thinking Minds Listening Ears*

Aim: To identify a pattern.

I have a pattern that has two colors. It is so beautiful. They are very bright colors. My colors are pink and orange. While walking up the side walk I wanted to color each block. If I only have six blocks and I started with pink, what would my last color be? Please draw an illustration of what it should look like and fill in the sentence frame.

Sentence Frame: It will be _____.

Riddle II

Jester Cooper says- *Thinking Minds Listening Ears*

Aim: To recognize a subtraction problem.

As I was sitting down for my breakfast, I opened my box of cereal. I poured this nice bowl of cereal. In it I had 3 raisins on top. I took a spoonful of cereal and ate one raisin. How many raisins are left in the bowl? Please draw an illustration and complete the sentence frame.

I have _____ left.

Riddle III

Jester Cooper says- *Thinking Minds, Listening Ears*

Aim: To Know the difference of quantity- more or less

Gloria went to the circus. She sees two acrobats. One acrobat has a group of 4 triangles which she is throwing in the air around and around. The other acrobat has a group of 2 triangles. They are being tossed around as well. How many more triangles does the first acrobat have? Draw an illustration of the question and complete the sentence frame.

There are _____ more.

Riddle IV

Jester Cooper says- *Thinking Minds, Listening Ears*

Aim: To begin to be able to group objects into a set.

I was walking in the park. The park is fun to walk in. It has fresh air to breathe. So as I was walking, I noticed that the sun was out and the wind was blowing a little. There were 3 blue jays, 2 woodpeckers and a cardinal. They were flying in a tree near by. How many groups of birds did I see? Draw your illustration of the problem. Then complete the sentence frame.

He saw _____ groups of birds.

Riddle V

Jester Cooper says- *Thinking Minds, Listening Ears*

Aim: To be able to identify one to one correspondence.

Gloria and I had a picnic. We went to a park that had a pond and swings. We went on the slide. After sliding for quite some time we went on the swings. The swings were fun. We got tired and went over to the picnic table. Gloria began to set the table; she put four picnic plates down and five napkins. How many plates will have a napkin?

The plates will have _____ napkins.

Riddle VI

Jester Cooper says- *Thinking Minds, Listening Ears*

Aim: To show quantity

We're off to Aunt Mary Lee's home for dinner. Aunt Mary Lee has wonderful and exciting dishes when I visit. The food she cooks is Southern and great tasting. When I arrive she tells my Aunt Evelyn we have four sweet potato pies, three pots of greens and four bowls of potato salad. She stated that she will be short one of her dishes. Which dish will she be short of? Please draw an illustration of the dinner and complete the sentence frames.

She will be short of_____.

She will have to make_____. (how many)

Riddle VII

Jester Cooper says: *Thinking Minds, Listening Ears*

Aim: To sort real world objects.

Come into my room of shapes. I have a rectangular table, two oval chairs, a circle rug and square light switch. How many shapes are in my room? Draw an illustration of the shapes in the room. Complete the sentences.

I have a _____ table.

I have a _____ rug.

I have 2_____ chairs and _____ light switch.

Riddle VIII

Jester Cooper says: *Thinking Minds, Listen Ears*

Aim: To make a prediction.

Chase wanted to build a tower. He had a room full of solid shapes. He had spheres, cylinders, cubes and cones. What shapes could Chase pick to build his tower? Draw an illustration of what you think the tower will look like and complete the sentence?

He can use a _____ and a _____ to build his tower.

Jester Cooper says: *Thinking Minds, Listening Ears*

Aim: To classify days for school and weekends.

Hilda will be going to school tomorrow. She looked at the calendar and counted the days she would not be in school. Hilda looked at certain days on the calendar. What days did Hilda look at? Copy your calendar dates and days from the one provided, then answer the question. Complete the sentence frame.

She looked at _____ and _____.

Riddle IX

Jester Cooper says *Thinking Minds Listening Ears*

Aim: To find symmetrical objects.

Gloria is at it again. She is at the amusement park. She goes on the Ferris wheel, hot air balloon and eats in the ice cream parlor. Please draw a picture of the places Gloria went and draw a line of symmetry on the correct objects. Two of the places have equal sides. (This is a tricky question because the students have to see the shape of the ice cream parlor which is square and the Ferris wheel which is round and can have equal sides.) (Symmetry)

The _____ has equal sides.

The _____ has equal sides.

Riddle X

Jester Cooper says *Thinking Minds and Listening Ears*

Aims: To follow directions.

Van wants to go to his friend Jonathan's house. Jonathan told him the directions. Come out of your house and at your front gate make a right, go forward 7 houses, to the corner. Then cross the street and go 2 houses backwards and you will be at my house. Draw a map of the directions. Make sure you include the house. How many houses did Van have to pass? (Help the student with an example of map making)

He passed _____ houses.

Riddle XI

Jester Cooper says *Thinking Minds and Listening Ears*

Aim: To share equally.

Althea has a pizza. She has to share it with her brother William. How can Althea share her pizza equally when she cuts it? Draw picture of the pizza pie and divide equally.

There will be _____ pieces.

Riddle XII

Jester Cooper says *Thinking Minds Listening Ears*

Aim: Subtraction story

Jamie, Missy and Sean were sitting at the art table painting their pictures. Jamie and Missy left the table. How many people were left at the table? Draw your illustration and complete the sentence.

There are _____.

Riddle XIII

Jester Cooper says *Thinking Minds and Listening Ears*

Aims: Choose the correct operation.

I came upon a farm and on the farm there were 7 cows. 3 of the cows went up the hill. How many cows were left? Would this problem be an addition or a subtraction problem? Draw an illustration and complete the sentence frame.

The story is a _____ problem.

Riddle XIII

Jester Cooper: *Thinking Minds and Listening Ears*

Aim: To explore even and odd numbers.

I was walking down under the bridge along the river bank and I looked up at the bridge and saw ten legs dangling over the side. I thought a person has two legs. So how many people were sitting on the bridge? Draw an illustration of the picture to help you. Complete the sentence frame.

There are _____ people sitting on the bridge.

Riddle XIV

Jester Cooper says *Thinking Minds and Listening Ears*

Aim: Ordinal Numbers and position- With this riddle watch that you do not tell the answer in the question.

Hilda wants to get everyone into line for her birthday party. There are six kids. The kid that is 2nd from the beginning and 4th from the beginning is called different names. What are the names they would be called? Draw a picture of the problem and complete the sentence frame.

They would be _____ and _____.

Riddle XV

Jester Cooper says *Thinking Minds and Listening Ears*

Aims: To become familiar the clocks.

Gloria has just learned how to tell time. She explained that a clock has several important parts a face and hands. The face is the front of the clock. The hands point to the numbers on the clock. The hands tell an amount of time for each. What do the hands stand for on the face? Which one is the minute hand and which is the hour hand? Draw a clock and complete the sentence frames.

The big hand tells _____.



The little hand tells _____.

Riddle XVI

Jester Cooper says *Thinking Minds and Listening Ears*

Aims: Read and interpret a tally chart.

Chase and his friends were playing different games in the court yard. Some kids were playing soccer, some were playing basket ball and some were playing baseball. Look at the tally chart below and answer the questions.

	111
	1111
	11

There were _____ kids playing baseball.

There were _____ kids playing basketball

There were _____ kids playing soccer.

Riddle XVII

Jester Cooper says Thinking Minds and Listening Ears

Aim: To explore probability of something happening.

Hilda made some iced tea by putting 2 ice cubes in her hot tea and Gloria made some iced tea by putting 2 ice cubes in some cold iced tea. Whose ice cubes will melt first? Draw an illustration and finish the sentence frame.

_____ Ice cubes melted first.

Annotated Bibliography

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This is a very small book that gives examples of the stop light writing. This is a form of writing that builds on ideas from the writer.
2. Barbieri, McGrath Barbara. (1994). The M&M Counting Book. Maine. Charles Bridge.
Barbara has made eating this candy fun an educational. It has a fun way of making math simple and pleasant. The book fosters the love of math.
3. Griener, Alice. (2006). The Write Tools- Improving Literacy Instruction. Colorado. Lead and Learn Press.
The Author has written a curriculum that is in use by my school district that I find to be very useful for explaining simple things such as details of a story that you want to write. It has improved writing in my classroom.
4. Jacobs, Harold. (1994). Mathematics A Human Endeavor. New York. W. H. Freeman and Company.
This book has such a connection with explaining math to the learner. It has basic college level math and explains problem solving.
5. Martinez, Joseph and Nancy. (2007). Teaching Mathematics in Elementary and Middle School Developing Mathematical Thinking. Ohio. Pearson, Merrill Prentice Hall.
A book based on statistical evidence of mathematical problems and activities. It is a good reference for building up a lesson for older students.

Appendices –A **Unit materials**

Drawing paper 200 sheets
Colored marker

Crayons 40 boxes
3 boxes of raisins
30 tablets primary writing paper
60 pencils
50 water paints
5 packs of multi colored paper and white
20 packs of colored chalk

Appendices B

Word Bank

As each riddle is done I would have the words available for the student to use in a\the sentence frame.

Triangle
Second
Fourth
Three
One
Four
Two
Collard greens
Oval
Square
Rectangle
Round
Cylinder
Cube
Saturday
Sunday
Ice cream parlor
Ferris wheel
Hilda
Seven
Subtraction
Addition
Five

Appendices C

Pennsylvania Kindergarten Standards

Mathematics

- 2.1 Numbers, number systems and number relations
- 2.2 Computation and Estimation
- 2.4 Mathematical Reasoning and Connections
- 2.5 Mathematical Problem Solving and Communications
- 2.6 Statistics and Data Analysis
- 2.7 Probability and Prediction
- 2.9 Geometry

Reading, Writing, Speaking

- 1.4 Types of Writing
- 1.5 Quality of Writing
- 1.6 Speaking and Listening

Appendices D – Assessment -Unit Rubric/Self Check list



Sentence Frame Rubric

4

Retells the problem through a clear description of the illustration. Written words are seen. I have done my best work.

3

Retells the problem with very little prompting. Written words are able to be seen. I have done my best work.

2

Retells the problem with prompts and draws the illustration with prompts. Sentence frame is incomplete.

1

My work is not my best work. Student needs several prompts to do all of the steps in the problem.



Sentence Frame Self-Checklist

Did I do my best work?

Yes No

Did I draw out the problem?

Yes No

Did I put my word into the sentence frame?

Yes No

Appendices E-Sentence Frame and Portfolio Drawing Sheet

Sentence Frame-