



Strategies for Success with Diverse Learners

by Miriam A. Leiva

Students at all levels often say that they prefer to do worksheets instead of tackling math problems with words. While it is important to have quick recall of facts and to carry out computations with ease, it is crucial that students be able to read, interpret, and solve application problems. The focus of mathematics education today must be to prepare students to apply their knowledge by solving problems in context. What does that mean to you, their teacher?

Your classroom probably reflects the changing demographics and diversity in this country and the challenges faced by teachers everywhere. Some school districts have students from all over the world speaking dozens of different languages. Even students whose first language is English may have difficulty with reading, comprehension, and mathematical reasoning. In addition, many children come to school lacking appropriate skills. In the past, learning math consisted largely of rote memorization of facts in order to compute quickly, but today's students need to know much more than just the facts. They must also be able to apply the facts and skills to solve real-world problems.

This article addresses specific teaching strategies to help each of your students succeed. Even though all students have different abilities, barriers, or challenges, implementing the ideas presented here will help you to help them succeed in math.

Strategy for Success: Write an easier problem and use models.

Even when students can understand the words in a problem, they may find it helpful to act it out with manipulatives, real-life objects (or realia), and drawings. For example:

An artist makes jewelry using beads of various colors and prices. He pays \$1 each for blue beads, \$2 for green, \$3 for red, and \$4 for all others. He designs a necklace with 6 blue beads, 4 green, and 10 red. How much does he spend on beads to make the necklace?

You can give the students colored counters to model the necklace. Here is one possible design:



Make a table on the board as shown, so that the information from the problem is simplified from words into color-coded symbols:

Blue \$1	Green \$2	Red \$3	Other Colors \$4

Have students work in small groups to find the cost of the necklace and explain their process. Students will learn from each other as they work together. *Auditory learners* in particular will profit from the discussion as they work on the task. *Visual learners* benefit from "seeing," as well as "hearing" and "doing." If there are *English language learners*, have someone who speaks their language, such as a bilingual aide, work with that group. Use creative grouping among students and collaboration among teachers! Planning lessons with your school's experts on *students with special needs* will give you more insights on how to reach all students in the same class.

For further enrichment, expand the problem and extend the discussion of it. Have students design necklaces and make up their own necklace problems to be solved by other groups. Ask the meaning of the word *profit*. Have different students explain how they would determine a price for the necklace that would give the jeweler a profit of \$20. When you refer to *profit*, you can discuss *maximum* and *minimum* in terms of the most expensive and the least expensive necklace. You can even discuss how profit works in a capitalist society. Problems like this one show that mathematics is essential for participation in our world today.



Strategy for Success: Present tiered lessons.

In a tiered lesson, students are divided into two or three groups, depending on their knowledge. Each group works on the same basic problem, the difficulty level increasing with each successive tier. Students can progress from one group to another as they become more proficient.

The Hotel Problem

Group 1 A hotel has three floors with ten rooms on each floor. The rooms are numbered from 1 to 30:

First Floor	1	2	3	4	5	6	7	8	9	10
Second Floor	11	12	13	14	15	16	17	18	19	20
Third Floor	21	22	23	24	25	26	27	28	29	30

Each room has the room number on the door. How many 0s are in all the room numbers? How many 1s? Fill in the table below to show how many of each digit are in all the room numbers.

Digit	0	1	2	3	4	5	6	7	8	9
How many										

Group 2 Proceed as in Group 1 except with 100 rooms. Complete a table to summarize how many of each digit are in all the room numbers. Is there a way to predict how many of each digit there are? How many digits are there altogether?

First Floor	1	2	3	4	5	6	7	8	9	10
Second Floor	11	12	13	14	15	16	17	18	19	20
Third Floor	21	22	23	24	25	26	27	28	29	30
Fourth Floor	31	32	33	34	35	36	37	38	39	40
Fifth Floor	41	42	43	44	45	46	47	48	49	50
Sixth Floor	51	52	53	54	55	56	57	58	59	60
Seventh Floor	61	62	63	64	65	66	67	68	69	70
Eighth Floor	71	72	73	74	75	76	77	78	79	80
Ninth Floor	81	82	83	84	85	86	87	88	89	90
Tenth Floor	91	92	93	94	95	96	97	98	99	100

Group 3 Proceed as in Group 2 but with additional questions. Is there a pattern to describe how many of each digit there are? Explain. If each digit cost \$5, how much did it cost to buy the numbers for all the doors? Suppose that each 9 cost \$9, each 8 cost \$8, etc. How much did all the numbers cost?

Strategy for Success: Read words without numbers.

This strategy helps students focus on understanding the problem before attempting to do the computation. It promotes whole-class involvement in reading and discussing. Use this approach to make sure that your students don't follow the example of the one who described his problem-solving method this way: "I add, subtract, multiply, and divide until I get the answer in the back of the book." Not a very useful strategy!

Select a problem from your book and write it on the overhead, taking out all the numbers. Display the sentences one at a time. For example:

- Mariah is going to buy ____ tickets for the concert.
- The tickets cost ____ dollars each.
- She has ____ dollars.
- How much money does she have left after buying the tickets? ____

Go through each sentence slowly, encouraging students to tell you what it says and to ask any questions. Some learners may not understand all the words, but others can help by acting out the roles of the sales person and Mariah at the ticket counter. After you discuss a sentence, ask the class to provide simple numbers to fill in the blanks.

Redo the problem with different numbers and give the students those numbers, including the answer. Let them work in groups to place the numbers in the blanks so that the problem "works." Then give the numbers from the original problem and ask them to solve.

To complete the exercise, tell them that the tickets cost \$7 each and Mariah had \$35 left. Let the students tell how many tickets she bought and how much money she started with. There will be different answers around the class, depending on the numbers selected. This open-ended problem leads to deeper understanding of the process of problem solving. By implementing this strategy, students will learn how to read the sentences in a word problem before proceeding to solve it.



Strategy for Success: Build on previous knowledge through scaffolding.

The strategy called *scaffolding* means constructing a foundation and the skeleton of the “building” to help students recall previous learning experiences and build on them. You can give students opportunities to build on their prior knowledge by posing and discussing word problems. Here is a problem that will stump some students because of the context and complexity. A planned discussion can help clarify what it says and asks.

The Ferris wheel cars hold 3 people each.

How many cars are needed for 16 people?

Ask students about their experiences in amusement parks. Some will not know what a Ferris wheel is, and even though they know the word *car*, they may not know what it is in this context. A picture is worth a thousand words, and you can have them discuss amusement park rides through pictures, dialogue, and stories that other students tell. You can also use problems like this one to introduce the concept of interpreting remainders in division.

Some students with limited English may only be able to give the solution as a drawing of how the people can be arranged in the ride. But they should also be encouraged to write as much of the solution as possible, as is required in mandated assessments. Teachers must have the highest expectations of all students. The more you expect of students, mathematically and in problem solving, the more they will learn and succeed.

Strategy for Success: Teach and assess.

It is our responsibility as educators to open the doors of opportunity to all students. Even though education is dominated by issues related to assessment rather than individual achievement, we must consider the implications of our teaching and assessment with respect to equity, asking ourselves the following questions:

- Are we measuring language proficiency or mathematics knowledge and understanding?
- Are we using evidence from multiple sources? (e.g., observations, portfolios, journals, self-

evaluations, and group work, as well as individual tests on skills and concepts)

- Are we using a seamless approach to instruction, curriculum and assessments?

Summary

In order to reach all students in diverse classrooms, we must

- hold them accountable with high expectations for knowledge and discipline, demanding work in and outside of class;
- implement a high-quality and coherent curriculum and intervention program as needed;
- use teaching strategies that address their differences, including learning styles, prior knowledge and experiences, language barriers, physical impediments, and other special needs;
- use appropriate materials, creative groupings, and creative evaluation tools;
- use a seamless, flexible approach to teaching, learning, and assessment;
- enlist others to assist in the classroom (other teachers and educators, the principal, parents, the community).

The strategies outlined here can help every student find success in math. Each student deserves the opportunity to learn in his or her unique way, with assistance as necessary, to achieve and succeed.

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