

Abstracts from "Math and Reality - An Investigative Approach"

Math & Reality: A Number Sense

Marcella Ubben Candelaria

This unit is designed primarily for 7th and 8th grade learning disabled students in a CBI (Community Based Instruction) program at a school with traditionally low math scores on standardized tests. The unit covers one semester, but with a different type of student population it could be taught in less time. The unit begins with basic number sense: counting, sequencing and number lines. The next concept is place value, using games and repetition to teach students that the place a number has is as important as the number itself. We will then learn about decimals using money. Next is an exploration of patterns in math and in the world around us, leading to the last item of geometry, where we will explore different shapes, their relation to each other, and begin a discussion of fractions.

Analysis of Functions and Their Graphs as Models of Physical Phenomena: An Integrated Approach Using Maple6

Alexandre D. Castrounis

Mathematics is a scientific field based on logic and reasoning, and has remarkable applications to all areas of science. This curriculum unit is motivated by two major goals. The first is to have students learn and apply relevant mathematics in the context of solving actual scientific real world problems. The second goal is centered on addressing the use of technology in scientific research and problem solving, as well as the role of technology in the classroom. Maple6 is a software application designed to manipulate mathematical data both symbolically and graphically, and is an integral part of this unit. Students often do not develop a thorough understanding regarding the importance of functions, their graphs, and the relation they have to the real world. This unit is designed to address the importance of functions and the analysis of graphical information with respect to real life models and phenomena. By the end of this unit, students will have a thorough background in the creation, uses, and analysis of many types of functions associated with real world phenomena. Students will also be able to employ fundamental analytical techniques towards

understanding the evolution and behavior of a given function or model. This includes a graphical analytical approach using Maple6. This unit will give students a firm analytical mathematical background necessary for future studies in pre-calculus, calculus, differential equations, and applied mathematics in general.

Deductive Proof in Geometry

William Glover

Ideally a math class should include information and experiences that will help the student appreciate the relationship of mathematics to their lives. If possible the development of the mathematical ideas should be presented with as much social and historical context as possible. For example, we might discuss how ancient Egyptians could have calculated an accurate value for pi. Mathematics is also an excellent vehicle for developing critical thinking skills. For most of the centuries since Euclid and Aristotle, geometrical proofs have been used to teach formal logical thinking. Traditionally conjectures for student proofs come from Euclid's postulates, however my Honors Geometry students will also be asked to make geometrical conjectures prior to the presentation of the formal Euclidian concept.

Teaching students to make mathematical conjectures requires a spirit of exploration and experimentation in the classroom. Students will be asked to make statements that they believe are true about a geometrical situation. Once the conjecture is stated the students then have a problem to solve. The conjecture needs to be proved by deductive logic or disproved by counterexample. Developing the student's ability to reason correctly, experiment with new ideas, and to solve problems are our fundamental goals.

This curriculum unit will focus on the use of deductive reasoning in the form of "if-then" statements and proofs. The unit will be presented during the second week of the first semester, and the methods will be applied for the duration of the course. The lesson plans for the unit will focus on deductive reasoning. The objectives of the unit include teaching students to:

1. recognize the hypothesis and conclusion of an if-then statement,
 2. use a counterexample to disprove an if-then statement,
 3. use properties from algebra in proofs,
 4. recognize the kinds of reasons that can be used in proofs,
 5. plans proofs and write them in two-column form.
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Patterns, Math and Thought

Heather Jenkins

The ability to recognize and utilize patterns is essential for success in mathematics and, arguably, in all areas of life. This unit focuses on identifying, generalizing about, extracting from and appreciating patterns with regard to the realm of mathematics and the world beyond the classroom. The unit is intended for use in a sixth grade bilingual math class over approximately a two-week period. Because of the diversity of students' proficiency levels and learning styles, the activities incorporate a variety of strategies and are meant to encourage students to become engaged problem-solvers. Ideally, the larger purpose of the unit is to foster the idea that mathematics is about thought rather than just numbers.

Studying the Stock Market Using Fractions, Decimals and Graphs

Jerri Lafer

Math seems to have a negative connotation, and just the *word* causes anxiety for many people. My students tell me that their parents are not good at math, so neither are they. Repeatedly, I have tried to teach students their basic skills; we all know how important these skills are to further mathematics study. Many students do not understand the importance of mathematics in their lives. The teacher's goal for this unit focuses on the four basic operations of fractions and decimals, and some graphs. The student's goal is to learn what is being taught, although it will be masked by a focus on and a motivation in making money by investing in the stock market. Money is a motivator and kids love money!

Students will be given \$1000 pretend money to invest in one stock. Their desired goal is to make money; the real goal is math education. Goals will be met through the use of whole class examples, small group work, self discovery, Marilyn Burns manipulatives, hands-on research, and paper practice. Self discovery is done through posing questions to small groups and having them try to form an algorithm for solving the situation before I give them any direction. If the focus is taken away from math and put towards manipulatives, hands-on activities, and making money, the students may learn mathematics without anxiety.

Mathematical Problem Solving Strategies

Jody Ann Lunz

The objective of this curriculum is to teach students basic mathematical problem solving strategies. The goal is to show students how to use a few strategies to solve a variety of different math word problems. The students are taught to look at the process of problem solving (how to solve) instead of focusing only on the results. This curriculum helps students look at math as finding different ways to find answers, not just finding answers.

This unit is designed with great flexibility. It can be used for basic addition and subtraction all the way through advanced algebra. Also, this unit can be used to help students with reading. The mystery section gives teachers a chance to do a cross curriculum unit, combining math with language and reading. Students can enjoy the competition of problem solving once they are given the tools to problem solve.

Study of Patterns and Variables

Linda V. Migliaccio

Learning math is learning to think. Many students (and their parents) believe that doing math requires some inherent skill and that they are missing that skill. In my experience this is incorrect. Anyone can learn to do math. Math requires both concrete and abstract thinking skills as well as logic. These are teachable skills (everyone is born with the ability to do them) that must be developed and practiced.

The goals of A Study of Patterns and Variables unit are to introduce students to algebra through real-life situations. Students will learn to interpret data in various forms. Students will present data in several forms including tables, graphs, equations, and in written form. Students will make decisions based on information presented in tables, graphs and words. Students will understand and find patterns of change and predict outcomes based on those patterns. Most importantly this unit will be culturally relevant and intriguing, as well as a tool for developing mathematical confidence in seventh grade students.

Students will work collaboratively to identify patterns of change in real world situations. Working together will help them develop essential communication skills. Students take verbal communication and turn it into written form as they explore mathematical formulas and the various ways of representing changing situations by using graphs and charts. Through solving problems and discussing various aspects of mathematics, students will become familiar with the symbolic representations used in math as well as the practice of

analyzing data within ever-changing systems. By working together and communicating ideas, students will develop a deeper understanding of mathematics and its impact on their everyday lives. This will lead to better grades, better test scores, and most importantly, mathematical confidence.

It's in the Cards:

Teaching Mathematical Concepts with Card Games

Jacqueline Robison

Votaries, or gambling enthusiasts, are plentiful if one would judge by the cars in the parking lots at the numerous Indian gaming casinos scattered throughout New Mexico. Are the players informed players or are they victims? Divination cards (tarot) have been a part of our lives for thousands of years. Card games and chance have grown to be very popular activities during the last fourteen centuries. It is apparent that in the last 100 years there has been a large increase in the act of gambling. It is also true that some people seem to win more often than others: Are they really lucky or are they using a skill? This curriculum unit will focus on the ability to count cards and calculate the odds of winning.

A primary goal of this unit is for the student to be able to play a card game with knowledge, not just luck. The student will learn how and why counting cards is an important part of being a good card player. An additional and very distinct feature of a good player is that knowing what cards are possible and, more importantly what the odds are that the particular card needed will be attained. The unit will focus on the student being able to assess if they played their own hand well or if they could have done something differently. The art of finding mistakes (or where a person could have done something differently) that would lead to a better outcome is a very important factor in a student's learning process, not limited to mathematics. A couple of other features to this unit are that students will learn social etiquette amongst their peers, and students will have ownership of their own learning process through the thrill of a game.

Problem Solving in Geometry

Jason Sanchez

This curriculum unit is intended for use in the seventh grade regular education mathematics classroom. Its purpose is to assist the mathematics teacher in providing students with a problem solving model, problem solving strategies and some opportunities for solving

geometry problems. The rationale for doing so is as follows: learning geometric concepts and problem solving skills simultaneously will enhance the acquisition of both; students need opportunities for developing reasoning skills; students will be able to apply acquired or developed reasoning skills to different situations; students will be better prepared for academia, life, and the workplace.

This curriculum unit provides a list of the National Council of Teachers of Mathematics Standards and the New Mexico State Standards that will be addressed, a detailed rationale for the unit, a brief history of geometry, Polya's Problem Solving Process and some problem solving strategies. The "Implementation" section addresses how students may use Polya's Problem Solving Process and apply problem solving strategies in learning geometric concepts. It also includes the objectives for the unit, a list of materials needed for implementation of the lesson plans, and lesson plans. Some of the concepts or skills addressed are: angles and their measures, compass use, identification of triangle types, transformations, polygons, development of spatial sense and mathematical writing. The intended duration of this curriculum unit is four weeks. However, the amount of time spent on each lesson may be adjusted as the need arises.

Although, I have created this curriculum unit for use in conjunction with the *Triangles and Beyond Mathematics in Context* text (Encyclopedia Britannica), It may also be used as a "stand alone" unit.

Mathematical Patterns: Fibonacci Numbers in Nature **Dorothy Stasiewicz**

This unit is designed for sixth grade students in a math/science block, but it will work well in a strictly math class. This unit would work best with 4th through 7th graders. It is designed to broaden the mathematical experience of students in an interesting way, and hopefully introduce them to the idea that mathematics is special, beautiful and a little mysterious. All of my revealed repeated over and over that in order for students to grow mathematically it is important that they be able to analyze patterns. However, Pulitzer Prize winner Charles Krauthammer says, "Real mathematics is not crunching numbers but contemplating them and the mystery of their connections." With this in mind, the unit starts with analyzing patterns in general, and then focuses on the pattern called the Fibonacci Numbers as they appear in nature. Is the fact that they show up so much in nature a coincidence, or are there scientific and mathematical theories that can explain it? This question will be posed to my students at the beginning of the unit, and after many hands on

investigations it will be asked again. All the while students will be working with numbers: graphing, measuring, problem solving and calculating.

Manipulatives with Mathematics: A Unit on Fractions

Tamara Werner

The unit focuses on fractions emphasizing the use of manipulative materials. Each lesson will hit a target area that all sixth graders need to know about fractions. I want to make sure that the students understand fully the concepts that lie beneath manipulative materials. The unit should be fun and meaningful at the same time.

The unit length is going to be two weeks. Since I have a block period, the time will be twice what other lessons are. This unit can be used with the *Math in Context Series* by Britannica, or it can be used alone to help students understand addition and subtraction of fractions.

Each lesson has an introduction into the lesson and an extension at the end of the lesson. The introduction should be used with the lesson as a base for where they are going for that day. The extension does not need to be used every day, but it can be used as part of the lesson.

My unit objectives are for students:

1. to be able to reduce fractions to the simplest terms.
2. to be able to find the common denominator of two fractions.
3. to add two fractions with unlike denominators.
4. to subtract two fractions with unlike denominators.

These goals and objectives are going to be met in a variety of ways. The first way is with a cooking unit. I want the students to understand what the fractions look like and ways to use them. The next is with manipulatives. I want the students to have hands on experience with fractions. I have learned the hard way that fractions can not be taught in just one way, and I want to demonstrate a variety of methods for working with fractions. This should also help the special education students. I want all the students to learn and remember fractions.