

Curriculum Analysis

Theoretical Models of Curriculum

Math Investigations

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June, 4 2006

In the Beaverton School District we have had the opportunity to adopt a new math curriculum, *Investigations*. As I stumbled through this first year I have learned how to be a better teacher and looked at math in a different light. I will be further researching the fourth grade curriculum what *Investigations* offers. My units I will be discussing are:

- Mathematical Thinking at Grade 4 (Introduction)
- Arrays and Shares (Multiplication and Division)
- Landmarks in the Thousands (The Number System)
- Different Shapes, Equal Pieces (Fractions and Area)
- The Shape of the Data (Statistics)
- Money, Miles, and Large Numbers (Addition and Subtraction)
- Changes Over Time (Graphs)
- Sunken Ships and Grid Patterns (2-D Geometry)
- Three out of Four Like Spaghetti (Data and Fractions)

TERC, Technical Education Research Center, has done many case studies on the Portland Public School District. Not only have the TERC researchers observed this district, but also they have invested in it. Portland Public is now looked to in terms of implementing *Investigations* well, creating a calendar that daily tells teachers what lesson they should be teaching, and achieving higher test scores. In many ways Portland Public has been made the model district for *Investigations*. What is it that has made this program so successful and made Portland such a target of TERC testing? A lot has to be

done with the commitment this district has made to implement the program, but also Portland has a lot of economic and social differences. This paper is going to better explore why *Investigations* is so highly regarded and what makes it so unique.

History

The 1600's through the mid 1700's there was a strong perennialism philosophy of teaching. Math was included in the three R's that was taught in public school. Around the 1750's an essentialism view emerged and schools started to branch out and included various math related classes such as surveying and merchant's accounting. This was done in an effort to create more trades people and workers. Public education was changing and evolving into education for the masses by the late 1800's.

The 1900's offered a wake up call to Americans which then in turn changed the math program in the United States. In 1957 the Russian Sputnik created a panic in the United States. American's were concerned that the Russians were getting ahead of them. Thus a lot of emphasis was placed on mathematics. Around this time a man named John Dewey was beginning have opinions about education and how students learn best. The reigning notion that students should be taught in a perennial way was something that John Dewey questioned. By the early 1980's American's were shocked when the government came out with a study called *A Nation at Risk*. It showed that American schools were failing and that education needed to be refocused. An essentialism way of teaching became apparent and once again math was one of the five basic focus points.

Now math uses a combination teaching philosophies. Currently I have teaching many units that are based on a progressive philosophy. Students are using hands on manipulatives that help create meaning for the learner. Curriculums are focusing less and

less on the drill and practice that was taught through the seventies and are now use real life situations to problem solve and analyze. The way teachers have taught has changed over time, however math has always been one of the main focuses.

TERC was created from a grant from the National Science Foundation. This program embodies years of research about how children learn. There are four main goals of this curriculum. First it is designed to offer students 'meaningful mathematical problems to solve.' Second it 'emphasizes depth in mathematical thinking rather than superficial exposure to a series of fragmented topics.' Third it communicates mathematical content and pedagogy to teachers. Finally it aims to 'substantially expand the pool of mathematically literate students.' (Russell, 2004) With these goals in mind TERC created a program that has a variety of units that vary in length from two to eight weeks. Each of these units explores major mathematical ideas, and then later on in the units review on the concepts. *Investigations* has a scope and sequence from kindergarten to fifth grade. Each grade's material is based on the national standards.

Economic

Investigations is a program committed to work equally well with students at different achievement levels. One way TERC attempt to do this is by offering extension activities for the higher students. *Investigations* also encourages students to discover algorithms that work for a problem. Thus students realize there are many ways to get the right answer. Students are encouraged to talk to each other and share their strategies. Since kids are challenged to solve the problem in multiple ways the low kids have

opportunities to show how they solved the problem that the high student might not have considered. In this program the journey is at times more important than the destination.

In America many jobs are looking for people who are able to be problem solvers, as well as tech savvy. "Supporters of the NCTM standards say the problem-solving approach motivates students and prepares them for the kind of math they'll use in real life and in the workplace." (Starr, 2002) *Investigations* pulls in many examples of real life problems for student to solve. *Investigations* uses current data and interests of students to generate thought provoking questions. These questions have students make sense of the data not by simply adding numbers, but by creating a model or a picture that allows them to come up with an answer that they can explain and understand. By creating students who at an early age can problem solve then we are preparing our future leaders to think solve problems, and be able to compete in a technology driven economy.

Social

When teaching math there is a challenge to meet all student's needs. It is said that the basics in math create equality for everyone. To help reach a variety of students this curriculum was created with a few key elements. First, each lesson allows for teachers to use more challenging numbers for the gifted student, or make "the problem more accessible by adjusting the number to create an easier problem." (Russell, 2004)

Another way to help students to understand is by offering tips for a linguistically diverse classroom. In lessons there are some multicultural extensions that have students connect aspects of their daily lives, culture, and background to the content of that unit. To help specifically the Spanish speakers there are exercises written in Spanish that allow parents to be involved and help with the homework if they speak Spanish. One way

Investigations has tried to close the gap with social differences is by involving parents. Since *Investigations* doesn't include a math book it's hard for parents to help students. It's especially hard when parents can't read English. Thus the *Investigations* units come with parent letters in different languages. The letter lets the parent's know what the unit is about and how they can best support their child. Another way *Investigations* reaches out to parents is printing parent notes on the back of all homework assignments. Thus parents have a greater understanding of what the instructions are. By allowing parents to understand concepts in their own language prior to a unit it can better equip them to help the student.

Finally *Investigations* includes technology and basics into a variety of units. This is done because it is well known that this is what drives our economy. If one of the main goals is for the public schools to create competent students who are able to be competitive in the real world then students need to know these two things. John Dewey claims "the main purpose or objective is to prepare the young for future responsibilities and for success in life." (Dewey, ?) How do we create successful students? While there are debates about which way is the best way to teach mathematics, "drill and kill" verses "whole math" both sides agree for students to be successful students need to know the basics and technology. (Starr, 2002)

Orientations and values

Investigations is a prime example of a progressive curriculum. All units have goals which are learned though exploration and participation. In many units there are problems based on what students are interested in. This is a prime component of a