

ILSI ME

Summer Fellowship 2005

Educational Transfer Plan

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Tour of NUMMI Plant by Math Students

Education Transfer Plan – a Proposal

Tour of NUMMI Plant by Math Students

Riverside High School, Pittsburg, CA

Jim Vaughan

Basic Concept: Students crave concrete examples of the need to learn math in order to succeed in the world after high school. Often, their perception is that, since nobody is likely to ask them to find the solution, for example, for the Quadratic Formula, that they don't need to learn what is being taught in their math classes. As an adult, we see numerous applications of skills and logic that came from our learning experiences in math. This connection does not exist for the typical high school student, however, if they are exposed to a dynamic workplace environment, such as an automobile production line, a framework for imprinting the applications of the learning experiences will be created. This small, but integral part of the equation, will allow students to choose to learn. This is the paradigm shift I want to facilitate.

California State Teaching Standard: Engaging and supporting all students in learning, specifically, connecting students' prior knowledge, life experiences and interests with learning goals.

Objective and outcome:

In order to facilitate this paradigm shift, I will engage them in a variety of authentic learning activities designed to allow them to reach a conclusion about the need to learn math. I will begin by engaging them in a modus operandi discussion in which they will design their math learning experience. They will have to design an actual learning experience, so prohibitions such as no homework, no lectures, no class work, no quizzes and no tests, will have to be coupled with statements like, "I will demonstrate my ability to correctly determine solutions to fraction problems by (state method of demonstration)." I will offer additional learning opportunities in math using an all class activity, which will include assessments (that they will immediately, but incorrectly, identify as tests), individual exercises, manipulative

exercises, spatial exercises and other multiple intelligence accessing opportunities. I will also help them learn about the corporate culture of NUMMI and its language elements; words like *kaizen* (continuous improvement of a process), *jidoka* (improvement at that work station so that problems do not get passed on down the production line) and *muda* (waste, waste of energy, waste of time).

Evaluating the outcome. As stated in the basic concept and the objective, the real goal here is to get students to change their thinking about the need to learn math. I will consider the program a success if students begin to be active in their study of math, demonstrate a desire to learn. The main evidence I will look for will be their questions, whether they ask, “When is this class over?” or “How do you rationalize an irrational expression?” I will look for the quality of the work that they do to determine if it is an authentic effort or merely minimal scratching on the paper in hopes of getting it accepted as complete. Mostly, I will listen to them to hear them say, “Hey, I can do this!” instead of, “I’ll never use this &#!+ !”

For further amplification of this process, please read *The Game of School*, by James Burke

Activities (time line):

Before end of Fellowship

Schedule tour and speakers at NUMMI
NOTE: Up until this summer (2005), this was done by several means, one of which was phone. The ONLY way to do this now is to schedule online at www.nummi.com then click on “tours”

August 29th, Monday

First day of school, Positive day of interaction and stories of NUMMI and the field trip to the factory, introduce the word for the week, “*kaizen*”(constant improvement)

August 30th, Tuesday

Learn all student names, discuss classroom prohibitions, first Problem of the Day, My Math Class concept

August 31 st , Wednesday	First individualized lesson, first classroom activity (attached), confirm schedule for field trip/tour with Sara Rogers at (510) 770-5652
Sept. 1 st , Thursday	review first classroom activity making sure to focus upon process understanding and how to improve it, second classroom activity (attached), review first individualized lesson with <i>each</i> student
Sept 2 nd , Friday	Initial assessment of student ability – this is NOT a test! (attached)
Aug 29 to Sep 16	Assess student behavior and performance to identify group for trip, maximum number of students: 40, identify chaperones (minimum 4)
Sept 6 th , Tuesday	Word for week, “ <i>muda</i> ” (waste), discuss attendance as seen by NUMMI to include excess absenteeism and family leave (sick infant, etc), return assessments, commence individualized learning plans for each student to conquer their math monsters, continue daily problem focusing on how to solve
Sept 7 th , Wednesday	Continue three part program of instruction and student learning, the story of Cognos at NUMMI and it’s uses: safety, attendance, production, quality; Discuss/write: how I need to track my progress in this class to attain “Kaizen”
Sept 19 to 23	Send out permission slips – and receive back the approved ones during that week only (unless a real tear jerker reason for an accommodation exists)

October 12, 2005
Wednesday
(cont)

Field trip
tour of production line at 10:30
presentation(s) by NUMMI personnel
(Pitt High graduate and Pitt resident),
“What I liked was..., What impressed
me was...I would/wouldn’t like to work
there because...I saw an application of
math when/at....”

October 13, 2005
Thursday

Class discussion on what we saw as
well as what we didn’t see! I am looking
for fire from the students here –
something that enlivened their interest
and excitement level.

October 14, 2005
Friday

Written assignment due, class
discussion on next move and next area
of math to learn about in class activities

October 17, 2005

Assignment: “I understand why I need to
learn math better now because...and,
the first thing I want to learn about in
math is ...” and “I can incorporate the
principals of *kaizen* in my approach to
learning by ...” (see example)

Week of October 17th

Do we need to go back to NUMMI? If
so, what do we need to see or do?
Conduct survey of perceptions of
opportunities in the corporate world,
compile statistics and analyze results.
(attached)

NOTE: Students opting not to participate in these activities will be
provided with in class assignments which, when weighed, will
approach a sizable percentage of their body weight and their
performance on those assignments will determine their grade.

Classroom activity

“Do the math”, Series nr. 1

How far did the dog run?

A woman goes to take her dog for a walk in the morning. While walking, this woman who had very good eyesight, saw her friend one mile away walking toward her. Her friend, also gifted of sight, waved to her and called out to her dog. The dog ran to the friend. Upon getting there, the dog turned around and ran back to the woman. Again, the dog immediately turned around and ran back to the friend.

If the woman and her friend walked toward each other at an average speed of 2 miles per hour, and the dog runs at an average of 8 miles per hour, how **far** does the dog run until the two people meet?

Required: State how to solve the problem and the answer you get with that method of solution. Can you think of any other way to solve the problem?

ANSWER: Since the woman and her friend will travel one mile at a combined speed (speed of closure) of 4 mph, they will be walking for a quarter of an hour. At 8 mph, the dog will travel a total of 2 miles in a quarter of an hour.

Classroom activity

“Do the math”, Series nr. 2

How many children were on the bus?

A certain number of children were on the MathBus.

At the first stop, $\frac{2}{5}$ of the children got off, and $\frac{3}{5}$ of the original number got on.

At the second stop, $\frac{1}{2}$ of the children got off, and $\frac{1}{3}$ of the number that was left on the bus got on.

At the third stop, $\frac{3}{4}$ of the children got off, leaving 5 children still on the bus.

How many children were on the MathBus before the first stop?

Required: State how to solve the problem and the answer you get with that method of solution. Can you think of any other way to solve the problem?

ANSWER: The problem can be solved by multiplying, subtracting and adding fractions. First, we subtract two-fifths from three-fifths and get one-fifth, which we add to one, or five fifths, to get the number of children on the bus after the first stop. After the first stop, we have one and one fifth the number of students on the bus.

Stop 2: We must now either multiply this amount by one half, or divide it by two. In either case, we are doing the exact same thing! One and one fifth is also six fifths. One half of six fifths is six tenths, and that reduces to three fifths. One third of that number is one fifth. We add this to three fifths to get four fifths. So there are four fifths the number of children on the MathBus at the beginning of the route.

Stop 3: We can multiply four fifths by three fourths to find out what fraction of the children were on the MathBus. This becomes easy when we cancel the fours – one in the numerator and one in the denominator, the result is three fifths. That’s how many children got off the bus. There were four fifths on the bus, three fifths got off, so only one fifth was left. That one fifth was five children. If one fifth is five, five fifths is five times that amount, so it’s five times five or twenty-five. There were twenty-five children on the bus.

Survey for Mr. Vaughan

Name: _____ Date: _____

Please answer the following questions in order to allow me to prepare information I get from NUMMI this summer to help you get a better understanding of the business world and jobs in that world.

When you think of American corporations, what image or feeling do you get?

To what extent do you see yourself getting a job at a corporation?

- a) all but certain I will
- b) fairly sure I will
- c) no idea
- d) doubt it but I could
- e) it won't happen

To what extent do you see corporations acting in ways that are responsive to the needs of their employees?

- a) to a great extent
- b) somewhat favorably
- c) neither favorably nor unfavorably
- d) somewhat unfavorably
- e) to almost no extent

To what extent do you see corporations acting in ways that are responsive to the needs of the communities in which they operate?

- f) to a great extent
- g) somewhat favorably
- h) neither favorably nor unfavorably
- i) somewhat unfavorably
- to almost no extent

If you did get a job at a corporation, how likely do you believe it would be that you could work for that corporation for all of your working life?

- a) almost certainly
- b) quite likely
- c) fifty fifty
- d) not likely
- e) no chance

To what extent do you feel a corporation has the kind of job that you would like to do?

- f) almost certainly
- g) quite likely
- h) fifty fifty
- i) not likely
- j) no chance

Please share with me any thoughts you have about what would make it difficult for you to find and get a job working for a corporation?

Our Initial Math Assessment

Name: _____ Date: _____

This is NOT a test, but will be used to help you build your math skills and knowledge. The better effort you give on this assignment, the better your learning experience will be in this class! Do NOT worry if you cannot do any problem, nor if your answer is exactly correct. It is much more important that you show how you got the answer! If you did it in your head be prepared to explain what you did.

Complete each problem and write your answer in the space provided. Show any work necessary to find the answer. Make sure you write clearly!

Solve the following problems without using a calculator.

1) $119 \div 7 =$ _____

2) $22 \times 9 =$ _____

3)
$$\begin{array}{r} 28764 \\ 162978 \\ + \quad 5429 \\ \hline \end{array}$$

4) $634987 - 251873 =$ _____

Perform the indicated operations.

5) $3x^2(x - 2x + 7) =$ _____

6) $(4x^3 - 2x^2 + 5x + 8) + (x^3 + 3x^2 - 10)$

State the mean, median and mode of the following set of data.

3.2 4.9 3.5 3.4 2.7 3.8 3.5 3.1 3.9

7) Mean = _____

8) Median = _____

9) Mode = _____

Solve the following.

10) one half plus three fourths

11) $\frac{4}{5} \times \frac{1}{4} =$ _____

12) The reciprocal of $\frac{2}{7}$ is _____