Instructional Plan **Jerry Moon** **NAS4 501**

Topic: Mathematical Modeling, Motion Applications **7/30/2003**

Class: Math10, Science 10

Instructional Objectives:

1.) Introduce Mathematical Modeling as a problem solving Techniques for real world problems.
2.) Identification of required information.
3.) Gain skills in obtaining information.
4.) Explore ideas of motion in relationship to velocity as a Rate of change and representation as a slope of a line.
5.) Show examples of constant motion as a linear relationship, And instantaneous velocity as a curved graph.
6.) To be able to explain the differences between average velocity, Average acceleration and instantaneous velocity by graph study.
7.) To devise simple mathematical models.

Routines

1.) Take Attendance.
2.) Set up lab Assistants.

Content Items	Special Materials	Instructional Strategies	Feedback Strategies Give	Feedback Strategies Get	Time Estimate
Preparation Reading	Its "Show Time" dialog	Teacher reads or add lib's script on stunts and introduces mathematics in successful stunts. A discussion and questions on how mathematics and physics plays a part in the lives of stunt artists and movie makers. Play in background a clip from the movie "Gone in 60 Seconds".	Show clip from "Gone in 60 Seconds" movie to engage students.	Let students share their experiences about stunts. Most likely topic may be "Fear Factor"	10 min.

Demonstrate Measuring distance vs. time.	CBL, CBR, TI 83 calculator, programming for calculator, Graphical Analysis™ computer software.	Have students participate in setting up equipment and used as subjects in motion experiments. Have each student copies of graphical analysis of their motion data.	Students work on setting up calculator and CBL, while other students work on graphical analysis program	Keep students involved as they begin to ask questions, lead class in discussion.	15 min.
Do "Toy Boat" worksheet as individual students.	Hand outs, Calculators Graph paper.	Worksheet develops concept of average velocity as a ratio of change in location/change in time. Students learn difference between speed and average velocity, units and measurement.	Let students discover relationships in interrupting different types of graph. If concepts are not being discovered, guide students by asking questions.	Teacher corrects as needed. If concepts need further discussion plan 5 min review.	10 min
Lecture on least squares equation.	Graphical Analysis Program and overhead viewer	Fitting a last square line to part of a data line. Students decide selection of two points and use them to determine the equation.	Teacher checks for understanding by having students demonstrate.	Teacher praises progress as this is the most difficult concept.	10 min.
Hand out homework assignment	Handout	This assignment reviews today's lesson, there are questions on velocity, speed, least-squares line and graph interpretation	Allows time for concepts to be developed	Students are asked to bring in battery	5 min.

"Start Your Engines"		in preparation for tomorrows activities.	by students. This exercises lead to information needed to design stunt.	operated cars and trucks. This personalizes the experience.	
Group Activity "Staging a Near Hit"	Toy battery operated cars and trucks, equipment to do motion experiments, masking tape, meter sticks, and "Staging a Near Hit" handout	Divide class into groups of fours, explain their activity. In this activity students groups plan a stunt involving two battery operated vehicles and stage a near collision demonstration. After using the motion detector for gathering information about their vehicles, the students follow questions and guidelines in handout to plan their stunt. Placement of the vehicles must be mathematically modeled to achieve success, After performing stunt, students evaluate results, do an assessment of why stunt succeded or failed, and retry with new calculations if nessary. Groups must prepare a written report with graphs, data, and mathematical models explained both symbolically and in English as to the success or failure of their stunt.	Students need to take in account for length and width of vehicles. They also need to develop a mathematical model using average velocity, distance and time, to determine the start points for both vehicles.	Teacher guides groups by asking questions if they are failing to set up the stunt using all factors. Praise is given for groups who have achieved success and opportunity for extra credit on designing a different stunt.	35 min.
Closing Discussion	Back in class room unit.	Concepts are discused and students are randomly questioned on graph interpretation, constant velocity, speed and the concept of average acceleration is introduced.	Students are given an opportunity for extra credit for designing a	Teacher assessment of students understanding based on	10 min

			new stunt and demonstrating it to the class.	responses.	

Mathematical Standards which are supported by this lesson include:

Standard 1: Mathematics as problem solving is achieved by allowing students to develop their own strategies in designing near vehicle collisions. The students apply previous knowledge of mathematics in a somewhat real world situation and their success is based on their ability to apply the process of mathematical modeling.

Standard 2: Mathematics as Communication is addressed by requiring a written report of their stunt which includes both a symbolic, and an English version of explanation of their stunt experiment. Communication within group requires that mathematical ideas must be expressed orally. Students should begin to see the relationship of mathematics in entertainment and in lifesaving situations.

Standard 3: Mathematical Connections is associated with the entertainment world of stunt people, connected to the laws of Physics, and involves high technology from electronics and computer programming.

Assessment:

1. Assessment of technology applications, by observation of classroom activities and written report.
2. Assessment of concepts of motion, by grading Toy Boat worksheet.
3. Assessment of mathematical principals, by grading of homework.
4. Assessment of mathematical modeling, by grading of final report.
5. Assessment of communication skills, by grading final report.