"Materials for Introducing Systems Modeling in Mathematics, Grades 9-12"

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If a system dynamics modeling paradigm is ever to make its way into the high school classroom in a significant way materials must be available for interested teachers.   A set of lessons for use in supplementing a traditional secondary school mathematics curriculum has been developed with emphasis on the study of the behavior of traditional functions over time. The first chapter, for example, is about functions which change at a constant rate. The chapter starts with the use of the motion detector, a sonar device connected to a computer lab interface. Students move in front of the detector in specified patterns as the graphs of the motion are displayed in real time on a projector. The students are to study the connection between the words describing how they were to move and the characteristics of the graph displayed. Different lessons are provided so students in a beginning Algebra course, an advanced Algebra course, or a Pre-Calculus course use similar motion but interpret the motion using increasingly sophisticated vocabulary and with attention to more depth of analysis. From the motion detector, lessons proceed to the study of the theory of finite differences. From the theory of finite differences STELLA model diagrams are constructed for the particular function type and application problems are presented requiring students to build diagrams that will exhibit the appropriate behavior to solve the problem. The problems start simply, matching those that might appear in a traditional math text. However, small extensions are made to some of the problems so they begin to ask the student modify a structure and apply it to a more interesting problem that students would have been able to study at a given level, using an equation interface for quantification. Also, some problems require that structures be combined, once students gain experience with more than one type of structure. Each lesson requires one or two 45 minute class period to complete. Periodically, story projects are included, so students who really enjoy this approach can expand their study. The projects are expected to be completed outside of class and may take one to two weeks, depending upon the time a student can commit to the project. An outline of the lessons is included below. This set of student lessons, teacher answers, and all models on disk is being published by High Performance Systems, the publishers of the STELLA software. A final title for the materials has not been determined.

Introducing System Dynamics Modeling in Algebra, Pre-Calculus and Calculus Classes
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Table of Contents

III.   Introduction to Quadratic Behavior
    A. Motion worksheet #4 (Alg I)
    B. Motion worksheet #5 (Alg II)
    C. Motion worksheet #6 (Pre-Cal)
    D. Finite Differences - Quadratic (Alg I or II)
    E. Quadratic Models 1 (Alg I)
    F. Quadratic Models 2 (Alg II)

IV.   Introduction to Exponential Behavior
    A. Finite Quotients - Exponential (Alg II)
    B. Exponential Models 1 (Alg I)
    C. Exponential Models 2 (Alg II)
    D. Exponential Models 3 (Alg II or Pre-Cal)
    E. Exponential Models 4 (Pre-Cal)
    F. Bank Account Story (Alg I/II)

V.   Review
    A. Systems of Non-Linear Behavior (Alg II or Pre-Cal)
    B. Mathematical Footprints (Alg II or Pre-Cal)
    C. Alcohol Model Story (Pre-Cal)

VI.   Introduction to Oscillatory Behavior
    A. Motion Worksheet #7 (Alg II)
    B. Motion Worksheet #8 (Pre-Cal)
    C. Motion worksheet #9 (lin,quad,oscill) (Cal)
    D. Predator/Prey Oscillation 1 (Alg II)
    E. Predator/Prey Story (Pre-Cal)
    F. Bouncing Spring Problem (Alg II or Pre-Cal)
    G. Pendulum Story (Alg II or Pre-Cal)

VII.   Introduction to Convergent and Logistic Behavior
    A. From Exponential to Convergent to Logistic Behavior 1 (Pre-Cal)
    B. Deer and Vegetation Story (Pre-Cal)

VIII.   Introduction to Differential Equations
    A. From Exponential to Convergent to Logistic Behavior 2 (Cal)
    B. Epidemic (SIR) Model Story (Cal)
    C. Tracking Lead Through the Human Body Story (Cal)
    D. Lotka-Volterra Model Story (Cal)
    E. Euler Method of Integration (Cal)
    F. Runge-Kutta Method of Integration (Cal)

IX.   Miscellaneous Topics
    A. Sequence and Series (Pre-Cal)
    B. Leslie Matrix Age Dependent Model (Pre-Cal)

X.   Appendix