**Synopsis of the Modeling Method**

The Modeling Method aims to correct many weaknesses of the traditional lecture/demonstration method, including the fragmentation of knowledge, student passivity, and the persistence of naive beliefs about the physical world.

**Coherent Instructional Objectives**

•     To engage students in understanding the physical and living world by constructing and using scientific models to describe, to explain, to predict and to control physical and biological phenomena.

•     To provide students with basic conceptual tools for modeling real objects and processes, especially mathematical, graphical and diagrammatic representations.

•     To familiarize students with a limited set of basic models as the content core of science.

•     To develop insight into the structure of scientific knowledge by examining how models fit into theories.

•     To show how scientific knowledge is validated by engaging students in evaluating scientific models through comparison with empirical data.

•     To develop skill in all aspects of modeling as the procedural core of scientific knowledge.

**Student-Centered Instructional Design**(These goals were developed for the original modeling physics course. The modeling biology course will achieve these goals to varying extents.)

•     Instruction is organized into modeling cycles which move students through all phases of model development, evaluation and application in concrete situations –– thus promoting an integrated understanding of modeling processes and acquisition of coordinated modeling skills.

•     The teacher sets the stage for student activities, typically with a demonstration and class discussion to establish common understanding of a question to be asked of nature. Then, in small groups, students collaborate in planning and conducting experiments to answer or clarify the question.

•     Students are required to present and justify their conclusions in oral and/or written form, including a formulation of models for the phenomena in question and evaluation of the models by comparison with data.

•     Technical terms and concepts are introduced by the teacher only as they are needed to sharpen models, facilitate modeling activities and improve the quality of discourse.

•     The teacher is prepared with a definite agenda for student progress and guides student inquiry and discussion in that direction with questions and remarks.

•     The teacher is equipped with a taxonomy of typical student misconceptions to be addressed as students are induced to articulate, analyze and justify their personal beliefs.