APPENDIX B

SCORING GUIDELINES
DEFINITIONS

Phenomenon = a perceptible event.

Phenomena of Interest = The perceptible events which the student is asked to explain and predict:
Floating and Sinking in various liquids
The Behavior of the Balance Beam
The period of the Pendulum

Representation = A general term which includes theories, models, rules, hypotheses, concepts, ideas, analogies, intuitions, drawings, equations, stories etc. used to conceptualize some aspect of nature.

Rule = the students system and procedures for predicting or controlling the behavior of a phenomenon (e.g. `What do do' or `How to do it' in order construct a pendulum with a given period, place masses on the balance beam so that equilibrium is maintained, determine whether a given object will sink or float)

Model = Explanation of the phenomenon in terms of concepts and constructs. `why does the phenomenon manifest as it does?' Explanatory rather than predictive.

A conceptual model may be the predecessor to the formation of a rule, and the successful application of a rule may be the means by which a conceptual model
is validated.

Hypothesis = a statement proposing that some factor influences the behavior of the phenomenon of interest.

Hypothesis Test = a prediction made in order to test the validity of a representation of a phenomenon as opposed to `trial and error' (i.e. trying something out to see what will happen)

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Theory = All that has been made explicit (and has not been rejected) by a subject regarding the phenomenon. This includes, beliefs, observations, hypotheses, evidence, conceptual models, rules etc.

GENERAL PROCEDURES FOR SCORING

During training sessions and group scoring sessions we sit and argue about why a particular set of behaviors should be score one way or another. Often as a result we change our scoring of that behavior because we change our mind about what we have seen, or we come to a better understanding of the nature of the scoring scheme, or we come to understand better how some set of behaviors may be legitimately considered evidence of knowledge or cognitive process. When we score videotape sessions individually we should simulate the group sessions in that we should consider the evidence for an assertions (i.e. a particular score) that we are intending, consider objections to that score, and arguments for or against other possible scores to be given.

Enter times as frequently as possible. When entering periods of time, indicate the beginning of the time period with a left bracket and the end of the period with a right bracket.
e.g. [2:23 6:42]

Unless otherwise noted each level of a variable implies the attainment of lower levels. In other words `level [4]' is `level [3]' with additional attainment or refinement.

SCORING SCIENTIFIC INQUIRY CAPABILITIES

Withhold `0' scores until the end of the scoring session

The same behavior may serve as evidence or an indication of more than one scientific thinking characteristic

Using the Note Sheets for Scientific Inquiry capabilities
A place to indicate significant aspects of the inquiry session that are not captured by the scales
SCORING LEVELS OF CONCEPTUALIZATION

Withhold `0' scores until the end of the scoring session except in the case of LEVELS OF CONCEPTUALIZATION

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Use a `0' to score `highest level confirmed' when none of the listed Levels of Conceptualization has been confirmed for the Pendulum and Balance Beam Tasks.

Use a `-1' to score `highest level confirmed' when none of the listed Levels of Conceptualization has been confirmed for the Floating and Sinking task.

Scores are entered for `LEVELS OF CONCEPTUALIZATION' only when a change up or down in that scale is judged to have occurred.

Using the Scoring form for Levels of Conceptualization
The `DIARY' -- A place to indicate things not captured by the scales

A `TEST' is a test carried on by the student of some facet of the student's conceptualization of the phenomenon (e.g. theory, hypothesis, model, rule), as opposed to trial and error exploration of the phenomenon and tests of predictions suggested by the inquiry guide, or repeat measurements to assure reliability. Thus theories and tests of theories are to be distinguished from tests of observations and tests of predictions which are not generated from the student's theory.

`CONFIRM' and `DISCONFIRM' are columns in which a time is entered when the scorer judges that the subjects can be considered to have confirmed some aspect of their theory. A judge need not agree with a student's decision that an aspect of the theory has been confirmed or disconfirmed.

`Directed' and `Non-Directed' Inquiries

The initial portion of each inquiry session is considered to be `non-directed'. The guide introduces the phenomenon and the goal, and then concentrates on eliciting the student's conceptualizations of the phenomenon, related knowledge and scientific thinking. When the guide determines that the student has gone as far as possible unassisted, the guide elicits a summary of the student's conceptualization and begins the `directed' portion of the session. During this time the guide may present facts or demonstrations which disconfirm any aspect of the student's theory.

Many inquiry sessions do not have a `directed' portion.

SCORING RELATED KNOWLEDGE

Fill in 0's at the end of each scoring session