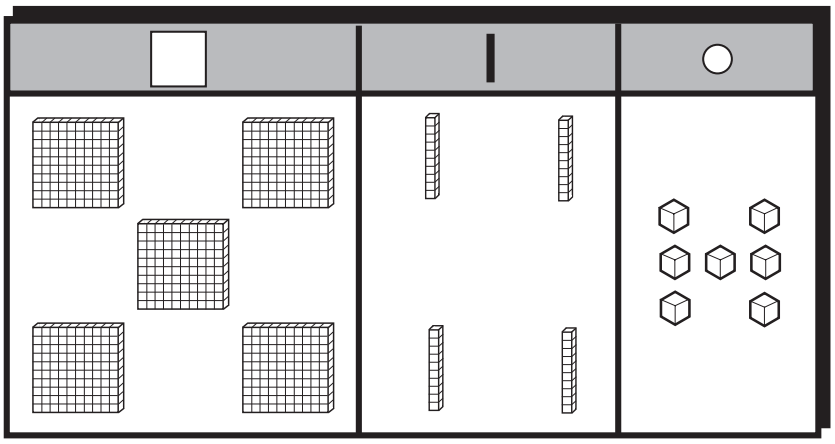
SIMs™
Sequenced Instructional Modes

How mathematical concepts, strategies, and skills are communicated is a critical component of **MEBA**. This is addressed through a sequence of instructional modalities referred to as Sequenced Instructional Modes (SIMs™). Three modes, **concrete**, **pictorial**, and **symbolic** are the building blocks of SIMs™. The concrete mode represents the least abstract level whereas the symbolic mode is the most abstract. Instruction should always begin with the least abstract and move toward greater abstraction. Therefore, learners progress from concrete, to pictorial, to symbolic. Prior to advancing to the next higher level of abstraction (e.g. from concrete to pictorial), learners experience lessons in which two modes are connected. Both the concrete and pictorial modes are instrumental in developing spatial visualization, a critical attribute of problem solving and geometric reasoning. SIMs™ bridges from concrete to symbolic in the order described below.

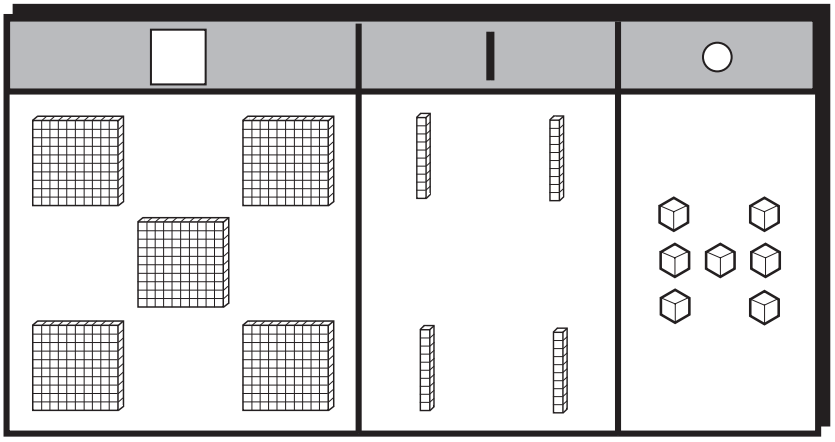
NOTE: In the examples illustrated below the base ten material is arranged in what we refer to as **Standard Configuration**. MEBA makes use of Standard Configuration to develop students' spatial imagery and a grouping sense of number which facilitates understanding advanced mathematical concepts. To learn more about this special arrangement of number refer to the MEBA publication: Developing Number Sense Through Standard Configurations.

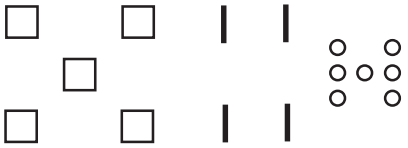
CONCRETE MODE (C): This mode involves students in a visual, auditory, tactile, and kinesthetic experience with the concept. The use of base ten blocks by students to represent various values, would provide a concrete experience with place value. The value 547 would be concretely represented as illustrated on the right. At this level no other representations such as pictures or symbols are used. While a written coding system is not used, students are encouraged to associate spoken language, oral word problems, and appropriate mathematical terminology with the physical model.



CONCRETE-PICTORIAL MODE (C-P): Students use physical models and relate these to diagrams or illustrations of the concept being considered. **These pictures directly relate to the physical model.** Therefore, at the concrete-pictorial mode, students would represent 547 with the physical model of base ten blocks and connect this concrete experience with the pictorial representation illustrated on the next page. As in the concrete mode, spoken language, oral word problems, and appropriate mathematical terminology are used to describe the application of the concepts.

 Mary Gilfeather & John del Regato

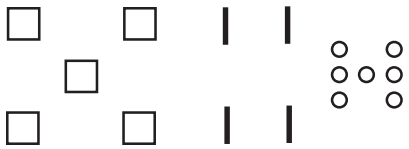




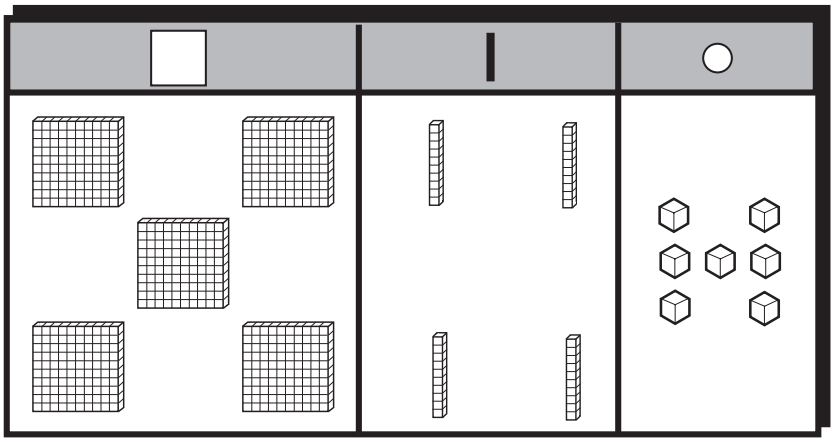
Written symbols are not used at this level.

NOTE: The pictures that directly relate to the concrete model are simple and efficient rather than elaborate in nature.

PICTORIAL MODE (P): This level of instruction provides more abstracted experience with the concept. Pictures, spoken language, oral word problems, and appropriate mathematical terminology are used to represent and describe the mathematical concepts being investigated. Neither symbols nor physical models are used at this level.



CONCRETE-SYMBOLIC MODE (C-S): At this level the written symbolic expressions are introduced and associated with the physical model. Students use spoken language, word problems, and appropriate mathematical terminology to describe the concrete and symbolic representations of the mathematical concepts. Matching the concrete base ten model of 547 with the numeric symbols or written words allows the student to understand the difference between "face" value and "place" value. In doing so, students learn that the symbols are codes to represent the concept. Pictures are not used at this level.

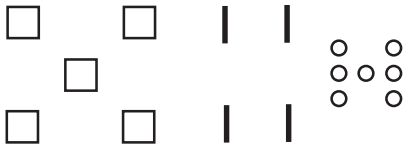


5 4 7

Five hundred forty-seven

PICTORIAL-SYMBOLIC MODE (P-S): Pictures, spoken language, word problems, and appropriate mathematical terminology are associated with symbolic representations. By drawing and writing symbols for various numeric values students extend and refine their understandings of the concept being represented by the symbolic

code. Physical models are not used at this level.



Five hundred forty-seven

5 4 7

SYMBOLIC MODE (S): Symbols, spoken language, word problems, and appropriate mathematical terminology are used to represent mathematical concepts. At this level physical models and pictures are not used. It is important to remember that symbols are only one representation of the concept. They are used to efficiently convey different concepts but **are not** the concepts. Without the appropriate concrete/pictorial experiences, symbols are arbitrary scratches devoid of meaning.

The concrete mode represents the least abstract level whereas the symbolic mode is the most abstract. Instruction should always begin with the least abstract and move toward greater abstraction. Careful planning to progress from concrete to symbolic experiences is necessary. In doing this, instruction should connect these modes yet maintain the sequencing from least abstract to greater degrees of abstraction. When **validating** a student's understanding, the student is typically given a symbolic representation of a concept and asked to provide a physical model or a picture of the concept.

The charts on the following two pages illustrate the seven different types of instructional modes that a learner can experience. Today's students receive mostly symbolic (S) mathematics experiences and thus have a functional and superficial understanding at best. Concrete (C) and pictorial (P) experiences are rare. Even when teachers are aware of the importance in using physical and pictorial models, they often wonder why at times they succeed and at other times they fail. It is our belief that a literate understanding of mathematical ideas and relationships involves the connection of more than one modality, e.g. concrete-pictorial (C-P), concrete-symbolic (C-S), pictorial-symbolic (P-S) or concrete-pictorial-symbolic (C-P-S). In doing so, we believe that we can lead children from a functional (uni-modal) manipulation of certain aspects of mathematics to a more literate (multi-modal) understanding of mathematics.