List of Thinking Operations

Most educators will agree that thinking is an important aim of education and schools shall do all that they can, to provide opportunities for thinking. How can this be done? Most good teachers have always found ways to include thinking operations into their lessons and activities. Here is a list of suggestions that can be used as a check list for teachers to monitor their own teaching. It is not implied that the listing is complete; nor is it implied that every single day should include any of these activities. The list is suggestive rather than inclusive. It does, however, contain many ideas that are widely used for giving emphasis to thinking. The list also contains operations that are used in many of the state mandated tests.

COMPARING When we ask students to compare, we are helping them to use discriminative judgment and to make decisions. Students need to study, analyze, and observe to discern similarities and differences and this requires critical thinking skills. Comparisons can be made of written materials, music, the arts, feelings, and experiences. The opportunity to use comparisons is limited only by the teacher's imagination.

CLASSIFYING may be conceived as an extension of comparing in which one looks for similarities and differences. When enough similarities are found, a grouping is possible; its characteristics are distinguishable from another grouping which represents a cluster. In pedagogic technique, the teacher permits and encourages students to discover the basis for the groupings. Classifying activities need not be only for science, but teachers may provide opportunities for students to classify in language arts, social studies, math and the arts.

SUMMARIZING is more than putting together a series of steps. It is more than recounting and reporting what has taken place. It is to discern and to evaluate what is significant and what is insignificant. It means a decision has to be made that requires reflection and conciseness without omission of important points. It also means to give a shortened version of something that has been said or written, stating its main points. Summarizing requires thinking skills.

INTERPETING When we interpret, we recognize meaning. It is concerned with the inferences and generalizations which may be drawn. Interpreting is to add meaning, to read between the lines, to fill in gaps, and to extend on given materials. Maps, charts, graphs, and tables lend themselves to interpretation as do works of art, sculpture, dance, literature, poetry and scientific investigations.

LOOKING FOR ASSUMPTIONS An assumption is something that is believed to be true without proof. It is something that is taken for granted without factual support. When students are taught to look at, evaluate and examine information with respectful scrutiny, significant contribution to maturity often takes place.

COLLECTING AND ORGANIZING DATA There are many ways and opportunities to collect and organize data. Before students embark on collecting data, teachers might ask, "What do you want to find out? How will you find the information? How will you use the data? What plan do you have to organize the data?" Collecting and organizing data presents challenging thinking situation and our students need more opportunities for both.

HYPOTHESIZING An hypothesis is an educated guess or a hunch. It is a possible solution to a perplexing situation. It is a possible explanation of a happening. It is often accompanied with an *if-then* statement. *If* something is done, *then* something will happen. Most people think that forming a hypothesis belongs only in science, but creative and innovative teachers seek for opportunities for their students to hypothesize in all disciplines. Students are required to think and predict outcomes.

OBSERVING When we ask students to make observations, we are, in a sense, asking to obtain information in many different ways. It is suggested that teachers seek out those tasks which are designed to give practice in *noticing* and *describing.* These could be objects, conditions, events, pertinent details or experiences. Students should be encouraged to ascertain the difference between what is *actually* observed and what is assumed. Not all observations need be visual. Some may involve listening, some touching or feeling, some smelling or tasting. Schools offer a rich environment of things to observe such as animals, plants, water, people, clothing, games, and events.

CRITICIZING In criticism, there is judgment and evaluation. There is some kind of standard to compare with that which one is criticizing. When students establish standards for criticizing, they become aware that they are not necessarily finding fault bur rather indicating what is good about something, what is bad, and what can be improved. There are numerous opportunities to use this operation in schools. There are editorials, letters, and news articles, plays, assembly programs, books, TV programs, movies, and many other sources.

DECISION-MAKING involves making choices and selecting among alternatives on the basis of laws, principles, generalizations, and rules. Decisions are made in such a way as to protect values. We ask: "What should be done? Where will it lead? Is it good or bad?" Teachers need to provide opportunities to make real choices which involve comparing, observing, imagining and other operations of thinking.

MAKING INFERENCES When students are asked to make inferences or to infer, they are reaching conclusions on the basis of evidence, prior knowledge, reasoning, conjecture or speculation. Sometimes they have to gather clues and read between the lines. They also need to understand the difference between stated and implied information and recognize the effects of their own point of view on their conclusions. This is an excellent thinking activity that has many applications throughout a student's day.