

CONCEPT LEARNING:

How To Make It Happen In The Classroom

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Despite much talk about concept-centered curriculum, too many students still just learn facts. Teachers report, and tests show, that even those students who seem to have learned concepts often fail to apply them to new but similar situations.

Let's explore some of the possible reasons.

Different Concepts of "Concept"

One reason may be that educators haven't been sufficiently clear and consistent about what they think a concept is. They haven't distinguished between concepts and other things they want students to learn, such as facts, principles, attitudes, and skills. Fuzziness or lack of common understanding among curriculum developers, teachers, and testers about what a concept is could well account for disparity among what is taught, learned, and tested.

Lack of Understanding of Concept Learning/Teaching Processes

Another reason may be the assumption that concepts are learned (and therefore should be taught) in the same way facts are learned. While much attention has been given to differences in individual student learning "styles" (preferences related to gathering information), very little has been focused on the differences in various learning "strategies" (procedures for processing information). The process for learning and teach-

ing concepts differs significantly from those appropriate for fact, principle, attitude, and skill learning. Lack of understanding of those differences on part of the curriculum developer or the teacher could certainly contribute to student failure to learn concepts.



Inadequate or Inappropriate Curriculum Material

Curriculum guides, teachers' manuals, and student materials may not contain enough of the right kind of information. Neither commercial nor locally-developed curriculums may be thorough enough in identifying, defining, and relating the concepts students are expected to learn; of outlining appropriate concept-learning processes; or of presenting the kind of information students need in order to form concepts. Too often, the concept is just "presented" (as though it were a fact). Teachers who have to work with an inadequate or inappropriate curriculum may well be misled as to how to help students

learn concepts, or, if they know better, are burdened with the task of revising or even developing the curriculum from scratch.

These may not be the only reasons students are not learning concepts as well as we think they should, but since these factors are under control, they should be addressed and, to the extent possible, eliminated.

Following are some ideas about concept learning and teaching which over the past twelve years many educators have learned and successfully applied. Their success came not from merely reading about or listening to these ideas, but as a result of hard work during and after intensive training in a staff development program called BASICS. This program and its predecessor, *The Hilda Taba Teaching Strategies Program*, focus on the thinking strategies students need to learn to achieve each of the basic types of learning objectives of any curriculum: concepts, principles, attitudes, and skills.

What is a Concept?

Following are three *examples* of concepts.


1. Any plane, closed figure having just three sides;
2. Any body of land bordered on all sides by water;
3. Any invertebrate having just three body parts and exactly six legs.

First, observe what each statement says. Noting the *differences* among them. Then decide what is *true of all three statements*. What is true of all three is what makes all of them examples of "concept."

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To learn a concept, students must form a clear mental image of how examples differ from nonexamples.

Now focus on the following three items. *None* of the three is a concept.

- a.  ABC is a plane, closed figure having three sides.
- b. island
- c. ant

Consider items "a," "b," and "c" one at a time. Compare and contrast each with the concept examples (#1, #2, and #3) and decide why "a," "b," and "c" are not examples of a concept. Item "a" states certain facts about figure ABC—its characteristics—but it does not state the characteristics common to any and all examples of that type of figure. Item "b" gives the English label for a type of thing

but does not state the set of characteristics common to any and all examples. Item "c" gives the name of one example of concept #3, insect, but it does not state the characteristics common to any and all examples of insects, distinguishing all insects from any non-insect.

Based on the above, consider the following definitions and examples:

Concept—the set of attributes or characteristics common to any and all instances (people, objects, events, ideas) of a given class (type, kind, category)

or
the characteristics that make certain items examples of a type of thing and that distinguish any and all ex-

amples from nonexamples.

Concept Label—one or more terms used to refer to any and all examples of a given concept.

Examples—any and all *individual items* that have the characteristics of a given concept (class).

Nonexamples—any and all *individual items* that may have some but not all the characteristics that make items examples of a given concept (class).

The concept is the set of characteristics, not the label. A person can know the label for a concept without knowing the characteristics of any and all examples and vice versa. A concept is not the same as a fact. A fact is verifiable information about an individual item, while a concept is a generalization in a person's mind about what is true of any and all items (even those the person has never seen) that are examples of the same class.

A few additional points about concepts:

All concepts are abstract. This is so because a concept constitutes a generalized mental image of the characteristics that make items examples. However, the characteristics of individual items may be either concrete (*all* of the characteristics are perceivable, as in an apple) or represented in some way. A representation may be quite "concrete" (many of the characteristics are perceivable, as in a model, film, or photo) or quite "abstract" (few or none of the characteristics are perceivable as in a diagram, symbol, spoken or written description). A common misconception is that young

Figure 1. Concept Examples.

Concept Label	Concept Characteristics	Examples	Nonexamples
Compound Word	— any word whose meaning is a combination of the meanings of the root words of which it is composed	nightgown oversee doorknob	carpet begun understood
Fruit	— the part of any plant that contains the seed(s)	apple tomato squash	potato celery carrot
Improper Fractions	— any fraction whose numerator is equal to or greater than its denominator	$\frac{8}{7}$ $\frac{16}{16}$ $\frac{4}{1}$	$\frac{7}{8}$ $\frac{4}{16}$ $\frac{1}{4}$



“Not only that but, by virtue of the unique characteristics that distinguish him from other mongrels in the world, Spot is himself a concept (in a class by himself).”

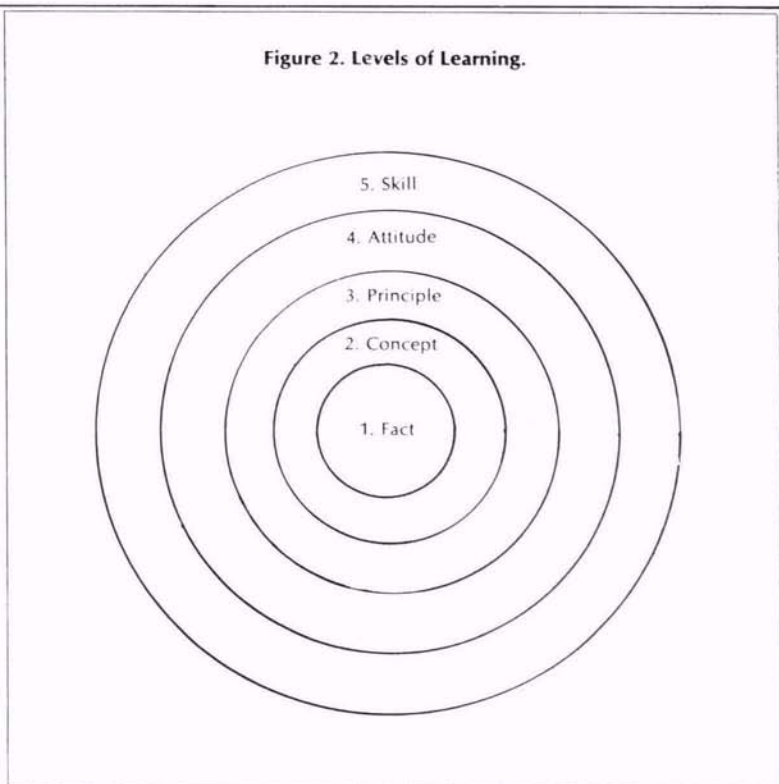
children cannot conceptualize because they cannot yet form abstract ideas. Actually, young children can and do conceptualize but only when the characteristics of examples of the concept are perceivable directly through the senses and they have the opportunity to perceive those characteristics firsthand in several individual items. They need these sense perceptions to form the generalized mental picture of the characteristics. (Is it any wonder that young children have so much trouble forming such concepts as "sharing" and "tidiness"?)

Concepts cannot be verified, like facts, as being "right" or "wrong." Although it is difficult for us to realize, our concepts are not what is but what we have learned to think is. As a cultural group, over time, we decide what things are and what to call them. We store our current sets of characteristics and the concept labels that go with them in the dictionary and this becomes our "authority" to arbitrate any dispute. However, we all know how dictionaries differ and that dictionaries need to be updated periodically to keep up with our changing concepts and concept labels and to add concepts that are newly-developed and commonly agreed on.

If you want to test this idea about concepts, see how many different explanations you get when you ask several people whether each of the following is a "family" and why they think it is or is not:

- A husband and wife with no children
- Several friends sharing the same home
- Roommates at college
- A separated husband and wife each having one of their children
- A mother and grown daughter living together.

Concepts are hierarchical; that is, some classes include other classes. Living things include plants and animals; animals include vertebrates and invertebrates; vertebrates include mammals, fish, birds, amphibians, and reptiles; and so on. My dog Spot is a specific example of every one of the classes in the hierarchy until he separates out into the canine class because some of his characteristics distinguish him from examples of feline, equine, and so forth. Not only that but, by virtue of the unique characteristics that distinguish him



from other mongrels in the world, Spot is himself a concept (in a class by himself).

We've already made the distinction between "concept" and "fact." Let's now consider the relationship between concepts and the other types of learning: principles, attitudes, and skills.

1. Fact: Verifiable information obtained through observing, experiencing, reading, or listening. Evidence of acquisition, comprehension, retention, and retrieval of information is the learner's expression of the specific, accurate, complete, relevant information called for.

2. Concept: Mental image of the set of characteristics common to any and all examples of a class. Evidence of conceptualization is the learner's demonstrated ability to consistently distinguish examples from nonexamples by citing the presence or absence of the concept characteristics in individual items.

3. Principle: Mental image of the cause-effect process which, under certain conditions, occurs between examples of two or more concepts. Evidence of understanding of the

principle is the learner's demonstrated ability to make well-supported and qualified inferences of either cause or effect in new or changed situations.

4. Attitude: Mental set toward taking some action based on the desirability of anticipated consequences. Evidence of attitude learning is newly-acquired willingness to take (or refrain from) an action based on the learner's concept of what the action is and his or her predictions as to the desirable or undesirable effects of taking (or not taking) the action.

5. Skill: Proficiency and speed in performing a mental or physical action or set of procedures. Evidence of skill learning is the learner's performance of the action/procedures at the desired level of proficiency or speed and, where applicable, a product that meets desired standards for quality and/or quantity. This performance is based on the learner's concept of the action, his or her predictions as to the effects of performing one way or another, and his or her internalization of the procedures through repeated practice.

It is important to note, in Figure 2, that concept learning is distinctly

different from any of the other levels of learning; therefore, the evidence of achievement is different. You can't, for example, appropriately test understanding of a concept by having the learner state facts or perform a skill. Note also that each level is prerequisite to and an important component of the next level of learning. This being the case, fact-learning is necessary but not sufficient to concept learning, and concept learning is necessary but not sufficient to the learning of principles, attitudes, and skills. (Paradoxically, the learner needs to develop a certain degree of thinking, listening, and reading skill before achieving even the fact-learning level.)

What Learning/Teaching Strategies Develop Concepts?

Fundamental to helping students learn concepts is understanding that conceptualizing has to take place in the mind of the learner. That is, the learner needs to establish in his/her own mind a mental image of the set of characteristics that makes something an example of the concept and that distinguishes examples from nonexamples. If the learner has access only to the concept label and a definition (all words), his/her mental image of the characteristics of examples of the concept may be vague, inaccurate, or nonexistent. Being able to accurately state a definition one has read or heard amounts only to fact-level learning, not conceptualization; the learner is only recalling words.

One who has conceptualized, on the other hand, is able to consistently identify new examples, create new examples, distinguish examples from nonexamples, change nonexamples into examples, and, in every case, is able to explain what he/she has done by citing the presence or absence of the concept characteristics. The learner can do this because he/she is guided by a clear mental image of the characteristics that should be there.

There are a number of strategies through which the learner can be guided so that he/she gathers the appropriate information, processes the information appropriately, and ends up with his/her own clear mental image of the concept characteristics.

For example, using an inductive strategy from the BASICS Program, a teacher might have students record on worksheets information about the physical characteristics and life cycles of ants, grasshoppers, moths, and mantises. When the information has been reported, verified, and recorded on a large wall chart, the teacher would ask questions intended to direct students' attention to differences among the examples and then to characteristics common to all examples. Students would be asked to formulate a statement specifying "What is true of all invertebrates like these?"

"You can't, for example, appropriately test understanding of a concept by having the learner state facts or perform a skill."

After giving (or asking students for) the concept label "insect," the teacher might have students complete another worksheet calling for information about the characteristics of spiders, centipedes, scorpions, and earthworms. The learning sequence would be completed by having students respond to:

According to this information, what are some of the characteristics of these invertebrates that make them like insects?

What was true of the insects that is not true of any of these other insect-like invertebrates?

Based on what you've said here, finish the statement, "What makes insects different from other insect-like animals is _____."

Identify the animals shown here which you think are insects and the ones you think are not. For each be ready to tell what about the animal made you decide it was or was not an insect.

Using a deductive (classifying) strategy a teacher would first present information about characteristics of all examples of the concept (a definition) along with the concept label. For the concept "contraction," for instance, the teacher might ask students to state in their own words

what they had read was true of all contractions. Next, students would be asked to identify and verify the characteristics in each of several examples of the concept. For instance the teacher might say, "In the sentence 'The girl's here' the word 'girl's' is an example of a contraction. Referring to the definition we just discussed, what about 'girl's' in this sentence makes it an example of a contraction?"

Next, students would be asked to note the absence of one or more of the concept characteristics in each of several nonexamples. For example, the teacher might say, "In the sentence 'The girl's coat is here,' the word 'girl's' is not a contraction. Referring to our definition, what about 'girl's' in this sentence makes it not a contraction?"

Then students would develop generalized personal statements giving characteristics of all examples of the concept and characteristics that distinguish examples from nonexamples. Finally, the teacher might have students identify which underlined words in a group of sentences were contractions and which were not. Students would be expected to explain what made each an example or a nonexample of contractions.

From these samples you can see there are certain common elements to concept-learning strategies:

1. Students must focus on several examples and nonexamples of the concept.
2. Students must gather and verify information as to the *concept-relevant characteristics* of each individual example and nonexample.
3. Students must note how the examples vary and yet are still examples of the concept.
4. Students must note what is *alike* about all the examples of the concept.
5. Students must generalize that what is alike about all the examples they've examined is also true of all other examples of the concept.
6. Students must note how the nonexamples resemble examples, but, particularly, how they *differ* from them.
7. Students must generalize about the characteristics that *distinguish* all examples of the concept from any item that might resemble them in some way.

What Should Curriculum Materials Provide?

You might find it useful and enlightening to check a number of curriculum guides and text materials to see how concepts are introduced. How often is there nothing more than words: the concept label and a definition? If examples are presented, are the concept characteristics clearly identified in each example, or is it assumed that the reader can and will identify the right ones?

For curriculum materials to promote concept development:

1. Concepts should be clearly identified as concepts (not facts, principles, attitudes, and skills).
2. Concepts should be clearly stated in terms of the set of characteristics by which examples are identified and by which examples can be distinguished from nonexamples.
3. Several good examples and nonexamples should be suggested or provided for use with students.
4. One or more appropriate concept development learning sequences should be outlined for each concept. These should state clearly what the learner needs to do at each step of

the sequence and what the teacher might provide, do, or say to guide students through the conceptualizing process.

5. Appropriate concept testing and reinforcing activities should be included (as in our example of having students distinguish contractions from possessives). Each should require students not only to identify new examples but also to cite the presence (or absence) of the concept characteristics.

None of the foregoing ideas is new. Nor is reading and understanding them all that is needed to make concept learning a consistent reality in the classroom. To conceptualize these ideas, the reader needs to encounter and deal with a number of examples and nonexamples of their use in the classroom. To develop skill in the use of concept learning/teaching strategies requires not only conceptualization, but firsthand experience with their results with students, willingness to take the required action to achieve the desired results, and enough practice and application to make the learning and teaching strategies an integral part of both curriculum and instruction. ■

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