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ABSTRACT

The Domain of Cognition is a taxonomy for planning, sequencing, and implementing instruction, which covers the entire range of cognitive and cognitive-affective learning and behavior. Students acquire, learn, and use information on eight hierarchically and sequentially arranged levels of complexity. The levels and their corresponding abilities are: (1) preparation and observation--receive cues; (2) reception--acknowledge that information is received; (3) transformation--assign meaning to and use information; (4) retention--demonstrate information which can be recalled from memory; (5) transfersion--form new information, based upon guidelines retrieved by the individual who is cued to use them in a particular situation; (6) abstraction--use guidelines to solve problems without being obviously cued; (7) organization--arrange and prioritize abstractions; and (8) generation--integrate two or more abstractions to create a completely new one. Unlike other taxonomies (such as Bloom's or Krathwohl's), the Domain of Cognition recognizes 21 processes and procedures which take place at every level of difficulty, and specifies the importance of guidelines and cues. (CP)

The Domain of Cognition:

A Functional Model for Looking at Thinking and Learning

by

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THE DOMAIN OF COGNITION

The Domain of Cognition which is described in this paper was conceived in the author's concern with the problems pre-service teachers, in-service teachers, and curriculum planners were having with existing taxonomies and to help eliminate some of the misconceptions about learning which have been a by-product of interpretations of current and popular taxonomies and hierarchies.

The Domain of Cognition includes eight distinct categories of thinking and cognitive-related learnings (see Figures 1 through 3). This taxonomy serves to provide a more functional model for planning and sequencing instruction and for identifying the outcomes of instruction. It also includes those findings from recent research on memory and learning which are relevant to cognitive-related thinking. The model then represents a theoretical construct which covers the entire range of cognitive and cognitive-affect learnings and behavior.

The rest of this paper presents a detailed description of this model and its attributes. The reader is cautioned not to equate this taxonomy with any existing model or hierarchy. This is an entirely new approach and would best be understood by viewing it in this way rather than through reference to these existing systems.

STEP-BY-STEP THROUGH THE LEVELS OF THE DOMAIN OF COGNITION

In this model of thinking and learning, the student may acquire, learn, and use information on eight different and sequentially arranged levels (see Figure 1 (yellow) and 2 (salmon). In order to clarify these levels and their interrelationships among one another, the section below will stress the flow of new information from the lowest level of thinking about this information, Preparation, to the most sophisticated level of using it, Generation. These levels are explained in terms of how entirely new information may be incorporated into one's thinking. For the purposes of this paper, this explanation is directed at how the student may operate in classroom settings and within a single period or over several days of instruction.

1. Progressing Through the Levels of the Taxonomy

Before new information is even observed or noticed by the student, he may begin his thinking about it by by being alerted to pay attention to this information even before it appears. The student is capable of thinking about information he has yet to observe or receive and he does it much of the time. This level of pre-Observation thinking about new information is labeled Preparation. Questions provided the student before he begins a reading assignment may serve to prepare him for what he is about to observe in the reading. On this level, the student thinks about and makes himself ready to observe some information based upon cues which alert, instruct, direct, or inform him as to what he is to pay attention to in a future situation. Pre-Observation cues can help make the student mentally ready for about-to-be received information.

THE DOMAIN OF COGNITION*

1.00 PREPARATION

"OBSERVATION" (Sensory input of data)

2.00 RECEPTION

2.10 Acknowledgment

2.20 Notation

2.30 Declaration

3.00 TRANSFORMATION

3.10 Personalization

3.20 Adaptation

"INFORMATION ACQUISITION" (Encoding and storage of data into long term memory)

4.00 RETENTION

4.10 Recognition

4.20 Recollection

5.00 TRANSFERSION

5.10 Replication

5.20 Variation

6.00 ABSTRACTION

6.10 Monotation

6.20 Formulation

6.30 Assemblation

7.00 ORGANIZATION

8.00 GENERATION

FIGURE 1:
An outline of the major levels and the sublevels of the Domain of Cognition.

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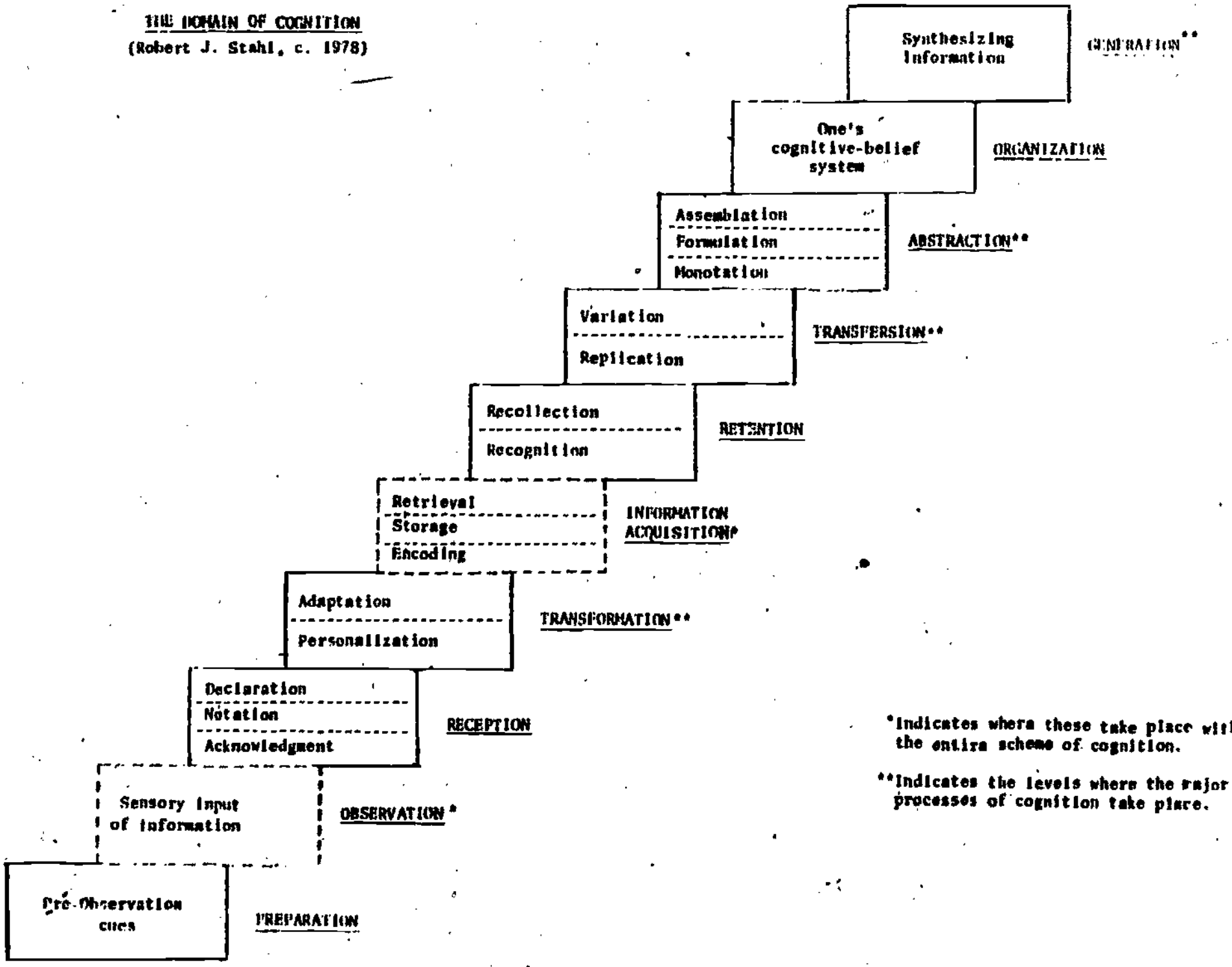
THE DOMAIN OF COGNITION
(Robert J. Stahl, c. 1978)



*Indicates where these take place within the entire scheme of cognition.

**Indicates the levels where the major processes of cognition take place.

FIGURE 2: The levels and sublevels of the Domain of Cognition illustrated in hierarchial form.

FIGURE 3:

THE DOMAIN OF COGNITION - SHORT DEFINITIONS

Level of Cognitive Functioning	Descriptions	Sample Behaviors by Which One May Infer These Internal Cognitions
1.00 PREPARATION	Preparation refers to the consideration by the individual of what is to be paid attention to, to be focused on, or to be ignored in terms of the experience and information which are about to be presented. This behavior stresses the cues or preinformation organizers which help to guide (or direct) a person's attention, perceptions, and cognitive processes even before information is presented to the person. These cues may be provided in immediately available informatio (i.e., information the person has just received) or may be responses to cues learned at higher levels.	
2.00 RECEPTION	Reception refers to the ability to acknowledge, report, or provide specific information or behaviors with much the same content and message as contained in data and/or experiences which are presently available to or have just been presented to the individual. This behavior does not require the recalling of previously learned information but only requires the indication that currently available data havebeen attended to and at least momentarily received by the individual.	
2.10 Acknowledgement	Acknowledgement requires the individual to demonstrate minimum awareness of some specific aspects of the environment. The person merely demonstrates some evidence of having minimally attended to some external experience or stimuli.	The student nods his head to acknowledge having heard the teacher's comments.
2.20 Notation	Notation requires the individual to demonstrate a minimal overt behavior that reveals that some information about the present experience has been at least temporarily retained. The emphasis is entirely on the giving of evidence of at least some minimal acceptance of the information even if it is only long enough to copy it.	The student takes notes on the teacher's lecture.
2.30 Declaration	Declaration requires the individual to demonstrate in more formal public ways that the specific information which has been attended to has been received. Here the individual reports what it is that is being or has just been witnessed in the form of specific observable details of this experience.	The student orally states what is in a picture the teacher is holding up.
3.00 TRANSFORMATION	Transformation refers to the ability to process recieved information and to translate it into information which gives it meaning and which has meaning for the individual. The individual is called upon to produce a form of presently available information with the expectation that it will not alter or change the message, content, or intent of the original information or experience.	
3.10 Personalization	Personalization requires the individual to explain what presently available information means from his own personal point of view and perspective. The individual attaches and assigns meaning to the content, form, message, and intent of some information or experience with this meaning related directly as to how the individual personally understands the experience.	The student tells what he thought the author meant to say in a particular segment of the story.
3.20 daptation	Adaptation requires the individual to form a second piece of information such that it represents only a new version of the original information without intentional changes in the message, meaning, or intent of the presently available information or experience. This behavior often involves changing the form or rearranging the content of some data without altering its message, meaning, or intent. The individual focuses on the use of presently available information and newly acquired understandings in a further effort to understand both within the context of the experience.	The student uses data just presented in a lecture to discuss a current economic issue.
4.00 RETENTION	Retention refers to the ability to present, provide, or recognize specific information, data, or items of much the same content and features as that which was originally presented or understood. The individual is required to recollect (retrieve) information from memory of the same or nearly the same content, features, and message as that which was originally presented or understood. This behavior or product may include some alterations in the message or content of the originally presented or transformed information, but these are encoding-storage-retieval problems and not the results of deliberate attempts on the part of the individual to modify (distort) that information as it was presented.	

4.10 Recognition	Recognition requires the mere indication that some form of information presently available to the individual is identical or at least similiar to information presented in a previous situation. The individual is not called upon to provide all the information but only to indicate those aspects of the present situation which are similiar to that information which they acquired from previous experiences.	The student correctly matches previously learned definitions to their parent terms.
4.20 Recollection	Recollection requires the individual to retrieve and provide all the information on his own entirely from memory in response to some stimuli. The individual recalls from memory information in much the same content and message as that which was originally presented and ultimately stored.	The student correctly lists in writing the names of the five generals studied in last week's lesson.
5.00 TRANSFERSION	Transfersion refers to the ability to form new information, understandings, and products based upon guidelines[1] retrieved by the individual who is cued[2] to use them in the particular situation. This behavior requires the use of guidelines to examine or explain a situation and to produce information about or from it using these guidelines as the basis for this productive effort. As defined and to be correct, the new information must be logically consistent with the known original information and with the guidelines which are used.	
5.10 Replication	Replication requires the use of a single, set, or combination of guidelines in situations which have previously been presented to the individual and which may be identical to the situation where the guidelines were originally learned. Here, the individual practices or rehearses the guidelines he has recalled from memory in trials or on problems of the kind in which he is already familiar.	The student uses a list of five features of "pressure groups" he has recalled to examine a newly formed "pressure group."
5.20 Variation	Variation requires the use of a single, set, or combination of guidelines in situations which have not previously been presented to the individual and which are new situations where these guidelines may be applicable. Here, the individual practices or rehearses the guidelines he has recalled from memory in trials or on problems different from those which he is already familiar.	The student uses a list of five features of "pressure groups" he has recalled to examine the behavior of the Puritan Church in 17th Century New England.
6.00 ABSTRACTION	Abstraction refers to the ability to use spontaneously and without cues previously learned guidelines understood as abstractions in order to solve, respond to, or explain situations both similiar to and different from those where these guidelines were originally acquired and practiced. On this level, the basis for a response must be both explained and tied to guidelines understood as abstractions. Furthermore, in all cases, the guidelines used must be as a response to internal cues from the individual himself rather than to cues provided by an external agent.	
6.10 Monotation	Monotation requires the use of a single or a set of guidelines understood as abstractions to examine, explain, or respond to a situation.	The student correctly and spontaneously uses the definition of the concept "competition" to explain a problem existing between two nations.
6.20 Formulation	Formulation requires the use of combinations or chains of guidelines as the basis for a response to a particular situation. The individual may find the use of two or more separate guidelines in combination with one another more appropriate to his needs in the given situation. In these cases, he may form his own 'rules' and 'principles' as a result of his chaining of two or three guidelines in an effort to resolve or explain a situation.	The student correctly and spontaneously chains two concepts to form the principle "If competition, then violence is likely" to explain a series of social events.
6.30 Assemblation	Assemblation requires the combination or chaining of several separate guidelines or sets of guidelines to make a meaningful response to a given problematic situation or experience. In such instances, this behavior involves the combination of guidelines chained to form complex sets of abstractions by which situations and problems may be examined, and possibly resolved.	The student correctly and spontaneously combines his understanding of the five features of "pressure groups" with the principle "If competition, then violence is likely" to predict what might happen if two rival groups begin to lose their supporters.

[1] See attached handout on "Guidelines".

[2] See attached handout on "Cues".

7.00	ORGANIZATION	Organization refers to the systemization of abstractions and their corresponding sub-abstract details. Because abstract understanding implies the internalization of information, knowledge, comprehensions, and guidelines understood as abstractions and since the volume of the abstractions acquired by the individual increases with time and experience, each individual engages in the processes of arranging, ordering, and placing into a hierarchy these abstractions within a single cognitive belief structure. Organization functions as the process and product of these procedures to arrange, organize, prioritize, and systematize these abstractions and their related content details.	
8.00	GENERATION	Generation refers to the ability to integrate separate elements understood as abstractions in order to form a single new product or abstraction which is unlike any previously assembled abstraction or set of ideas with this integration being internally consistent and an extension of the abstractions used in the process.. This process requires that the individual integrate through synthesis (e.g., Hegel's model) two or more sets of abstractions resulting in an elimination of some of the abstractions in favor of forming a new single abstraction. On this level the individual supplies the essential components needed to create the new integration through synthesis.	

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Following the Preparation level comes the actual intake of sensory received information broadly referred to as Observation. While Observation is not technically a level of this taxonomy, it is described here in order to inform the reader as to where the intake of new information actually takes place within the whole scope of cognition (see Figure 2). If it is to be received by the student, new information from external sources like teacher lecture or the textbooks must be picked up by his senses. The teacher cannot assume that information presented in class will be taken in or 'observed' by the student.

Following Observation comes the level where the student indicates whether or not he has received this new information. Level 2, Reception, stresses the student giving some evidence that some information of some kind has been taken in by him. Classroom teachers may see signs of this reception of information through minimal behaviors (e.g., a simple nod of the student's head) or more obvious ones (e.g., an oral statement of what the student is reading). Higher levels of thinking progress from what information the student has received, and what was received may or may not be similar to the information that was presented in class. Reception level thinking goes on automatically with or without behavioral evidence that it is taking place. The teacher should seek observable indicators of Reception, especially when the information that was to be received is important to more advanced levels of thinking and learning.

Information that is received must be given meaning that makes sense of this information in terms the student, himself, understands. This meaning is initially assigned just after the information has been received by the student. In his attempt to make sense of this new information, the student may also try to put it to use during the same class period in which he received it. Both the assigning of meaning to and the use of new information during the class period where it was first learned are Transformation level forms of thinking. The uses the student makes of this newly received information helps him in his assignment of meaning to it as well as serves as a test for the meanings he has already assigned to it earlier in the period. For the teacher, Transformation learnings and behavior are not to be equated with long-term memory or that the student will 'know' this information tomorrow. As a general rule, new informations and understandings the student receive in any part of a class period can never attain higher than Transformation level learning on the day they were received.

Following Transformation comes the automatic and apparently unconscious operations where information is discarded or coded, stored into long term memory, and prepared for retrieval. The information that is stored is not always the same as what was received which in turn may not be the same as that which was presented to the student. However, it is the information that the student stores which serves as his 'knowledge' of that information. The more critical information is for higher levels of thinking, then the more necessary it is that he

store this information in long term memory for each accessibility and retrieval. Since guidelines are the basis for all higher level thinking, it becomes important that teachers help students receive and practice these guidelines on the transformation level. The highest phase of this 'information acquisition' level is the retrieval of stored information from long term memory.

Level 4, Retention, follows the retrieval of information from long term memory and serves as the level which demonstrates what can be and/or has been recalled from memory. For purposes of this model and classroom instruction, it is assumed that new information presented in the previous day's class which can be recalled from memory is stored in memory. Thus, that which can be recalled from memory from at least the previous day's lesson is operationally defined as the student's "working knowledge" of this information. The student can give evidence of what he can and has retrieved by recognizing this information when it is presented in the next day's lesson (e.g., via a multiple choise test) or by providing all the information on his own via total recall (e.g., completing a fill-in-the-blank test).

At this point, the distinction between "working knowledge" and "usable knowledge" needs to be pointed out. "Working knowledge" is that information the student can recall from memory while "usable knowledge" refers to only those forms of information the student can put to use in order to guide, direct, or serve as a basis for his thinking. The term "guidelines" is used in this taxonomy to mean any form of information which the student can apply to help guide, or base his thinking. All evels of thinking above Retention depend upon the understanding and use of 'guidelines.' Therefore, it is important that the student be able to recall the 'guidelines' he has previously received and stored so that higher level thinking is possible.

If the student is able to recall these guidelines, then he is able to put this information to use. The Transfersion level represents the application of recalled-from-memory information in situations and settings familiar to, and different from those where this information was first received. For example, the student may be asked to recall ten characteristics of primitive societies from yesterday's lesson and to use these characteristics today to look at another group of people which is considered a nomadic tribe. This use of retrieved information illustrates Transfersion level thinking. On this level, the student can make use of one or all twenty-one processes in order to put to use and practice the guidelines he has recalled. For Transfersion, the student not only practices using recalled guidelines, but he also comes to better understand what signs he can use to tell (cue) him as to what guidelines he should use in a given situation. The accuracy of his recall of the guidelines, the correctness of his use of these recalled guidelines, and the associations he makes between a given set of guidelines and one or several signs which can cue him to use a given set of guidelines are important forms of Transfersion thinking.

EXAMPLES OF THE FORMS OF INFORMATION
WHICH MAY SERVE AS "GUIDELINES"

A single or specific		A set, list, or group of:	
assumption	law	assumptions	laws
attribute	method	attributes	methods
axiom	methodology	axioms	methodologies
belief	model	beliefs	models
canon	moral reason	canons	moral reasons
category	name	categroies	names
characteristic	norm	characteristics	norms
class	policy	classes	policies
component	postulate	components	postulates
concept-label	practice	concept-labels	practices
concept	precept	concepts	precepts
conclusion	premise	conclusions	premises
code	principle	codes	principles
criterion	procedure	criteria	procedures
decision	process	decisions	processes
definition	program	definitions	programs
description	property	descriptions	properties
doctrine	quality	doctrines	qualities
element	reason	elements	reasons
explanation	reference	explanations	references
feature	relationship	features	relationships
formula	relevant attribute	formulas	relevant attributes
frame of reference	rule	frames of reference	rules
generalization	specification	generalizations	specifications
guideline	standard	guidelines	standards
hypothesis	technique	hypotheses	techniques
indicator	tenet	indicators	tenets
inference	theory	inferences	theories
justification	trait	justifications	traits
label		labels	

FIGURE 4: According to this approach to conceptualizing the thinking-learning of information on different levels of cognition, the individual must learn to use "guidelines" such as those identified above as the basis for Transfersion and all higher levels of thinking.

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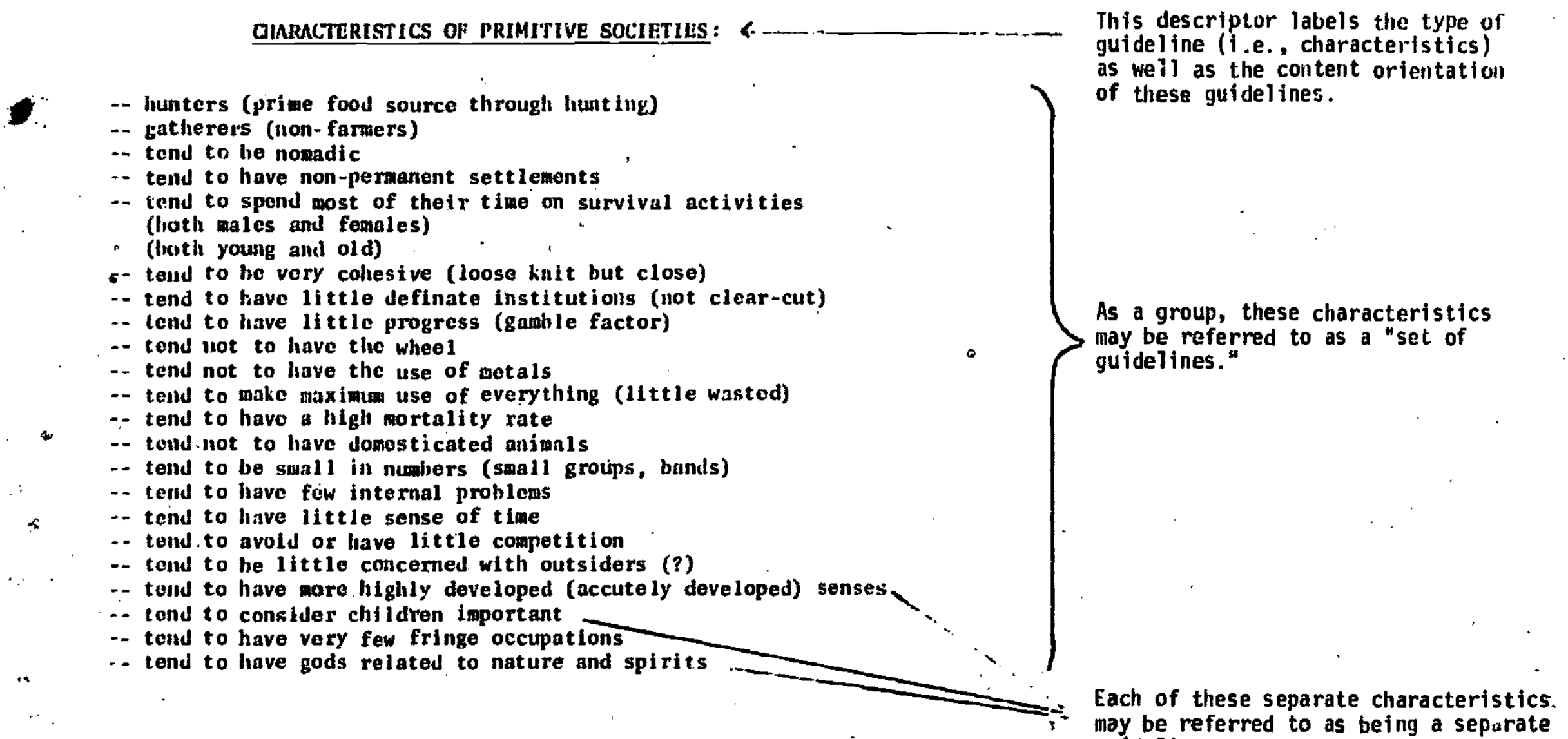

FIGURE 5: An illustration of the distinction between an individual guideline (in this case the form of guideline called 'characteristics') and a set of guidelines (in this case the entire list of characteristics associated with a primitive society).

At some point in time, the student comes to understand a set of guidelines so well that he knows when, where, and how to use them without being told or obviously cued to use them by some external source. In such cases,the student may have difficulty remembering the precise wording of the original guidelines since their intent and message are so well inter..lized that for him to spend time trying to remember them before using them would be highly inefficient and awkward. When this understanding of the message and use of guidelines is achieved, then this thinking is on the Abstraction level. The student can make use of these internalized guidelines understood as abstractions by means of any of the twenty-one processes.

Because of the very nature of Abstraction level thinking, teachers cannot "teach" students to think abstractly, i.e., to internalize guidelines so that they can be spontaneously and freely used without cues in situations where their use is appropriate. Teachers can have students practice these guidelines over and over on the Transfersion level, but they cannot give students practice on the Abstraction level. The best the teacher can do is to provide the "conditions" where a particular set of guidelines would be appropriate and then check to determine whether or not students can indeed use these guidelines without being cued to use them. Because a particular unit focus, content area, setting, materials, or earlier test item may provide the student with cues which tell him what he had better or must use to deal with a problem or situation, most teachers would have a difficult time setting up "conditions" to test for Abstraction level thinking for those guidelines they introduced to the student.

As more and more guidelines are understood on the Abstraction level, the student automatically and unconsciously arranges, interrelates, and prioritizes these sets of abstractions. This activity is referred to as Organizational level thinking and its results form the student's cognitive belief system. Guidelines understood on this level operate to influence what the student prepares to receive, what he receives, how the information received is transformed, stored, and retrieved, what and how information is understood on the Transfersion level, and what is understood on the Abstraction level. Depending upon their importance some guidelines have greater influence than others on one's overall thinking, learning, and behavior.

Finally, the student may find that some things cannot be explained or resolved by what he presently understands. He finds that separate or combined sets of guidelines do not provide satisfactory ways of dealing with some situations. Therefore, sets of guidelines may become inter-meshed with one another such that a new set of guidelines emerge which is distinct from either of the orginal sets and which is more functional than either or both the previously existing guidelines. This occurence creates new usable information and is referred to as Generation level thinking.

Following the above description of the sequential progression through the successive levels of this taxonomy, the reader may desire to see the levels and sublevels defined more specifically. Figure 3 provides short definitions while Appendix A provides extensive definitions and illustrates specific behaviors for these levels.

The classroom teacher should realize that the taxonomy helps to explain how information is incorporated within a students thinking. It is not meant to suggest that only correctly understood information operate in this way. Rather, any information a student receives, transforms, stores, retrieves, and later uses may be inadequate or incorrectly understood. In such cases, the student will usually operate as if his understanding is correct and complete unless he receives information to the contrary. As a general rule, the student operates as though his knowledge and understanding are correct and will continue to operate on that assumption until he receives information to the contrary.

2. Some Complementary Components of This Model of Thinking

As introduced above, not all information can be used to guide, direct, or base a student's thinking. Information which can be used to guide, direct, or base a student's thinking. Information which can be put to use is referred to as a "guideline." Figure 4 (pink sheet) presents a list of some of the forms of information which may be used and, hence, which are included in the broad category called "guidelines." Different content areas on subject matter fields will tend to make more use of some of these kinds of guidelines than others. Figure 5 provides an actual example of a "set of guidelines" with each "tendency or characteristic" serving as an individual guideline. A later part of this paper will provide much greater detail on guidelines and the uses of guidelines as they relate to the different levels of thinking.

Often times the level of student learning and thinking is determined by what "processes" he can use rather on what he uses as the foundation for this process. This orientation assumes that different processes are inherently related to particular levels of thinking and are dependent upon higher level learnings and understanding of information. However, this taxonomy rejects both of these assumptions. As defined, here, a process is the simplest form of mental activity which is content-free and which functions to treat information or content in a particular way in order to bring about a particular result unique to it. Furthermore, a given process is independent of any specific level of cognition and is not to be associated with a body of content or information. Figure 6 (blue sheet) lists the twenty-one separate processes which have been isolated so far. (also see Fig. 8).

MAJOR INFORMATION PROCESSES OF COGNITION*

Process Name	Major activity of the process
1. Association	Associating
2. Classification	Classifying
3. Combination	Combining
4. Comparison	Comparing
5. Condensation	Condensing
6. Conversion	Converting
7. Description	Describing
8. Designation	Designating
9. Discrimination	Discriminating
10. Extension	Extending
11. Extraction	Extracting
12. Interpretation	Interpreting
13. Organization	Organizing
14. Proposition	Proposing
15. Reconciliation	Reconciling
16. Selection	Selecting
17. Separation	Separating
18. Translation	Translating
19. Utilization	Utilizing
20. Valuation	Valuating
21. Verification	Verifying

FIGURE 6: The major information processes of cognition which may occur on the Transformation, Transfersion, Abstraction, and Generation levels of the Domain of Cognition. These same processes in combinations with one another form "procedures of cognition."

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Processes and procedures (which are combinations of processes such as problem-solving, conditional reasoning, and induction may occur on the Transformation, Transfersion, Abstraction, and Generation levels. What determines on what level the student is operating for a given process or procedure is the level that he understands the guidelines he is using as the basis for the process--nothing more and nothing less. Consequently, a student may engage in the activity of "analysis" on at least four (4) different levels depending on how well he understands the information base he is using for the basis of this process

3. The Taxonomy as a Model For Planning and For Sequencing Instruction

In order to plan for and develop instructional activities for classroom use, the teacher must first consider the type of thinking and learning the student should reach by the end of the unit. For practical purposes, the teacher cannot anticipate being able to get a student to "generate" original sets of guidelines or to modify the way he has organized his abstract understanding.

For planning purposes, the teacher should first consider the highest level of learning the student is expected to reach and then consider planning downward from this level. Figure 7 (goldenrod) depicts the taxonomic levels in reverse stairstep sequence for purposes of illustrating the upper-to-lower level orientation one takes in planning instruction.

At best, the teacher can achieve Abstraction level learning. In order to achieve the ability to freely and spontaneously use guidelines to respond to situations in settings where their use is not expected or anticipated, the student must have practiced using these guidelines on the Transfersion level. And, in order for the student to practice guidelines on the Transfersion level, he must be able to recall them on the Retention level. In order for the student to be able to store and retrieve these guidelines on this level, he must have Transformed them after their Reception on the pre-storage level. Finally, to ensure that the guidelines are likely to be received, the student may need to be prepared to receive them on the Pre-Observation level.

As a model for sequencing and implementing instruction, the teacher follows the reverse procedure by starting at the Preparation level and moving "up the ladder" towards the level of understanding that the student is expected to reach. Figure 7 depicts both the sequence for planning and the sequence for implementing instruction.

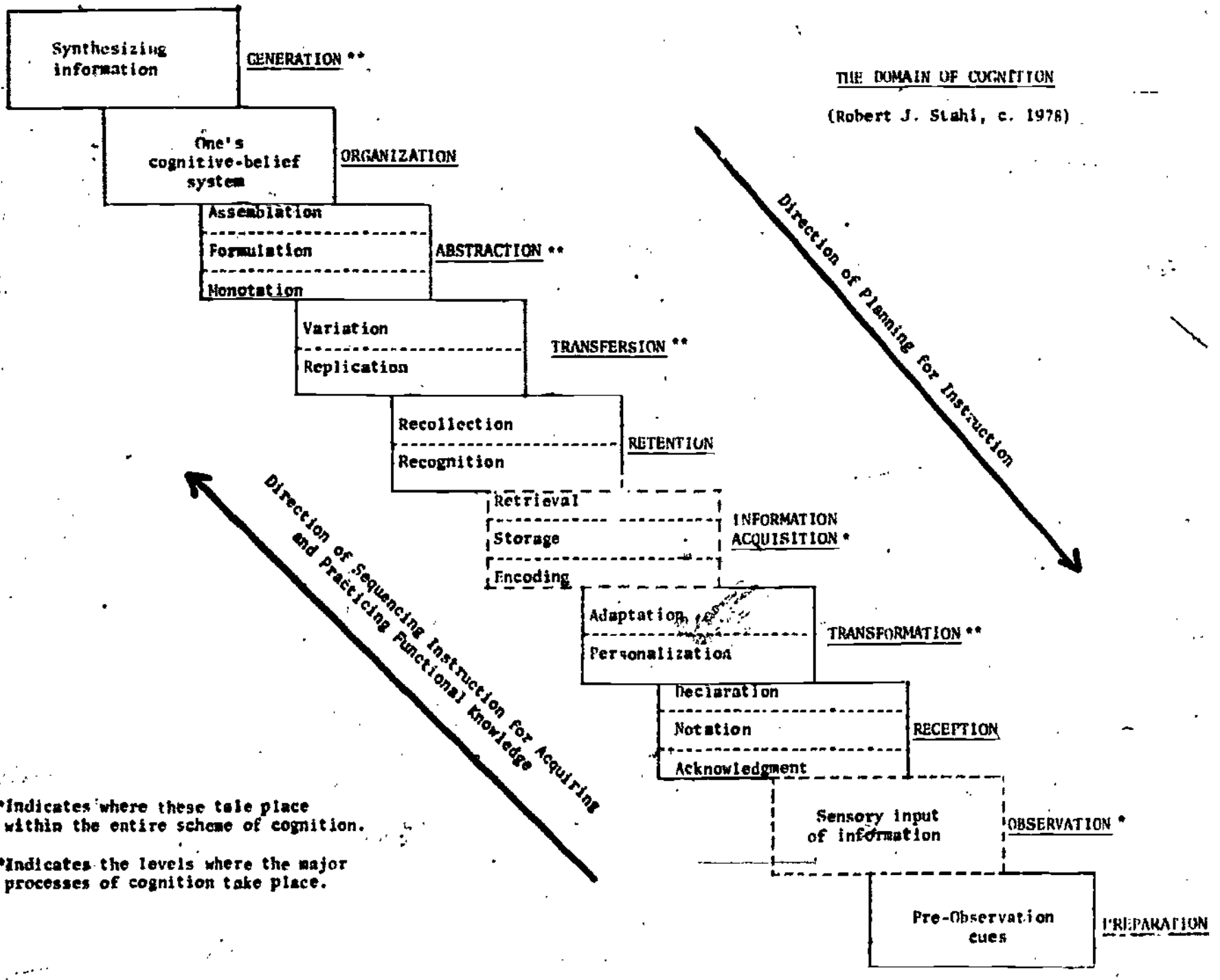

FIGURE 7: The levels and sublevels of the Domain of Cognition as viewed through the planning for and sequencing of instruction.

CRITICAL ATTRIBUTES OF THE DOMAIN OF COGNITION

Because of the dynamic nature of this taxonomic model and of the tendency of readers to compare this model with that of Bloom and/or Krathwohl, this section of the paper will focus on those areas which are unique to this particular approach. The attributes described below also serve to mark how the Domain of Cognition significantly departs from existing taxonomies. The critical attributes to be discussed in the order of their presentation are:

1. The integration of cognition and cognitive-affect;
2. The levels of the Domain of Cognition
   a) Explanations of and distinctions between the levels of cognition
   b) Pre-Observation level cognitions
   c) The interaction between Reception and Transformation level thinking
   d) Post-Transformation encoding and storage into long term memory
   e) Moving from Transfersion to Abstraction level thinking and learning;
3. The role of "guidelines" in cognition;
4. The role of affect-oriented guidelines in cognition;
5. The role of cues in cognition; and,
6. Processes and procedures of cognition
   a) The processes of cognition
   b) The "process cluster"
   c) Procedures of cognition
   d) The distinction between higher and lower level processes and procedures
   e) Cognitive-affect processes and procedures

The explanation of these attributes and components of the model will provide a more in-depth description of this taxonomy, especially in the area of the interrelationships among its parts.

1. The Integration of Cognition and Cognitive-Affect

By design, the Domain of Cognition sought to include all types of strictly internal cognitive (thinking) operations into one single frame of reference. Extracted from taxonomies and systems which presented cognitive-affect as "affective" behaviors were those aspects of learning and behaving which are essentially cognitive in nature. Thus, the Domain of Cognition includes in integration of cognitive and cognitive-affect learnings into a single, functional model of cognition.

The original purpose of the dissolution and eventual integration of the former cognitive and affective models was not the intentional blending of these two modes of behavior. Instead, this effort sought to 'purify' current affective models in order to leave them with those aspects of behavior which were uniquely "affective" (i.e., emotive behaviors and sensations, feelings, and dispositions). An equally important task was to develop a single model which consolidated all behavior that appeared to be cognitive in nature. The product of these efforts is a model which seems to have accomplished both purposes. For this reason, the Domain of Cognition must not be considered a modificatio of any existing taxonomy--it is an entirely new way of looking at nking and learning.

In this taxonomy, cognitive-affect, like all cognitions, is not automatically assigned to any specific levels of thinking. And, again like all other cognitions, cognitive-affect takes many different forms within the whole range of behaviors associated with this model of thinking and learning. Cognitive-affect is incorporated into this system in the ways identified and described below.

a. Affect decisions and thinking are not automatic indicators of any particular level of cognition. Like all thinking and outcomes associated with thinking, the level of one's affect decisions and thought is directly tied to the level of understanding the student has of the information which was used as the basis for the decision or thought. Therefore, in order to help a student achieve higher level values/moral/ethical/aesthetic decisions and thinking, the student has to learn the guidelines which produce such decisions on higher levels.

b. Affect-oriented guidelines, like all guidelines, serve as the basis for decision-making and thinking. Affect guidelines are not to be automatically associated with any given level of the taxonomy. The level to assign a guideline is determined by how the student understands the information included in the guideline itself. Hence, all affect-related guidelines (e.g., moral reasons, moral criteria, and ethical principles) are treated only as different kinds of information and are

not viewed as being inherently better or on higher levels than other forms of guidelines.

c. Affect processes and procedures are also free of any particular level of thinking. These processes and procedures operate on several different levels of the Domain of Cognition and are defined as being both "content-" and "level-free." The primary affect process is Valuation while affect procedures include moral reasoning, values/moral problem solving, and making ethical judgments. In each of these situations, the level assigned to process or procedure is always determined by the level of understanding of the guidelines used as the content for the process thinking. Thus, affect processes and procedures, like all cognitive processes and procedures, operate independently of any given content information as well.

As illustrated above, cognitive-affect is an active, on-going and integral aspect of the Domain of Cognition and is not a separate component to be treated differently than other cognitive operations.

For those who are looking for more obvious indications that this taxonomy does indeed contain integral components of cognitive-affect behavior will find few such indicators. This dimension is, however, discussed as is appropriate under some of the other attributes and descriptions of this model.

2. The Levels of the Domain of Cognition

The Domain of Cognition includes eight (8) categories or levels of cognitive-oriented behaviors ranging from pre-Observation 'set' to the generation by the individual of new information unique to that individual as extended from his personal cognitive belief system (see Figures 1-3 and Appendix A). These levels appear to possess a hierarchial arrangement and for convenience may be considered as being hierarchial for purposes of understanding how individuals process information at different levels of complexity. Among the features of these levels and their interrelationships are:

a) Explanations of and distinctions between the levels of cognition

Level 1, Preparation, represents pre-Observation thinking which serves to 'set' or direct the attention of the student to specific aspects of the environment immediately before it is presented or experienced. Levels 2 and 3, Reception and Transformation respectively, represent post-Observation and pre-storage thinking. The effects of the thinking which occurs on these levels in large part influence "what" and "how" information just received is likely to be encoded and stored in long term memory. The interation of these levels of thinking also in part is responsible for what information is not

likely to be stored for later retention or retrieval. The encoding and storage of information into long term memory follows Level 3 or Transformation thinking.

Retention, Level 4, represents the ability of the student to provide evidence of the retrieval of stored information. It represents that body of information which may be considered the student's working knowledge of previous experiences and information. For purposes of instruction and as a practical rule of thumb for the classroom teacher, it may be assumed that a student who cannot retrieve information from the previous day's lesson--no matter how well he seemed to have understood it at that time, then the teacher cannot operate as if the student has 'knowledge' of it.

Transfersion, Level 5, represents the use of stored and retrieved information in various situations when it is appropriate to use it. On this level, the student has the opportunity to practice using his working knowledge. After a time the student may become so familiar with some information and its uses that they become understood as 'abstractions' rather than merely as specific pieces of information. When this level of understanding occurs, Level 6, Abstraction-level thinking, has been reached.

The movement from Transfersion to Abstraction level thinking on the part of the student brings with it a corresponding change on part of the teacher's role in instruction. Whereas prior to Abstraction the teacher could assist the student to acquire and practice using new learnings, on this level and those which follow, the teacher can only provide "conditions" which would allow the student to freely and spontaneously use the information supposedly understood as an abstraction in order to react to the situation presented. Thus, the student must have internalized certain kinds of information (i.e., guidelines) that have been practiced along with their appropriate cues such that their use is spontaneous even though only indirect cues may be provided. (The sections on "guidelines" and "cues" below will serve to clarify these two critical components of the Domain of Cognition and the way one goes about processing information.) On the Abstraction level, in a given classroom situation any time the student is "cued" by a specific form or context in the situation as to what he had better use to deal with the problem, then this level of thinking is at best Transfersion. Thus, a student's performance on a written assignment in social studies when he is not directed or expected to pay attention to grammar, spelling, etc. would be a good sample of "how" and "what" he understands about grammar, spelling rules, etc. on the Abstraction level.

Organization, Level 7, represents the arrangement and structuring of accumulated abstractions within a single cognitive-belief system. The last level, Generation, represents the efforts of the student to integrate via synthesis (e.g., Hegel's model) separate sets of guidelines understood as abstractions to produce new orientations to and understandings of his universe of experiences.

b) Pre-Observation level cognitions

Each student continually responds to environmental information on the basis of pre-experimental cues or dispositions which tend to prepare him for the next experience or piece of information. The pre-Observation cues serve to provide the student with a 'mental set' which frequently influences--if not determines--what information will be attended to and probably received, how this information is to be processed, and how this information is likely to be encoded and stored in long term memory.

Although the teacher often provides cues to the student immediately prior to the presentation of information or experiences, these cues may not possess the same strength as ones the student has himself provided. Most students have acquired their own procedures for 'reading' environmental cues to alert them as to what to expect or to look for next in the way of information or experiences. And, unless cued otherwise or unless their own provided cues are over-ridden by some stronger external cues, each student will tend to follow his own 'reading procedures' and cues in preparing himself for classroom learning activities. The student may be cued by the subject matter content itself/by the classroom, by the teacher's directions, etc. such that he forms prejudgments about (a) what information is likely to be presented, (b) what information is likely to be important and hence, warrant his attention, and (c) how he should or can attend to, process, and/or store the information to be presented. In some cases, his personal cues over-ride any cues the teacher may provide--no matter how interesting or motivating they may appear to the teacher, other students, or an outside observer. (More details on the role and function of "cues" are presented below.)

c) The interaction between Reception and Transformation level thinking

Reception represents the level which indicates that some information of some kind has reached the student. As presented in this taxonomy the sublevels of Reception (and Transformation as well) are primarily identified to help the teacher view these levels of thinking as they would appear in specific classroom settings. Regardless of whether they appear in the form of outward behavior or not, the teachers need to be fully aware that Reception and Transformation level thinking takes place automatically within the student as new information is presented to him. It is also important for the teacher to realize that even though Reception and Transformation level thinking is automatic, this in no way is to be interpreted to mean that what goes on during or what becomes the end product of this thinking is necessarily a correct, complete, or an accurate representation of the original information or experience. For this reason, the teacher must listen and observe carefully during the student's public demonstrations of these two levels of thinking to make sure the results are consistent with the original information as it was presented. Furthermore, in many cases, the teacher's

passive response to a student's behavior serves to reinforce "what" and "how" he understands the information he currently is thinking about and trying to learn.

The lower forms of Reception level thinking indicate only minimal receipt of information while the highest form, Declaration, reveals publicly (orally) exactly what information has been received. Received information is eventually processed in terms of its meaning to the student. Hence, those visual, auditory, and other sensory inputs which have been received are translated into meanings which make sense to the student himself (i.e., it attains Transformation level status).

Because it is personal, the translation-transformation transition from Reception to Transformation level thinking may at times distort or modify input information that has been received. Transformation acknowledges the fact that different students consistently seem to understand information and experiences in quite different ways. Part of this transformation activity involves the degree to which the student understands and considers the meaning of the entire context in which the received information was embedded. This translation activity also involves how the student will use previous information and understandings as a basis for looking at and processing the new information. In the classroom, Transformation should extend to the efforts of the student to practice using his newly received information during the same class period it is received. This higher form of Transformation, Adaptation, represents yet another way the student can give meaning to and test the meanings already assigned to newly received information.

Subsequently, there is one important rule the teacher should follow to guide their assessment of a student's level of learning newly presented information. No matter how 'sophisticated' a student appears to have understood and can use new information presented to him in a given classroom period, the student can never exceed the Transformation level of cognitive understanding for this information on the day this information was first presented. Such 'sophistication' would only reveal the active interaction between Reception and Transformation level thinking. It should not be used to infer that this information or understanding has already been stored in long term memory for easy retrieval at a later date. Such active interaction would only serve to indicate "what" and "how" information is likely to be encoded and stored. Thus, Reception and Transformation serve to influence and not determine what and how information wil be stored for later retrieval. Consequently, the general rule the teacher should keep in mind for instructional situations is that new information presented to and understandings achieved by a student in one class period cannot be considered to be either stored or learned data until the next class period. The acceptance and adherence to this general rule would be consistent with the definition of "learning" as a reasonably stable ability of a person over time in regard to an acquired behavior based upon the use of received information.

An example may serve to clarify the meaning and implications of this aspect of thinking and 'learning.' Lets suppose a student receives information on the definitions of the three terms 'revolution,' 'civil war,' and 'rebellion.' Lets further suppose that he spends the rest of the same class period distinguishing between examples and non-examples of each of these using the definitions as the criteria of selection. This behavior illustrates Transformation level thinking and no higher level--regardless of how many of the examples he identified as being correct. Hence, while the student may appear to have 'knowledge' of these definitions and seemed to know how to 'apply' it, his responses cannot be used as the basis for inferring that this 'knowledge' has either been stored or can be retrieved at a later time by the student. To treat this behavior in any other way is to misrepresent the level of thinking itself. To assign this behavior at any higher level is not warranted by the student's actual performance nor does it indicate that he will be able to recall this information from memory at a later date. Hence, at-the-time-of-reception-of-new-information behavior can never be equated with learned knowledge nor with any behavior resulting from the use of stored information retrieved from memory. Ultimately, it is what the student has stored and can retrieve from memory about this information tomorrow that reveals what is in fact 'known' about these definitions, their uses, and the situations which were studied.

Inherent in this taxonomic model is the assumption of the existence of an 'elastic-like' short term memory componen . As mentioned above, it must be assumed that new information present d to and understood by a student during a given class period cannot be equated with the reaching of the Retention level (i.e., post-long term memory storage). The new information must be assumed to be only in 'temporary storage' and has not as yet been stored in one's long term memory. This elasticity of short term memory helps to explain why a student may cram large quantities of relatively new information into their memory or carry on during a three hour seminar as if he had really retained the information and afterwards behave with almost no 'knowledge' of what he had supposedly learned.

This phenomenon of apparently loss of knowledge also helps to explain why a well-structured and well-articulated "summary-review" at the end of a given period assists all students in consolidating and highlighting the information covered in class. This review helps students to reconsider--at the last moment so to speak--the meanings and understandings they have attached to this information. It may well be that the break etween classes allows the student to "clear" his short term memory the information just collected from the previous class and to prepa it for the next. This clearing includes the encoding and storage of information into one's long term memory as well as the discarding of some information deemed of little or no value by the student.

d) Post-Transformation encoding and storage into long term memory

Following Transformation level thinking about newly received information, the student automatically (and apparently unconsciously) decides what is to be kept and stored from all that has been received. Once this decision has been made, the results are automatically coded and stored for later use. The meanings which have been assigned to the information as well as the uses it was put to shortly after its reception influence this decoding-encoding-storage procedure. Depending upon how well students have accurately translated and used the newly received information, assessed its importance and/or relevance, and formed associations between new and already stored information, the new information may be (a) stored in convenient and easily accessible ways, (b) stored in more remote places, (c) stored in the 'wrong' way in terms of inappropropriate cues, or (d) discarded and not retained at all.

It is important for the teacher to realize that no one can guarantee that a student will encode information correctly and completely or will store it for easy later retrieval. However, it seems very possible for the teacher to take steps to increase the likelihood that information will be properly and accurately received, transformed, encoded, stored, and eventually retrieved by the student. These steps begin with (a) providing appropriate and functional pre-Observation cues, (b) reducing interference at the Reception and Transformation levels which may distort what is being received and/or how it is being personalized, (c) providing accurate and meaningful feedback on the "what" and "how" of information that has been processed on these two levels, and (d) using reinforcements to encourage positive and accurate meanings be assigned to the new behaviors and understandings the student is demonstrating. The literature abounds with the characteristics of each of these four steps as well as describes the means by which a teacher can help influence what students are likely to receive, encode, store, and retrieve.

e) Moving from Transfersion to Abstraction level thinking and learning

On the Transfersion level, the student practices and rehearses guidelines he can recall from memory in situations where these guidelines are appropriate. (See the section on "guidelines" should that be necessary.) The function of this level of thinking is to assist the student to determine how he can make use of the information he has stored and can recall. Transfersion thinking also helps the student to determine whether or not he knows "when, where, why, and how" to use the information he has stored in long term memory. In a sense, this level helps the student to make his recallable information practical knowledge.

The ability to use information retrieved from memory is a higher level ability than using the same information on the day it was first presented. It is higher level thinking because the student has already demonstrated the ability to store and retrieve the information and does not have to depend on referring to class notes, the text, etc. as the source of the information that is to be used. At any time, a student has to refer to notes or a text and then allows his thinking to be tied to the information provided in these sources, he operates on the pre-Retention level--even though he may have covered this information days, weeks, or months before. Here is an example of where the source of the information being an external rather than internal one makes the thinking which results a lower level rather than an upper level operation. Thus, while a student's response may be the same for both the Transformation (external source) and the Transfersion (internal source) levels, the Transfersion level response represents the higher level of cognition because the basis of his response is known at a higher level (i.e., known via recall from one's own memory rather than because it is presently available to the student and has not as yet been stored in long term memory).

In order to make information retrieved from memory practical knowledge and in order to make use of it for higher level thinking, the information must be of the form that can be 'put to use.' In the Domain of Cognition, information which possesses the potential to direct, guide, or provide the means to explain, examine, or deal with a problem, experience, or situation is referred to as a guideline. Guidelines may take the form of a list of characteristics, a definition, a rule or principle, a set of directions, etc. (see the section below on "guidelines" should that be necessary at this time). Each of these forms of information may be used to guide thinking and are different from information that cannot be used to direct or guide thinking. For example, a specific date, time, name of person, place name, or location which specify items for their own same would not be considered as guidelines because the student would have to make use of some other information such as the characteristics of a time period, the chronological sequence of some series of events, etc. in order to find much 'use' for these specific data. Guidelines are also associated with a specific or a variety of cues such that when these cues are given, the student should then recall and then use the guidelines he has associated with the particular cues. If the student is to be able to use the guidelines he has stored as guidelines, he must also be knowledgeable about the appropriate and inappropriate cues which go with each set of guidelines he has acquired. Since guidelines provide the basis for moving into higher levels of thinking, the student must be able to retrieve guidelines stored as information so that he can use and practice them on the Transfersion level.

As part of the learning on the Transfersion level, the student is informed as to what guidelines he is to use in order to respond to the particular problem or situation presented to him. For instance the teacher may inform the student that he is to examine the film on the Aborigines in terms of the 'characteristics of primitive societies' which he was able to recall from memory earlier in the period. Since these characteristics (i.e., guidelines) were studied on a previous day and were recalled at the beginning of the period, the student is now directed to practice using these characteristics on the Transfersion level. This activity gives the student practice in (a) identifying relevant stimulus cues associated with these guidelines, (b) actually learning more cues to which he can associate these guidelines, and (c) applying these guidelines to respond correctly and adequately to a given situation. A Transfersion level lesson would also emphasize what it is about the situation that might be used as "cues" to help tell the student that in future situations they should also consider using these same guidelines to direct their thinking. The cues may be presented by the environment, by the nature of the course or its subject matter content, by the type of problem, or by the form or shape of an item. It is during this practice-oriented level that the student comes to better understand the relationship between a given cue and the use of the guidelines he has associated with it. It is expected that after a time, when a certain cue is discovered in a particular situation, the student will automatically retrieve and use those guidelines which he has associated with it.

As a student comes to understand a set of guidelines, its uses, its appropriate cues, and the relationships between a given cue and its relevant guidelines, he begins the act of internalizing these to the point that he understands them as "abstractions" rather than as concrete pieces of information. In other words, the student begins to use these understandings as part of his way of perceiving, thinking, and behaving without being consciously aware that he is doing so. When this happens the student is said to have achieved the ability to spontaneously and freely use these understandings in relevant situations without being deliberately prompted to use them. In a manner of speaking, he will have internalized these understandings so well that they have become almost habitual, spontaneous, automatic ways to view and explain environmental situations which contain their relevant cues.

On the Abstraction level the teacher can only test for and/or provide conditions to determine whether or not the student has in fact internalized these understandings as abstractions. These tests or conditions must be separate and distinct from the contexts, situations, and most of the obvious cues which were present when the student first learned and later practiced these guidelines. For this reason, many teachers would have difficulty setting up appropriate tests to measure learning on this level. Math teachers may well have the most difficulty in setting up such conditions whereas English, Science, Social Studies, and other such subject matter area teachers should have relatively

little difficulty in providing such conditions. A student's use of the characteristics of "laissez faire economic and social theory" as the basis of interpreting Eisenhower's 1956 GOP Nomination Acceptance Speech several months after these characteristics were studied and practiced in class and without the teacher providing cues to 'tell' him he is to use them would illustrate an Abstraction level behavior.

The teacher must also keep in mind that certain processes such as "comparing," "extracting," "utilizing," and valuating" are not automatically Abstraction or higher level activity. Abstraction level thinking, like all levels of the Domain of Cognition, is not associated with any particular process. The level of thinking is always determined by what the student uses as the basis for the particular process. If the student has internalized guidelines learned and rehearsed at the Transfersion level and then freely and spontaneously uses these in a quite separate situation without being cued to use them, then the teacher may assume Abstraction level thought. At the same time, on the Abstraction level like the Transfersion level before it, there appear to be at least twenty-one (21) different ways (processes) one can use guidelines to examine, explain, or view situations and experiences with the level of the understanding of the guidelines used in this thinking rather than the particular process itself serving as the basis for determining the actual level of the student's thinking.

3. <u>The Role of Guidelines in Cognition</u>

The Domain of Cognition assumes that post-Retention thinking and learning are based upon the use of that type of information that takes the form of guidelines. By guidelines is meant those forms of information which serve to direct, guide, or orient thinking or behavior in a particular direction or way. They provide the basis for proceeding in a particular way in a particular situation. In short, guidelines are those forms of information a student may use in order to view, examine, explain, make decisions about, or respond to other data, situations, or experiences. Examples of some of the different kinds of guidelines which are available include assumptions, criteria, rules, directions, definitions, postulates, generalizations, principles, and formulas. (Figure 4 contains a list of some of the various kinds of guidelines which a student can learn to use. Figure 5 provides a list of actual examples of guidelines students can acquire and practice.)

The role guidelines play in upper level thinking is a critical one. Individuals appear to need guidelines in order to operate at levels above Retention. Hence,guidelines must be emphasized on the pre-Retention level to increase the likelihood they will be transformed, stored, and recalled as completely and accurately as they were when they were frist presented. For only guidelines which can be recalled from memory by the student are available for him to use as a basis for

higher level cognitions. For this reason, guidelines must be included as an important focus--if not the most important focus--on all levels of instruction.

On the pre-Observation Preparation level, a student may be cued to look for the presence of some guidelines that he is expected to learn or may be alerted to the fact that a particular set of guidelines would be most useful for him to use in order to handle a situation about to be presented. For example, he may be told that the next segment of a filmstrip is going to present a series of steps he should follow in order to plot a point on a word map. Another example would be the inclusion of a set of questions prior to a reading for the purpose of 'directing' the student's attention to the important parts of the reading.

On the Reception and Transformation levels, a student may be directed to identify specific guidelines, their uses, and their appropriate stimulus cues and to give each all of these special meaning. Secondly, the student may be given the opportunity to practice using these guidelines in class on the day these guidelines are presented to him. In such first day cases, the student should receive feedback as to the completeness and the accuracy of his understanding of these guidelines, their uses, and their appropriate cues. Thirdly, the attention of the student at the end of the period should be directed at what guidelines were presented and used, how they were used, and what cues were associated with their use. It is recommended that the student rather than the teacher orally express his understandings of this newly acquired information both during and at the end of the class period in which they were first presented. In the "summary-review" at the close of instruction for the day, the teacher also should stress the guidelines as well. In any case, the degree to which all the above are covered on the day new guidelines are first introduced serves to increase the likelihood that this information will be completely and accurately coded and stored for each access in the student's long term memory.

On the Retention level, the student should be required to recall rather than merely recognize the guidelines he has stored from at least the previous day's lesson. The student should be required to recall how and why these guidelines were used in a previous lesson. In addition, the student should recollect the cues which were (and are) associated with the particular guidelines he studied. The more important a particular set of guidelines is to explaining and solving later situations and problems the teacher expects the student to be able to handle, then the more complete and accurate their recollection must be. Incomplete recall or mere Recognition-level Retention are indications that the guidelines have not been understood and/or stored as well as they should have been. This low ability to recollect needed guidelines is an extremely weak foundation for more complex levels of thinking.

The more critical the guidelines are for hetring the student deal with complex situations the teacher wants to present, then the more time the student should spend on the initial acquisition of the guide - lines and on reviewing and re-learning them on the pre-Retention levels. If this review is necessary, the teacher should keep in mind that a student's reference to notes, a text, a handout, or a mini-review lecture by the teacher would revert the thinking level to below the Retention level because the student would in essence be treating this information as newly received information. Hence, any-time a student depends upon some outside source to provide the guide-lines he is to use in a given situation, this behavior must be con-sidered pre-Retention level thinking.

On the Transfersion level, the student uses recallable knowledge of guidelines, their uses and their cues, in situations where this knowledge is appropriate and where he is directed to use it. The student may use these guidelines in similar and/or different situa-tions and settings from those where he originally acquired these guidelines. The student may find himself using a single guideline, combining two or three guidelines, or forming complex patterns of several guidelines in order to respond to situations and problems. In each instance, the student focuses his efforts on practicing and rehearsing his knowledge of these guidelines towards acquiring an almost automatic response pattern to situations where these guide-lines are appropriate. As he practices using these guidelines, the student may gradually convert these guidelines from information under-stood as stored specific content into information understood as an abstraction.

Before going further, a couple of notes of caution should be issued to the classroom teacher. First, from the time new informa-tion is first introduced to the student, his prior learnings and thinking processes will tend to modify, translate, and possibly even distort this information in order to fit it into the cognitive belief system he already possesses. Hence, all new guidelines and informa-tion the student receives will tend to undergo this modification and translation procedure. Unless the teacher is careful, the student may modify new guidelines so much that what is left are mostly those guidelines he used before the new guidelines were introduced. There-fore, the teacher must insist that the student acquire, learn, and use correctly the guidelines as they were presented to him. This accuracy is especially important on the Transformation and Transfer-sion levels. Secondly, teachers are cautioned not to become so ob-sessed that students use certain processes that they ignore what the student uses as the basis for these thinking processes. Students should learn better bases for thinking at higher levels (i.e., more functional guidelines). It would appear that the single criterion for determining the level of all thinking is the level of one's under-standing of the guidelines which are used to direct and ground his thinking independent of the thinking process that is used to produce the response or behavior.

On the Abstraction level, the student is not to be deliberately nor obviously cued as to what guidelines he is to use, but is expected to use the appropriate guidelines when a situation given to him contain their own cues which are associated with a particular set of guidelines. On this level teachers can only provide situational cues at a time or in a manner where the student is not expecting the cue and/or where the student is not anticipating the use of a particular set of guidelines. In most instances, Abstraction level performances cannot be measured in a course or unit where the guidelines serving as a basis for this level thinking were originally acquired and/or practiced.

One's Organization level structure treats guidelines as relatively concrete items of information when they are understood at the Reception through Transfersion levels. By the time they have achieved Abstraction level understanding, these guidelines become part of the student's cognitive belief system. These abstract understandings become the means by which other information and guidelines not understood as abstractions are considered, assimilated, and accommodated into the student's overall thinking.

On the Generation level the student is concerned entirely with the abstractions he already possesses. The students may eventually work with his ideas in such a way that he finds his existing frames of references of little use to him or finds them incompatable with his need to explain or cope with a particular situation or problem. Here the student finds that no existing single guideline or set of guidelines understood as abstractions seems to work and there is a need for him to formulate new ways of thinking or behaving. Consequently, the student integrates separate guidelines into a single set which contains components from each previous set (e.g., integrating via Hegel's model of synthesis).

In review, guidelines operate as the basis for all upper level thinking and serve as the basis with which a student can learn to think abstractly. It is essential then that teachers help each student to develop a large repertoire of guidelines which can be used by him as a frame of reference for viewing his experiences and life situations. In nearly all cases, the student has already acquired some abstractions as a result of previous experiences, and these serve to operate in a conservative fashion, i.e., they serve to retain the status quo and hinder the acquisition of new, different, and/or restrictive guidelines. Thus, the teacher must work hard on all levels to help their students acquire and use newly presented guidelines as they are first identified rather than reinforce these guidelines as they are gradually modified by the students' existing cognitive-belief system.

4. The Role of Affect-Oriented Guidelines in Cognition

Now that the role guidelines play in thinking has been explained, it is appropriate at this point to introduce the relationship of guidelines to cognitive-affect as this behavior is integrated within the Domain of Cognition. First, cognitive-affect may take the form of guidelines and fulfill the role of guidelines as described above. When cognitive-affect takes this form, these affect-oriented guidelines are neither automatically more important or are they considered immediately to be higher levels of thinking than are non-affect guidelines. Affect guidelines are neither inherently more or less important than affect-free guidelines. Secondly, affect guidelines may be acquired, retained, and learned in the exact same ways as are all other types of guidelines. They are not processed or learned any differently than are any other types of guidelines. Thirdly, the forms which affect guidelines may take are similar to those which non-affect guidelines may take (see Figures 4 and 5). As can be assumed from the above discussion, the Domain of Cognition views all guidelines, including cognitive-affect ones, as being equal to each other as forms of information a student can acquire. That a student finds some affect guidelines of more or less value to him is a product of his own cognition and is not the result of any inherent differences among the guidelines he has available to receive.

For the sake of convenience, affect-oriented guidelines may be classified into at least five (5) different categories. These represent arbitrary categories rather than natural ones. Each of these categories is identified and briefly explained below:

a. Aesthetic guidelines. These guidelines represent information which the student may use to guide or orient his thinking in terms of beauty, ugliness, pleasantness, etc.;

b. Moral guidelines. These guidelines represent information which the student may use to guide or orient his thinking in terms of what is right, wrong, moral, immoral, fair, just, etc.;

c. Normative guidelines. These guidelines represent information which the student may use to guide or orient his thinking in terms of what is socially acceptable, expected, or considered to be proper within the context of his group, society, culture, etc.;

d. Value guidelines. These guidelines represent information which the student may use to guide or orient his thinking in terms of what is considered good, bad, etc.; and

e. Value/affect-free guidelines. These guidelines represent information which the student may use to guide or orient his thinking in terms of some values or other affect-oriented decision which is based on non-affect guidelines but whose use makes an affect decision possible.

Each of these affect-oriented guidelines may be used to make decisions and to direct thinking on several different levels of congition. They may be received and transformed as new information and used at the time they were first presented. They may be stored and later retrieved on the Retention level. Once recalled, they may be practiced and rehearsed on the Transfersion level and then later understood and spontaneously used on the Abstraction and Organization levels. It should be evident by this explanation that a set of affect-oriented guidelines is not to be immediately attached or identified with any particular level of cognition. Psychologically, the actual level of each of the affect guidelines the student knows is determined by the same criterion as are all forms of guidelines; that is, by the level of understanding the student has of the guideline itself.

Affect guidelines understood at the Abstraction level or above heavily influence how a student will tend to respond in a given situation. In most cases, students have gradually acquired various sets of affect-related guidelines as a result of their personal interpretations of their experiences and the external guidelines they have been exposed to via parental rules, the teachings of their church or religion, etc. Many students are not aware of most of the affect guidelines they use to make decisions and to behave. Teachers should help students to identify, explain, and clarify the abstract affect guidelines they use as well as to examine how and when they do use these guidelines.

Like all guidelines, a student may learn to use different affect guidelines, but this requires much more than the mere introduction of one set of guidelines to replace an existing set. The student must learn to correctly and accurately use these new affect guidelines as he would any other guidelines to the point that this new set is understood as an abstraction. Only on this level will the student have the chance of acquiring the new affect guideline such that he "lives it" rather than having to continuously and consciously trying to "follow it."

Besides operating independently of any specific level of cognition, these affect guidelines also operate independently of any specific process of cognition. The process of assigning value (i.e., valuating) is another aspect of thinking that has long been treated as being an upper level process. However, valuating, like its twenty co-processes, is not inherently a higher level process. Like all processes, valuating may occur on several levels including Transformation, Transfersion,

Abstraction, and Generation. For purposes of this section of the paper, the teacher needs to realize that affect guidelines are not to be equated with any particular level nor with any particular process of cognition.

5. The role of cues in cognition

A student not only responds immediately to specific parts of his environment, he also uses information just received as a basis for deciding what he should or should not pay attention to in the present situation or in the situation that is to follow. Information which helps the student to know what he is to retrieve or use, what he is expected to or should pay attention to, or what he may or should prepare himself for in a given situation or in the situation that is to follow is referred to as a cue." At times a cue may alert the student as to the kinds of information he should begin retrieving or what guidelines he is to use. At other times, the cue serves to help the student to understand how he might organize information that is about to be presented to him. This type of cue may also inform the student as to what he should and/or should not pay attention to in an upcoming event. At still other times, a cue may serve to help the student identify what process(es) he may or should use to process information that is to follow.

As used here, the term "cue" refers to any aspect of the environment which serves as information to alert, clue, hint to, indicate to, intimate, pre-inform, prepare, signal, warn, or suggest to the student to behave in certain ways in response to a given situation or an immediate future situation is a cue. An announcement to students of what parts of an upcoming lecture will be and will not be on tomorrow's test is an example of a cue. In yet another way, information the student has associated with certain types of behavioral responses such that when presented with this information he knows what he is to do is a cue.

One the pre-Observation level, the student may be alerted through external or internal stimuli that he must, should, or may need to focus his attention on certain elements of or information in his environment or an upcoming event. This pre-Observation cue helps to ensure the likelihood he will attend to, observe, and receive certain kinds of information he has been alerted to receive. These cues serve as pre-experimental information so that he may form a 'mind set' as to what is to follow and what he should or is expected to pay attention to in the situation that is to follow.

Generally speaking, all students have acquired a vast repertoire of internal cues which they continually use as a basis for influencing their attention, reception, thinking, and behavior. These cues serve to help the student make many routine decisions and responses often without being consciously aware of why he is responding in that way.

For instance, if the teacher directs the class by saying "Get out a sheet of paper and pencil and clear your desks," the student automatically prepares himself for a test. Interestingly, a cue which serves to get one student to attend to a specific item may not cue another student to do the same. A given cue frequently has different strengths of influence for different students. Hence, teachers cannot assume that a specific cue or combination of cues will work equally well with all students. As a general rule for the classroom teacher, unless a situation or cue represents a significant departure from the contexts and content the student is to use or unless it is of the type which especially appeals to the student, the teacher should assume the setting itself (and the student's previous learned expectations in that particular setting) provides its own cues to the student.

Cues are important for other reasons than to attract one's attention. Much of learning is based upon the association of one piece of information with at least one other piece of information. Thus, information tends to be considered in terms of its relationships and associations with other information such that the identification of one item of information serves as a cue to retrieve other information which has been associated with it. For example, the student usually learns the date "1492" in association with the information on the "first expedition of Columbus to the New World." Therefore, when one mentions either "1492" or "In what year did Columbus set sail on his first expedition to the New World?", the other piece of information tends to come immediately to his mind as well. This form of cue serves as the basis for much of a student's memory storage and retrieval thinking as well as his behavior.

Besides helping a student to learn information in such a way so that it cues the retrieval of other appropriate information the teacher should consider another important use of cues. The student needs to associate certain specific cues with those guidelines which are appropriate to use in situations where these cues are presented. He also must learn that in situations where he is told to use a particular set of guidelines there probably exists some form of the cues he had associated with that set of guidelines.

Besides helping a student to learn information in such a way so that it cues the retrieval of other appropriate information, the teacher should consider another important use of cues. The student needs to associate certain specific cues with those guidelines which are appropriate to use in situations where these cues are presented. He also must learn that in situations where he is told to use a particular set of guidelines there probably exists some form of the cues he had associated with that set of guidelines.

For post-Retention learning, the student must not only learn guidelines per se, but he must also understand (a) situations where these guidelines are appropriate, (b) how these situations act as cues to inform students as to the correct guidelines to use, (c) how these guidelines should be used, and (d) what it is that make these guidelines appropriate for the given situation. In higher level thinking, cues serve the role of alerting the student as to what guidelines he ought to use in a particular situation or setting.

Cues may also be associated with affect-oriented and affect-free guidelines and information. As with all cues, the student must have acquired the association between a given cue and its appropriate guidelines so that these affect-related cues actually function as cues. And, as with all aspects of cognitive-affect, a given cue is not to be automatically connected to any particular level of thinking.

6. Processes and Procedures of Cognition *

Students continually use various thinking processes and procedures in order to understand, practice, and make use of information they have received and/or retained. While these processes and procedures appear to be automatic mental activities each student possesses, it sometimes is not clear as to when, where, and how students make use of either. The sections below serve to clarify the issues regarding what these two activities are and how each fits into cognition.

a) The processes of cognition

Although they are often treated as being equivalent, there is a clear difference between a cognitive process and a procedure. A process may be defined as the simplest form of mental activity which is content-free and which functions to treat information or content in a particular way in order to bring about a particular result unique to it. By definition, a process cannot be subdivided into any smaller or simplier unit of cognition. Each process serves to take information and deal with it in its own particular manner which is distinct from what any other single process by itself can do (See Figure for a description of the major information processes of cognition). At least twenty-one (21) distinct processes are available for the student to use including the processes of "association," "classification," "comparison," and "valuation."

For the sake of convenience, each process may be viewed along at least four different dimensions. Each of these dimensions help to provide another way of understanding the particular mental activity which is associated with that process. The four dimensions are identified and briefly defined below:

* In April, 1979, Stahl changed the name "processes" to "metaprocesses". This paper otherwise remains unchanged since the 1978 presentation.

MAJOR INFORMATION PROCESSES OF COGNITION*

Figure 8

PROCESS NAME	MAJOR ACTIVITY OF THE PROCESS	FUNCTION OF THE PROCESS [1]	COMPLEMENTARY ACTIVITIES
1. Association	Associating	joining or tying two or more items together with the emphasis on the conjunctive aspects rather than on the whole	Affiliating, Connecting, Interrelating, Relating, Tying
2. Classification	Classifying	forming groups and/or putting items into categories	Categorizing, Grouping, Ordering, Sorting, Systematizing
3. Combination	Combining	putting separate items or information into some single whole	Blending, Chaining, Compiling, Integrating
4. Comparison	Comparing	identifying what and/or how items are similiar to and/or different from one another	Contrasting, Equating, Likening
5. Condensation	Condensing	producing a shortened version of some longer form of information	Abbreviating, Abridging, Consolidating, Simplifying, Summarizing
6. Conversion	Converting	changing the external or internal features, size, etc. of an item or information for the purpose of making it different	Altering, Changing, Deviating, Modifying, Revising
7. Description	Describing	reporting the features, number, etc. of the external aspects of information or an item	Announcing, Narrating, Reporting
8. Designation	Designating	assigning a label, name, or exactness to an item	Naming, Defining, Labeling, Specifying
9. Discrimination	Discriminating	treating items or information differently from one another	Differentiating, Discerning, Distinguishing,
10. Extension	Extending	providing information which would likely fill a void in the information which is available or being considered	Appending, Concluding, Conjecturing, Estimating, Projecting, Completing
11. Extraction	Extracting	taking apart or a away from a larger whole to focus on its parts and their relation to each other and/or to the whole	Abstracting, Analyzing, Assuming, Deriving

Figure 8 (Continued)

12. Interpretation	Interpreting	making sense of information in terms of the meaning it has	Conceptualizing, Opining, Perceiving, Personalizing
13. Organization	Organizing	putting separate items together in some interrelated order or sequence with the stress on the interrelationships as well as the order and system	Adjusting, Arranging, Assembling, Composing, Sequencing, Structuring, Systematizing
14. Proposition	Proposing	suggesting or providing a probable way of dealing with a situation or problem	Hypothesizing, Planning, Recommending, Theorizing
15. Reconciliation	Reconciliating	putting apparent opposition items or information together so that they form a compatable or consistent whole	Accommodating, Arbitrating, Balancing, Compromising, Conforming, Equalizing
16. Selection	Selecting	making a preferred, imperative, or needed choice	Choosing, Deciding, Determining, Judging, Picking
17. Separation	Separating	taking apart information and/or a whole to identify its distinct individual parts with the focus on the spliting of the parts from eachother	Breaking, Disconnecting, Disuniting, Dividing, Segregating, Severing
18. Translation	Translating	putting information into a different form or version than it was originally given without deliberately changing its message, meaning, or intent	Coding, Decoding, Defining, Paraphrasing, Restating, Simulating, Substituting, Symbolizing, Transforming
19. Utilization	Utilizing	demonstrating how information or an item could be, is being, or has been put to use	Applying, Employing, Fitting Transferring, Using
20. Valuation	Valuating	assigning value, a rating, or priority to an item or information	Appraising, Appreciating, Assessing, Evaluating, Judging, Prioritizing, Ranking, Rating
21. Verification	Verifying	specifying how information has been or is to be accepted as valid, true, reliable, or accurate	Authenicating, Confirming, Proving, Substantiating, Supporting, Validating

Robert J. Stahl (c.,1978)

[1] Functions listed are illustrative and are not to be treated or considered as inclusive.

Note. The numbers are used do not represent order of priority or importance.

a. Process name. The name serves merely as a label for the particular mental activity and helps to distinguish between the overall activity as an activity and the activity at the time it is actually occurring within the mind of the student. Examples of this dimension include: Association, Classification, Comparison, and Valuation.

b. Major activity of the process. This dimension serves to describe the mental activity as it takes place in terms of what it actually does to information, i.e., it stresses the activity while it is "in-process." Examples of this dimension include: Associating, Classifying, Comparing, and Valuating.

c. Function of the process. This dimension focuses on what the activity actually does to the information it is using and on how it treats this information towards getting some result unique to that particular process. One example of this dimension is: "joining or tying two or more items of information together with the emphasis on the conjunctive aspects rather than on the whole or its parts."

d. Complementary activities. These activities represent other forms this process may take or, maybe more correctly, specify other labels and names which have been attached to this one particular form of mental activity. Examples of this dimension by way of the complementary activities associated with "Association" are: Affiliating, Connecting, Interrelating, Relating, and Tying.

As provided in the Domain of Cognition, the student has at least 21 basic processes he can use to think about and respond to information and his experiences. Depending upon the type of preparation, cues, problems, etc., some of these processes may be more appropriate than others in a given situation. The teacher should also keep in mind that these 21 processes may be viewed as suggesting at least 21 different types of classroom activities which could be developed to help a student use any set of guidelines he is learning and/or can recall. Should a student work on a classification exercise in the classroom, the teacher should note that the outward performance of the student serves only as indicator of what probably took place or is taking place in the student's internal cognitive operations.

b) The "Process Cluster"

In the act of examination, understanding, and responding to situations and information, certain processes tend to occur in close

proximity to one another. These processes appear to be related indirectly or concommitantly to one another. Interestingly, in most cases, one does not find a single process occurring in isolation. Furthermore, the nature of thinking, suggests that as an individual finds evidence of one process occurring, evidence consistent with at least one other process is usually also present. For example, in a situation where information (e.g., an alternative) is being "selected," the student may also find himself using the processes of "valuation," "verification," and "discrimination" as well. Subsequently, this patterning of apparent inherent interrelationships among separate processes suggests that rather than approach broader process and procedure instruction in terms of a number of randomly selected or separate processes, the phenomena of process clustering should be considered and used. (See Figure 9 for an illustration of this aspect of cognition.)

Although the implications of the process cluster construct may not be immediately apparent, they are nonetheless significant. Because learning, thinking, reasoning, and decision-making all involve combinations and multiples of these processes, efficiency and/or difficulty in achieving effective results may in part be attributed to which combinations and multiples a student uses in a given situation. Hence, individual differences in problem solving, for example, may be due to variations among the combinations and/or order of the particular processes they may choose to use in solving problems. Thus, students who have developed their own sequence of processes for thinking, learning, reasoning, and decision-making may then resist efforts to acquire new patterns representing new combinations and/or orders of these processes. In effect, for the student, this would amount to the acquisition of new patterns of thinking--completely "free and independent of" the specific content used in this thinking--and the unlearning and forgetting of old patterns.

In addition, individual students who provide answers to teacher questions may arrive at an appropriate answer as a consequence of combining and arranging these processes in order to frame their response. Since each process appears to take some 'time,' it would seem that part of a student's problem in responding to a question may be due to the time it takes him to process information through those processes he has selected to use to produce a response. Thus, the time element needed for the student to process information prior to, during, and following its consideration and retrieval may contribute in part to the variation among students in their response rate to given questions or problems. Fortunately, since birth, each student has gradually developed his own series of qutomatic response patterns (habitual patterns of processes) to help him examine, understand, and react to stimuli and information. However, less fortunately, he may have also developed less than effective and efficient process patterns of thinking and responding...at least for handling the kinds of information and situation typically stressed in schools.

It is quite possible that the time it takes for each process may vary from student to student or may vary according to the type of information the student uses to process. Thus, familiar information may take less time to process than might entirely new information. Secondly, some combinations and/or orders of processes may form more efficient and effective response patterns than others. If so, then the teacher might want to consider whether or not any particular combinations and/or orders of processes may form more efficient and effective response patterns than others. If so, then the teacher might want to consider whether or not any particular combination and/or orders of processes may form more efficient and effective response patterns than others. If so, then the teacher might want to consider whether or not any particular combinations and/or orders of processes are appropriate of all students or for just some certain ones. It might be appropriate to consider whether the time needed for a specific process can be reduced or whether a student can reduce the time which may be required between processes. Answers to these concerns would be invaluable in terms of making better decisions about the planning of instruction, the selection of teaching methods, the behavior of the teacher, and the use of certain types of evaluation procedures.

In summary, the process cluster recognizes that in cognitive activity, information processes tend to appear in multiple and in combinations with one another. The "cluster" provides a useful model to describe, study, and explain the processing of information by students. It also helps to explain how students vary in their ways of thinking about very similar situations. Finally, the use of the processes are more appropriate for achieving certain types of outcomes.

c) Procedures of cognition

As suggested by the above presentation of the "process cluster," combinations and patterns of separate processes appear to be relatively frequent events in a student's way of thinking. It is this phenomenon which mark the distinction between a process and a procedure. Whereas a process is the simplest form of mental activity, a procedure is mental activity which is made up of two or more processes in combination with one another in an effort to bring about a particular result. By definition, a procedure can be broken down into simplier units of cognition, i.e., processes. Each procedure, such as problem-solving, deduction, induction, reasoning, and decision-making, serves as a means of taking information and treating it in specific ways in order to achieve a result not normally possible by using any one single process by itself.

Procedures are complex combinations, sequences, and/or arrangements of interrelated single processes which attempt to help the student deal with his experiences and data. Like processes, each student seems to possess his own procedures or patterns of processes. However, unlike processes, a student may or may not have developed

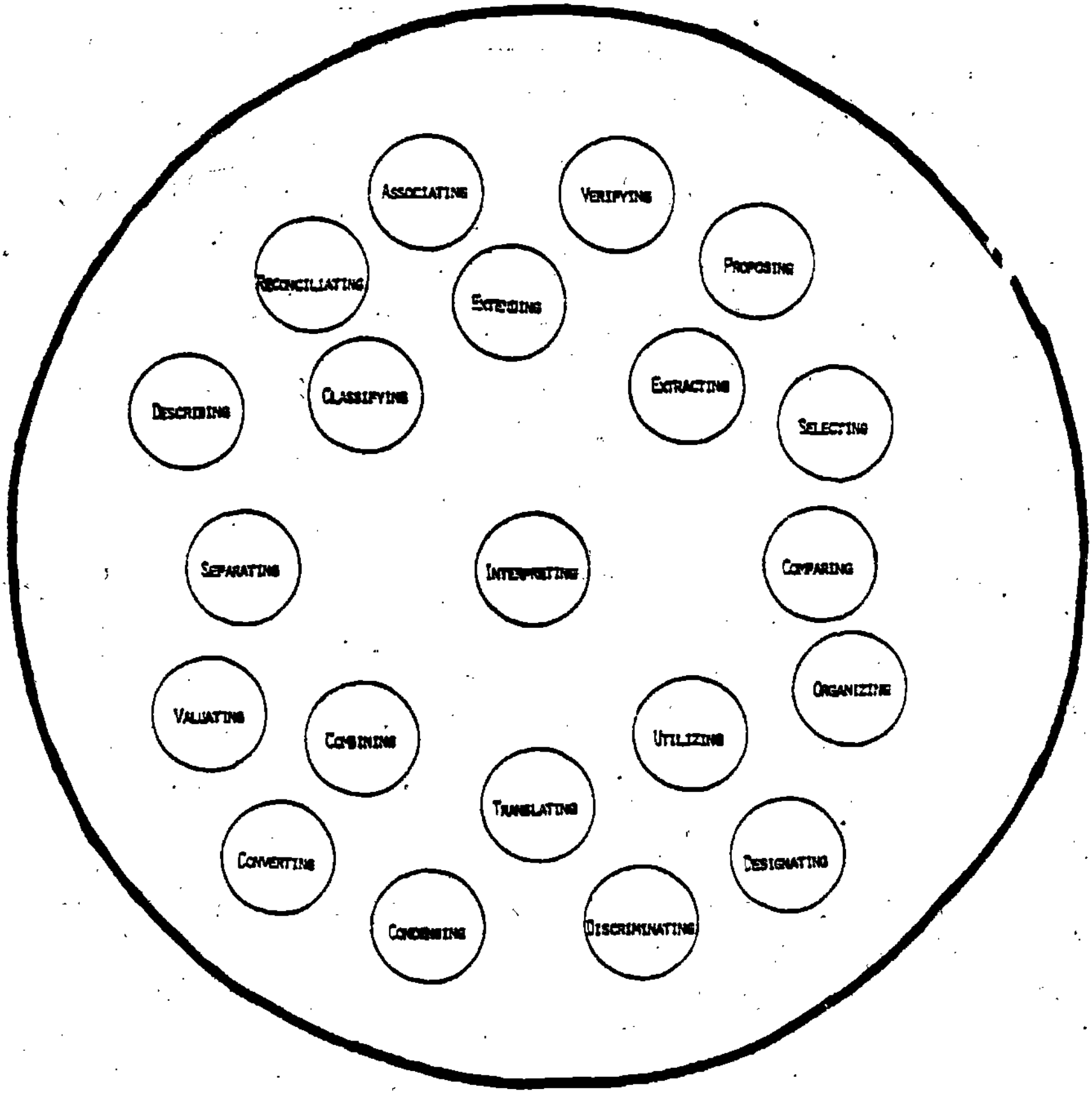

FIGURE 9:

The "Process Cluster" considers the apparent interrelationships among and between separate information processes as one engages in more complex cognitive procedures (e.g., problem-solving, deduction, reasoning, and induction).

efficient or effective combinations and sequence of processes for his own needs. Thus, while the student can only practice using the 21 processes he has available to him, he appears to be able to acquire and may be able to practice using more efficient procedures. He can do this by selecting, combining, sequencing, and testing new or different process patterns which make up the procedures he uses or want to use.

The distinction between a process and a procedure may be further illustrated by an example. The example below represents the phases a student may go through in order to solve a problem. Each phase of this problem-solving procedure is characterized by a specific process which allows the student to accomplish the information task that needs to be done at that point in time.

a. As the problem is presented in a narrative context, the student breaks down the parts of the whole situation in order to focus on its parts and their relation to the whole situation-(Extraction);

b. Of the parts and the information identified, the student gives priority to one of the parts as being that which represents the real problem to be dealt with and resolved-(Valuating);

c. Once identified, the student treats this part, i.e., the problem, differently than other information about the situation-(Discrimination);

d. The student may not attempt to tie this problem to other problems he has handled before-(Association) and may see it as being of a certain type or class of problem-(Classification);

e. At this point, the student may then retrieve information which he has connected to this type of problem-(Association) and begin putting this information to use-(Utilization); and,

f. Finally, the student may take a series of necessary steps in order to solve the problem-(Selection) as well as indicate how he knows the solution is likely to be correct-(Vertification).

The example above serves to demonstrate how processes are used to form procedures the student can use to respond to his life situations.

d) The distinction between high and lower level processes and procedures

Processes and procedures are not to be automatically associated with any particular level of thinking. No single process is inherently or automatically "better" or "higher" than any other process or procedure. These processes and procedures are independent of any and all of the eight levels of thought included in the Domain of Cognition. These mental activities may take place on the Transformation, Transfersion, Abstraction, and Generation levels and they appear to take place on the Preparation and Organization levels as well. As a consequence, the teacher and/or curriculum planner can no longer automatically associate a given process (e.g., application, analysis, classification, comparison, evaluation) or procedure (e.g., problem-solving, deduction, induction) with a particular level of thinking. To do so would be to misrepresent the nature of thinking and learning as it is currently understood. Continuing to make such assignments would also suggest a dogmatic adherence to a dysfunctional view of these cognitive activities.

What then is the criterion for determining the level of cognition for a given process or procedure? First, being content-free, both processes and procedures depend upon information for them to 'work.' Therefore, it becomes the level of understanding of the information which serves as the basis of these mental activities that ultimately determine the level of cognition of the student's behavior--and that includes whatever process and/or procedure the student used or is using for this behavior.

e) Cognitive-affect processes and procedures

Being one of the 21 processes, Valuation is to be viewed and treated as one of many forms of mental activity with no inherent qualities which make it "better" or "higher" than any other process. Similarly, a procedure that includes Valuation or any other process which may focus on using or dealing with affect-oriented content must be considered of equal importance as an affect-free procedure. Psychologically, affect-oriented processes and procedures are neither "better" nor "higher" mental activities regardless of the amount of affect-related content they are treating. As always, the classroom teacher must realize that it is the level of understanding the student has of the guidelines and information used as the basis of the Valuation process and affect-procedures that determine the level of any affect-oriented mental activity.

APPENDIX A:

LONG DEFINITIONS OF THE LEVELS AND SUBLEVELS OF THE DOMAIN OF COGNITION

NOTE: Appendix B, which describes how to write instructional behavioral objectives was not finished in time for this presentation. Individuals may write for copies of this material when it becomes available.

1.00 PREPARATION

Preparation is that form of thinking where the individual is making use of internal and externally provided cues to get ready for information or an experience that is expected to occur in the immediate future. Preparation includes those mental activities in which the individual makes ready to do something in a situation that is to follow. This preparation may involve (a) the retrieval of stored information that is believed to be relevant to the upcoming situation, (b) the awareness or disposition to attend to certain aspects of the upcoming situation while ignoring others, and (c) the selection of appropriate processes which are believed to be needed in order to receive, transform, and use information which is expected to follow.

Preparation level thinking is heavily influenced and activated by internal and external cues. An individual's environment contains an almost infinite number of potential cues which could be used to alert or prepare the person for something that is likely to follow immediately within one's experiences. Information which helps the individual to know ahead of time what information needs to be retrieved or may be used, what should or should not be paid attention to, or what he may or should prepare for in a given situation serves as appropriate cues for Preparation thinking. However, before they can serve as "cues," the individual must have first learned what these are cues for--that is, what can be associated with a particular type of information such that the presence of a "cue" actually alerts the individual to prepare for something that is likely to follow.

For the most part, individuals have learned to 'read' environmental cues so well that they are continually and spontaneously preparing themselves for the next situation or their next experience. Statements such as "I'm surprised to find out" or "I didn't expect to see you here" reflect situations where information received was not in line with what was expected to be received. Similarly, the expectations individual students have about a particular course, assignment, teacher, classroom, and so forth serve to help them prepare themselves for what they will pay attention to, how they will receive and process information, how they will determine the importance of information that is presented, and what information they will need to retrieve from memory in order to deal with an upcoming situation. In some cases, their preparation serves as a 'mind set' or 'advance organizer' for information about to be received.

For Preparation to occur, the individual must be actively making use of internal and external cues in order to make himself ready for information and situations which are expected to follow. What he makes himself ready for and how he prepares himself will greatly influence what the individual is likely to observe via sensory input, to receive as information, and to interprat and make use of the information that is received.

PREREQUISITES FOR PREPARATION

A) The prior learning by the individual of the association of two items of information such that the occurrence of one item serves as a cue to prepare the person to expect or attend to the second item; and

B) The identification (via either internal or external stimuli) of an item of information which takes the form of a "cue."

GIVEN THE PRECEDING PREREQUISITES:

If and only if at the moment of behaving, an individual is making use of either internal or external cues in order to get ready for information or a situation that is expected to follow immediately, then evidence of Preparation exists.

2.00 RECEPTION

As used here, Reception refers to the ability to acknowledge, report, or provide specific information or data with much the same message as that which is currently being presented or has just been experienced. The individual is required to reveal (indicate) the content of the information as it is available with the same or nearly identical content which is being presented or has just been presented with the criterion for accuracy being the original data or information itself. The behavior or product representing Reception may include minor alterations in the message or content of the available information. These alternatives are translations-of-experiences-into-appropriate behavior or verbal-statement-Problems and are not the results of deliberate attempts on the part of the individual to alter this content or message.

Reception behavior and/or its resultant product must not depict any real alterations in the accuracy of the content or message of the original information. The individual may be required to recognize accurate information or to select correct data from among incorrect data, but the basis of either is the reporting of presently available information. Hence, Reception stresses accurate "witness accounting" of information or experiences at the time of or immediately after it has been encountered. Regardless of the content or subject matter that is being reported, this behavior requires some form of recognition that the information which is currently being presented in the situations has been resolved by the individual.

For Reception to occur, the individual must be called upon to produce (or show evidence via recognition of) information of exact or nearly the exact content or message in which it is being or has just been presented, experienced, and witnessed. Reception requires the acknowledging, reporting or stating of presently available information without any deliberate changes made in the message of this information. In all cases, the basis for determining the correctness and accuracy of the resultant reported information is the original data itself.

2.10 ACKNOWLEDGEMENT

This level of Reception requires the individual only to indicate an awareness of specific aspects of the environment which contains information which is to be attended to and received. In fact, Acknowledgement is the form of behavior by which the individual reveals at least some awareness of the existence-perception-reception of some piece of data. Here the individual indicates an awareness of the available information but is not called upon to publically announce the specifics of what has been noticed. The individual merely provides minimal evidence of having attended to and received some outside experience or information. The individual may demonstrate this level of reception by various overt behaviors from answering "yes" or "no" to such questions as "Did you just see that shooting star?" to self-initiated behaviors like nodding a head after someone remarked "It's cold in here!"

2.20 NOTATION

This level of Reception requires the individual to do more than merely indicate an awareness of some environmental or informational experience. Notation level behavior requires the individual to act in some way to reveal that the information has been received and retained for at least a minimal length of time. Again, the individual is required to take some active role to indicate that some information has been at least temporarily retained. However, the individual is not required to verbalize orally what this information is. Examples of this behavior include note taking or following along with someone who is demonstrating an exercise or body movement. At this level, the individual does not orally indicate what has been received or how it has been understood. The emphasis is entirely on the individual giving evidence of at least some minimal acceptance of the information even if it is only long enough to copy it down.

*When given the opportunity, the student will write (in their notebook) the definition of the term "conflict" as this term is defined in the class lecture.

*When asked to do so, the student will list on the chalk board the three major sports in Brazil as these were mentioned in the day's reading assignment.

*When directed to do so, the students will correctly color in the five states of the United States which border the State of New York.

2.30 DECLARATION

This level of Reception requires the individual to reveal in more formal public ways the specific aspects of the environment which contains information which has been attended to and received. Here, the individual is called upon to report what it is that has been witnessed. Here the individual identifies and reports information and descriptive data as it is being experienced or immediately after the experience while it is still immediately available in the person's mind. Declaration behavior focuses on the individual reporting what is presently being seen, touched, heard, read, tasted, smelled, or experienced with this report containing no intentional effort to distort or modify the information or experience itself. The individual is required to provide behavioral evidence of the specific information that has been received from an experience. The individual may demonstrate this level of reception by various overt behaviors from stating, "Did you just see that falling star?" to announcing the three chemicals which are contained in bottles on the lab table. The highest form of Declaration behavior is for the individual to report accurate factual data which has been presented in situations immediately experienced as opposed to merely accurately declare what is presently available at that time. As a rule, factual information describing an experience or data which has been presented within a given class period (regardless of its length) is to be considered Declaration behavior rather than Retention level learning.

*When asked to do so, the student will recite the names of the four South American nations which are listed on the chalkboard.

*When asked to do so, the student will orally state the definition of the term "Nutrition" as this term was defined earlier in the class period.

PREREQUISITES FOR RECEPTION

A) The immediately prior presentation of and/or the current availability of information or the experience in its present form;
B) The identification or elicitation (via external or internal stimulus) of the particular information which is to be indicated or reported; and,
C) The awareness that the reporting process is not to include any intentional alteration in the message or content of the experience or the given information.

GIVEN THE PRECEDING PREREQUISITES:

I., and only if, at the time of thinking, a product, a behavioral pattern or a response required the individual to report (state) information of the identical or near-identical content and message as that which is presently being or has just been experienced, witnessed, or observed and this information can be verified by the original source and is consistent with this source, then Reception has taken place.

3.00 TRANSFORMATION

When individuals take in information from a just-ended or on-going experience, they try to give meaning to as well as to make sense of this information in terms they, themselves, understand. As they go about their effort to "understand" this recently received data, they rely on previous knowledge and learnings to influence the meanings they attach to this information. As individuals assign meanings to newly received information, they produce new information--information which serves to confirm or clarify those assigned meanings. When an individual uses previously learned information to examine, explain, or deal with newly received data, they produce even more new information which they just give meaning to at that time. For example, suppose a student uses his previous understandings of the uses of the concept definition of "competition" to explain the activities of two used car dealers. In the course of his explanation the student produces new information and understandings which is different from both his definition and the situation he examined. This behavior helps to illustrate how he gave meaning to the new information he had received about the car dealers. Finally, when individuals practice using newly received information (e.g., the definition of the term "revolution") in either familiar or different situations or settings, they also produce new information which too has to be given personal meaning that makes sense of both of these kinds of new information.

Transformation, as a level of thinking, focuses on what and how individuals make sense of recently received information with the results of this activity being "what" and "how" they will ultimately code, store, and be able to retrieve this information. For purposes of instruction, recent as used here represents the time span usually taken for the class period or instructional activity in which the individual first received the new information.

Transformation refers to the ability to take information recently received from a personal experience and form it into a second piece of information which has meaning to the person. This activity may include the changing of the form of the received information into a new form which is consistent with the message, content, and/or intent of the original information. The outcome of this activity is almost always a somewhat different version of the newly received information. If the information is entirely new to the individual (e.g., notes from the teacher about a civilization not previously studied), it may be received and translated solely on the basis of its important features. Frequently, this information is considered and transformed in terms of what it means within the context in which it has been presented. In all of these situations, the focus of transformation is on how the individual personally understands and makes sense of newly received or produced information.

The Reception, Transformation is an activity which automatically takes place within the individual with or without public demonstration. Since this transformation by meaning can result in the assignment of both accurate and inaccurate meanings to experiences and information, teachers must be especially active during this phase of learning for the student. In each and every class period, it is the result of this level of thinking that will eventually be the information the student will "store" and be able to retrive at a later date. To reduce the chances that negative or incorrect meanings have been assigned to newly received information, teachers must pay attention so that they support only student meanings which are accurate, complete, and correct ones.

Transformation is the crucial part of the information acquisition process that directly affects what, how much, and exactly what it is about new information the individual will most likely store and be able to recall. It is this phase of learning that students make decisions about what they consider worth remembering as well as how it is they will want to remember it. And, since the actual coding and storage of the data are apparently beyond the conscious control of the individual, then what takes place at this level is of crucial importance in influencing these coding and storage activities. Consequently, if individuals can't recall the "right" information for the teacher or don't seem to have "understood" what was said from the previous day's lesson, it is most likely the results of transformation that produced these "poor" behaviors. Ultimately, it is not what actual information is presented in class that individuals will remember and later retrieve. Instead, it is what and how they have decided to "understand" and "give meaning to" this information after the lesson is over that will affect their recall.

3.10 PERSONALIZATION

Personalization refers to whatever the individual does to "make sense out of" and "give meaning to" newly received information and understandings. This activity may involve ascertaining genuine meaning (i.e., the intent and message of the information) in terms of previous experiences, of one's prior understandings, or of the context where the information was obtained. It may also involve noting characteristics of form, features, image, or symbols that would be helpful for future retention and recall.

Personalization occurs when the individual student reports what the information means that was just presented in class. Individuals may reveal personalization by stating how they understand what has just been given, how they are trying to understand what has just been given, or what they believe the newly received information means from their own point of view.

"When asked to do so at the end of the lesson, the student will explain in oral form how he understands the civil rights movement as this movement was discussed in the lesson.

"When directed to do so at the end of the period, the student will explain in written form what the Declaration of Independence as presented in class means to him.

"When called upon to do so at the end of the period, the student will clarify in written form what the information on the characteristics of a primitive society as presented in class mean to him.

3.20 ADAPTATION

Whereas Personalization involves effort to make sense out of new information, Adaptation refers to those activities which put this new information and the meanings assigned to it to use. Transformation thinking and/or its resultant behavior depicts an intentional effort to make use of new information to test, verify, and assess the information and the meanings which have been assigned to it. On this level, the individual is expected to take the information just received and use it as the basis for comparing, classifying, discriminating, interpreting, evaluating, or extending other information, items, objects, etc. Here the individual is required to apply the understandings and meanings of the information he has received during the particular class period to other situations, problems, or experiences. In other words, the individual practices and rehearses his understandings and knowledge of the new information he has just been introduced to during the class period.

Adaptation calls for the individual to form new information through the use of the understandings he has of information which was presented earlier in the same class period. For example, an individual who is called upon to use a list of characteristics of the scientific method he was presented with at the beginning of the period to examine a description of a historian "at work" would be enjoyed in Adaptation level thinking. This example illustrates how the individual forms new information (i.e., his description of the historian "at work" as viewed by the historian's adherence to the "scientific method") through the use of the newly understood information (i.e., the list of characteristics of the scientific method). Hence, any time an individual puts to use information and understandings he has received on the day he has received it, then Adaptation level learning has been achieved.

To enhance the effectiveness of Adaptation, the individual must first have given accurate and complete meaning to recently received information. The individual must then be called upon to produce new information (in the form of interpretations, comparisons, valuations, etc.) which is logically consistent with the information that is being used. A critical aspect of Adaptation level learning is the degree of congruence between the information as it existed before it was received by the individual and the information as it was understood and put to use on this level. The more complete and accurate the newly produced product or information is in terms of its representation of the original information determines the extent to which the learning can be considered acceptable.

"When asked to do so at the end of the period, the student will write an interpretation of a political cartoon using as a basis for this interpretation the characteristics of a political cartoon as these were presented earlier in the period.

"When given a copy of two versions of a single battle, the student will write an evaluation of both using as a basis for his assessment the details of the battle as these were identified earlier in the period.

PREREQUISITES FOR TRANSFORMATION:

A) The ability of the individual to have received information via sensory input on the Observation level;

B) The reception of information which is currently or has recently been available to the individual;

C) The identification (via either internal or external stimuli) of the particular type of translation-transformation (e.g., personal meanings, interpretations, comparisons, etc.) that is expected to result.

GIVEN THE PRECEDING PREREQUISITES:

If and only if at the time it was first received by the individual a product, a behavior pattern, or information required the individual to take recent information and translate it into a new form which is consistent with the inferred, implied, assessed meaning, message, and completeness of the original source and this new product could be verified by comparing it with the original source, then evidence of transformation exists.

4.00 RETENTION

As used here, Retention refers to the ability to recall, to provide, or to recognize specific information, data, or product in much the same content and message as that which was originally presented or understood. The individual is required to recall (retrieve) information from memory of the same or nearly identical content and message in which it was originally learned with the criterion for accuracy being the original data or information itself. The behavior or product representing Retention may include minor alterations in the message or content of the recalled information, but these are encoding-storage-retrieval problems and not the results of deliberate attempts on the part of the learner to alter this message or data.

Retention behavior and/or its resultant product must not depict any real alterations in the accuracy of the original information. The individual may be required to recognize accurate information or select correct data from among incorrect data but the basis of either is on the recalling of previously learned information. These forms of Retention require little more than recognition resulting from rote memory or recall. However, regardless of the content or subject matter that is being recalled, Retention requires only the retrieval of stored information.

For Retention to occur, the individual must be called upon to produce (or show evidence via recognition of) information of exact or nearly the exact content or message of that which was originally presented, encoded, and stored. Retention requires the straight retrieval or recall of stored information without any deliberate changes made in the content or message of the information as it was originally presented or understood. In all cases, the basis for determining the correctness and accuracy of the actual recalled information is the original data itself.

4.10 RECOGNITION

This form of Retention-level learning is the lowest level of retrieval which can be accepted. It represents the mere indication that some of the information presently available to the individual has been recognized as being similar to information previously presented. Thus, the individual is merely acknowledging having confronted the information in some previous situation. Recognition requires only that an individual points out or identifies from among data given that information which is similar to previously experienced data. For this reason, the accuracy of Recognition responses is not to be equated with the individual's ability to fully recall this information from memory without much of this information being provided at that time. In Recognition, even although the individual is called upon to provide this information from recall, in a sense, the individual is retrieving information only to check on the 'correctness' of the data which has been presented.

*When provided with a list of ten generals, the student will correctly identify all four of those generals who served the Southern army recognizing this information from that given in class.

*When provided with a list of terms and their definitions, the student will correctly match all ten terms with their definitions as both were given in the class handout.

4.20 RECOLLECTION

This behavior requires the individual not only to retrieve information but to provide it in the form of some type of evidence (e.g., in writing, orally, by demonstration, etc.). Recollection calls upon the individual to give (disclose) the information which is being sought from the ones provided rather than merely recognizing the information from that presented to the person. The emphasis here is that the individual alone is required to recall and make public all of the information which is to be considered or used. Thus, the individual must provide the information entirely from memory. In short, the individual must retrieve (recall) from memory all of the information which is needed.

*When asked to do so, the student will write the names of the first three British Prime Ministers as these names were presented in the text.

*When called upon to do so, the student will orally recite "Hamlet's Soliloquy" as this was stated in the play, "Hamlet."

PREREQUISITES FOR RETENTION

A) The prior presentation, learning, and storage of information in its or near original form;
B) The identification and elicitation (via external or internal stimulus) of the particular information which is to be retrieved; and
C) The awareness that the retrieval process is not to include any intentional alteration in the message or content of or to produce any substantive changes in the retrieved information.

GIVEN THE PRECEDING PREREQUISITES:

If and only if at the moment of behaving, a product, a behavioral pattern, or a thought required the individual to retrieve (recall) from memory stored information of the identical or near-identical content in which it was originally learned (stored) and this information could be verified by some external source and is consistent with this source, then Retention has taken place.

5.00 TRANSFERSION

Transfersion refers to the ability to form new information or a product derived from information or products already known and based upon guidelines retrieved by the individual who is cued to use them in the particular situation. In other words, the individual is to interpret, make inferences from, conclude from, explain, or extend given information on the basis of some criterion or frame of reference which that person has recalled from memory. This behavior requires the use of guidelines to examine a source of information and produce new information about or from this source using some guidelines or criterion upon which to support this productive effort. As defined and to be correct, the new information must be logically consistent with the known original information and with the guidelines which are used.

Transfersion includes the ability to make accurate inferences about unknowns based upon the knowns and some set of guidelines. This form of Transfersion is one of the most widely emphasized behaviors individuals use in the classroom. However, individuals who are engaged in the learning process can master Transfersion only when they use certain specific types of information. Therefore, this behavior involves the making of inferences on the basis of guidelines accurately understood at the Transfersion level and recalled at the Retention level. In other words, individuals must apply guidelines, principles, etc. they have learned on these lower levels to explain situations, solve problems, and interpret information. Transfersion requires that a single or set of guidelines becomes part of the way individuals think about and respond to various information and situations. As such, it is this level which demonstrates how well retained guidelines have been understood and how well individuals understood their use. In short, Transfersion is the ability to make use of concrete information in such ways as it becomes useful as a guide to thinking and behaving.

This behavior and/or its resultant product requires the individual to assign meaning to the content or components of an information source or to provide information which logically fits a given source but is absent or needed. These assigned meanings may take such forms as assumptions, inferences, conjectures, opinions, interpretations, predictions, translations, or estimates. This behavior and/or product must be new to the individual at the time of the behavior or production and cannot be information recalled from past experiences. However, the basis for this new information must be guidelines which have been recalled from memory. Transfersion occurs when new information is generated which logically fits existing data and which may be explained on the basis of established guidelines which the individual has been cued to use.

For Transfersion to occur, the individual must have recalled guidelines with which to examine and interpret a source of information or must be able to provide a criterion upon which an examination or interpretation was made. In either case, the individual is called upon to produce new information logically consistant with the given information and based upon some specific guidelines or criterion which serve as the basis for determining correctness. A critical aspect of Transfersion level learning is the ability to explain or justify the resulting new information in terms of the original information and the recalled guidelines or criterion specified. It is the completeness and accuracy of the final product or information based upon and logically inferred from the original source and the explanation of this information on the basis of particular guidelines which determine the extent the new information or product can be considered acceptable.

Transfersion is the critical stage for moving into the higher cognitive processes. It is the formative stage at which guidelines become understood as abstractions and abandoned as mere pieces of concrete information to be recalled. It is the stage at which these guidelines are practiced and rehearsed on problem after problem (or situation after situation) such that this abstract understanding can be acquired. Abstraction requires the individual to spontaneously use guidelines as abstraction to resolve or explain situations or problems. In order to use these guidelines as abstractions, they must first be comprehended. They must be tested and rehearsed as guidelines via trial-and-practice situations where they are repeatedly used in a variety of ways. Unless the individual understands the what, when, where, and how of a set of guidelines so that its use becomes automatic, then movement onto Abstraction will be useless. On the Transfersion level, the individual is cued as to which guidelines are to be used. On the Abstraction level, these same guidelines are to be used without the individual being cued as to their use.

5.10 REPLICATION

Replication is the form of Transfersion that emphasizes the use of a single, set, or series of guidelines in situations which have previously been presented to the individual. Here, individuals rehearse the guidelines during repeated trials in situations or on problems of the kind which they are already familiar. In most cases, these situations may be identical to those where the individual originally encountered the guidelines. For example, an individual may have become familiar with the procedures for solving quadratic equations. Then, after demonstrating the ability to recall these procedures, the individual is presented with example after example of such equations to practice on.

In each case, the context of the lesson and environment cue the individual as to what Procedures are to be used. During Replication, the individual rehearses the guidelines which have been recalled in situations similar to those where they were first encountered.

In classroom situations, the individual must be able (and should be called upon) to explain why and/or how the particular response was arrived at in terms of the recalled guidelines that were to be used in this situation. Most frequently, the nature of the original learning situation, the type of problem or situation used, and the sequence of the curriculum itself all combine to provide the external cues to the individual as to what guidelines they are to use. Thus, the individual is aware (alerted to) what guidelines are to be used in the particular circumstances and therefore knows what is expected to be followed to deal with the given situation. Students then replicate the use of recalled guidelines in similar situations or problems. For the teacher, the correctness of the student's response is based at least as much on the correct use of the proper guidelines as it is on the adequacy of the given response."

* When given a set of rules for a sport, the student will write an explanation of the need for such rules using as a basis for the explanation three of the five "reasons for sports-related rules"as these were presented in class.

* When given an unfamiliar political cartoon, the student will write a correct interpretation of the cartoon using as a basis for the response four of the six guidelines for interpreting such cartoons as these were presented in the text.

* When given ten quadratic equations, the student will write the correct solutions to all ten using the Procedures for solving such problems as these were given in class lecture.

5.20 VARIATION

Variation identifies that form of learning where individuals are to use the guidelines they have recalled in situations unfamiliar to them. These unfamiliar situations are best described as circumstances or problems different from those where the guidelines were originally presented. Like Replication, the individual is cued as to which guidelines are appropriate, and is required to use these guidelines in novel and new situations. The emphasis is on the individual extending the recalled guidelines in trial situations new to that set of guidelines. For instance, let's suppose the individual has recalled and used the set of characteristics which describe the institution of Religion in examining three different nomadic societies. Let's further suppose that these examinations have successfully identified various societal and cultural behaviors and artifacts on the basis of the given characteristics of Religion. For Variation, the individual would be given a different societal or organizational condition (e.g., an early river valley civilization like Egypt) and asked to identify the 'religious' behaviors and artifacts using the same characteristics as used earlier. In all cases of Variation, individuals must be able to explain, justify, or support their decisions on the basis of the appropriate guidelines they have recalled from memory.

* When given a photograph or poster, the student will write a correct interpretation of it using as a basis for the response four of the six guidelines for interpreting political cartoons as these were presented in the text.

* When presented with a brief announcement of a newly discovered jungle tribe-society, the student will write an appropriate essay describing what future news articles on this group would expect to contain and support the description by using fifteen of the twenty-six characteristics all primative societies tend to have in common as these were given in the handout.

PREREQUISITES FOR TRANSFERSION

A) The demonstration of recollection of a single or a set of guidelines on the Retention level;
B) The identification (via external stimuli) of the single or set of guidelines which is to be used;
C) The identification (via either external or internal stimuli) of some information or source which is to be examined in terms of the specified guideline(s); and
D) The identification (via either external or internal stimuli) of the particular information process or outcome that is to be used.

GIVEN THE PRECEDING PREREQUISITES

If and only if a product, a behavioral pattern, or response required the individual to assign meaning to information or an experience using predetermined recalled guidelines as the basis of the assignment with the result being consistent with the meaning of the original information, then evidence of Transfersion exists.

6.00 ABSTRACTION

Abstraction refers to the ability to spontaneously and without cues use previously learned guidelines as abstractions in order to solve, respond to, or explain problems and situations both similar to and different from those where these guidelines were originally learned and rehearsed. This behavior involves the use of guidelines understood as abstractions to intepret, explain, or resolve correctly a situation or information when the use of these particular guidelines was not specified by some external stimuli. On this level, the reasons for the individuals response must be both explained and based upon guidelines understood as abstractions. Furthermore, in all cases, the use of whatever guidelines which are used must not be in response to some cues given by an external agent.

Abstraction includes the ability to use such guidelines in order to more deeply and fully clarify the meaning and messages of some information. Interestingly, individuals frequently use the level to respond to situations and problems using their own accumulated set of perspectives, hunches, and guidelines as the basis of their responses. Since such personal guidelines have helped them in previous situations, individuals tend to rely more and more on these guidelines to assist them in life experiences. Whenever possible, these individuals will attempt to use their personally arrived at guidelines to respond to their experiences rather than acquire and use those presented by some external agent (e.g., the teacher). Hence, for some individuals to acquire a new set of guidelines at this level implies that they abandon an old set which they previously used. As a general rule, individuals tend to resist changes in the abstract understandings they have acquired as a result of their own life experiences and thinking.

Whether personally developed or instructionally-acquired guidelines are used, the frame of reference for explaining and supporting responses on this level must be guidelines which have previously been rehearsed on the Transfersion level. As far as the teacher is concerned, the response must be in terms of the guidelines which have been emphasized during instruction.

For Abstraction to occur, the individual must take the guidelines understood as abstraction and use them as a frame of reference for examining a situation or information. In these cases, the individual picks up cues (i.e., deduces) what guidelines are to be used in the particular response. The individual then is presented with certain "conditions" where what has been rehearsed at the Transfersion level is appropriate. But, the individual now must obtain the cues to utilize the correct set of guidelines from the situation itself rather than from some external source or stimuli. Ultimately, the appropriateness of the response is tied to both the accuracy of the response and to the use of the particular set of guidelines which was to be used in the situation given.

The focus of this level of thinking and behaving is always the use of the abstract guidelines itself with the realization that given situation or experience represent only concrete examples or illustrations of these guidelines.

6.10 MONOTATION

In some situations the individual encounters, only one set of guidelines may be used to examine or resolve the situation. The individual may find that only one set of guidelines of which he is aware can be used in the situation. At other times, several sets of guidelines may be appropriate and the individual may decide that only one of these is to be used. Regardless of which of these procedures is used, when only one set of guidelines is used, the monotation learning is being used. This form of Abstraction focuses on the individual being able to repeat what has been rehearsed on the Transfersion level without being cued to use the guidelines which are to be used.

- When given a situation where various forms of propoganda devices are illustrated, the student will write a comparison of two sets of these devices including three ways which the devices in each set are similar to and different from one another and basing the comparison on the ten characteristics of propaganda devices as these were presented in class. [a]

[a]Because the responses on the Abstraction level are essentially free responses to "conditions" provided by the teacher and/or the environment, specific objections written on this level tend to be projective. That is, they are written to include the behavior expected of students and the specific guidelines they are to use as the basis of this behavior even though they are not to be cued to use them. The teacher is reminded that on this level, the correctness of the answer students provide is only part of the total behavior required for Abstraction learning to be confirmed. The most important feature of their answer is that they must base and explain it in terms of the guidelines which they have rehearsed on the Transfersion level and are now using without being cued or directed to do so.

6.20 FORMULATION

Because more than one guideline is often appropriate to examining and understanding any one single situation or problem, individuals may find themselves using combinations of guidelines in their thinking and reacting. These individuals may find the use of two or three separate guidelines in combination with one another appropriate to examine a given experience. In these cases, they may form 'rules' or 'principles' which chain or combine two or three guidelines.[a,b] These particular chains or combinations represent (what the individual believes) a logical relationship among the guidelines used to form them. Thus, these chains or combinations become propositions which are sufficiently probable to the individual to warrant use and/or verification in particular situations. To the individual who formulates these chains, the relationship suggested by the particular combination possesses a high probability of being valid and as such is worthy to be considered and used in the situation.

As one would expect, individuals who "invent" and use such chains must be able to support their reasons for each particular chain in terms of the abstractions they have used to formulate them. In addition, they must explain how their "chain" is appropriate to the situation where it was "invented" and used.

"When given a situation which includes both "conflict" and "violence," the student will write a description of the reported events as they illustrate the relationship conflict and violence including an explanation as to the basis of this relationship using the concept of conflict and violence as these were presented in class without being cued to do so.

6.30 ASSEMBLATION

Individuals often encounter situations when more than one or two guidelines or chains are inadequate to examine or resolve the situation. At these times they find themselves needing to use several guidelines, sets of guidelines, or chains in combinations with one another to make meaningful decisions about the situation or problem. In some instances, the individual may realize any number of plausible interpretation or solutions are appropriate responses depending upon the particular guidelines or chains which are used. Yet in other situations, the individual may realize that there are available several different combinations of guidelines and chains which can be used to arrive at only one appropriate answer or explanation. In both cases, assemblation involves the combination of guidelines and chains to form complex sets of abstractions by which situations and problems may be examined. As with the combinations and chains formed on the Formulation level, these combinations must represent logical relationships among the guidelines and chains used to form them.

The individuals who "invent" these complex sets of combined guidelines and/or chains must be able to support the relationships that are implied in them. In all instances of Assemblation, the complex combinations which are formed and used must be developed and provided by the individual without any cues from external agents or sources.

"When given a situation of a societal problem that could be corrected, the student will write a series of proposed policies which could help reduce and eliminate this problem including explanation as to the reasons why they might work based upon the guidelines for reducing pollution, the characteristics of governmental activity, and the methods of public persuasion which were presented in class without being told to use these three sets of guidelines.

PREREQUISITES FOR ABSTRACTION

A) The demonstrated understanding on the Transfersion level of guidelines which are to be used as abstractions;
B) The identification (via internally deduced cues only) of the appropriate single or set of guidelines which is to be used;
C) The identification (via either external or internal stimuli) of some information or source which is to be examined in terms of these appropriate guidelines; and
D) The identification (via either external or internal stimuli) of the particular information process or outcome that is to be used.

GIVEN THE PRECEDING PREREQUISITES

If and only if a product, a behavioral pattern, or response required the individual to resolve, explain, or examine correctly a situation or problem on the basis of appropriate guidelines understood as abstractions and these were used without the individual being cued to use them, then evidence of Abstraction exists.

[a]The reader is reminded that "concepts" are included as one of the types of "guidelines" which are available to be acquired, retained, rehearsed, and understood as abstractions (see Figure 4).

[b]Gagne would refer to such combinations as "rules" or "principles" and aspects of this procedure as evidance of "rule-" or "principle-learning." Note that "principles" and "rules" as well as other combinations or chains of guidelines may be formed on two lower levels besides Abstraction. Individuals may combine newly confronted guidelines to form rules on the Transfersion level. They may also combine guidelines they are rehearsing on the Transfersion level. On this level, they would initiate their own combination of guidelines to form rules or principles to enable them to explain, examine, or resolve a particular situation without being cued as to which specific guidelines are appropriate or that they should be combined.

7.00 ORGANIZATION

Because abstract understanding implies the internalization of information and guidelines and since the volume of the abstractions acquired by the individual increases with time and experiences, each individual engages in the processes of arranging, ordering, and placing these abstractions within a single cognitive belief structure.

Organization functions to (a) arrange the various guidelines understood as abstractions into a system, (b) determine the interrelationships among them, (c) establish the hierarchial relationships among them, (d) determine how information and guidelines not understood as abstractions should be considered and placed within the framework of the existing cognitive belief system, and (e) achieve some level of equilibrium, harmony, and consistency among the relationships included within the overall structure.

While Organization tries to effectively function in these ways, in actuality the results of this process may be something less than consistency and harmony. In some cases, the results of this process so 'compartmentalize' what one has come to understand that he is unable to realize his own inconsistent behaviors, thoughts, beliefs, values, or ideas. With these situations, the problems individuals may experience are more related to their "Organization" of their knowledge than they are problems suggesting the inability to learn.

The structure which results from Organization includes cognitive and valuational understandings carried through the Abstraction level. It interrelates these two dimensions of understanding and responding into a single cognitive belief system. This structure is subject to change as new abstractions are attained or as new experiences disrupt the equilibrium to the point of forcing some reorganization of appropriate parts of the system. In general, individuals become more and more rigid in their consideration and placement of new abstractions within their existing belief system. Thus, as the individual ages, more and more experiences and ideas are attended to and screened by way of the internal frame of reference this organization has produced.

*After having reacted on separate occasions to three (or more) similar situations including the identification of personal choices and the reasoning behind each of these decisions, the student will write an explanation of their decision and reasoning with an emphasis on the consistency and harmony of these with one another across situations using as the basis of their explanation the student's own sets of guidelines.

*When given three situations which are similar, the student will write an essay describing how two of these are more similar to each other than either one is to the third and explain why these two are together different from the third using as the basis for this description and explanation the same set of guidelines without being cued as to what they are to use.

PREREQUISITES FOR ORGANIZATION:

A) The understanding of two or more sets of guidelines on the Abstraction level; and,
B) The demonstrated use of several sets of guidelines to resolve or explain similar situations where they may or may not be appropriate.

GIVEN THE PRECEDING PREREQUISITES:

If and only if at the moment of behaving, a product, a behavioral pattern, or a response required the individual to react on the basis of several different sets of guidelines for interpreting, examining, and reacting and the reaction can be systematically explained in terms of the individual's own reasoning, then evidence of Organization exists.

8.00 GENERATION

Generation refers to the ability to integrate separate elements in order to form a single new product or explanation which is unlike any previously assembled entity with this combination being internally consistent and an extension of abstract understandings taken through the Abstraction level. This must involve the combination, accommodation, or synthesis of two or more sets of guidelines each having been learned and demonstrated at the Abstraction level. This behavior may be the result of a direct instruction from an external source (directive) or of personal initiative to produce a product.

This behavior or its resultant product must depict a purposeful new integration or accommodation of guidelines understood as abstraction to form a unique whole. This may include the gathering together of assorted isolated entities to form a single new entity or the rearrangement of the parts in a single existing entity. In either case, the concrete elements, forms, or entities used or produced only represent the internal synthesizing processes which is or has taken place within the mind of the individual.

When Generation occurs, the individual brings together the abstractions which are understood as guidelines, principles, rules, etc. and combines, accommodates, and synthesizes these into consistent, logical, and unique combinations which may take visible form in some concrete behavior or product. In other words, Generation requires the integration of abstractions which is then translated into the concrete via behaviors and/or products. Thus, by definition, the learner must be able to explain the behavior or product in terms of the unique integration (synthesis) of two or more sets of guidelines (abstractions) and not merely in terms of the concrete elements themselves.

This behavior involves the generation of new information, explanations, products, or behavioral patterns as a result of the person's own initiative using and synthesizing guidelines identified by the individual. Here the individual identifies what is to be the focus of the 'creative' effort as well as what guidelines (abstractions) are to be synthesized to deal with this focus. Hence, the individual supplies the essential components needed to invent, discover, or create new integrations and their resultant products.

PREREQUISITES FOR GENERATION

A) The demonstrated understanding on the Abstraction level of two or more sets of guidelines, principles, techniques, etc. as abstractions.
B) The identification (via internal stimuli) of the particular guidelines (abstractions) which are to be integrated or synthesized.
C) The identification (via either external or internal stimuli) of the particular form (information, product, explanation, or behavioral pattern) which the synthesizing processes are to focus upon.

GIVEN THE PRECEDING PREREQUISITES

If and only if a product, a behavioral pattern, or information required an individual to integrate (synthesize) two or more abstract understandings in order to form a single unique whole and this integration and product are internally consistent and are valid (can be explained) in terms of the inter-relationship between the given abstractions (e.g., guidelines) and the physical elements used to illustrate these synthesized abstractions, then evidence of Generation exists.