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ABSTRACT

Intended for educational practitioners interested in direct application of learning and cognitive style to the classroom and the encouragement of transfer skill acquisition, this document is a review and synthesis of cognitive, learning, and teaching style literature with application to adult life stages and development. The first section of the document is primarily an overview, discussion and merging of cognitive and learning styles with transfer skills. "Linking Style and Transfer Skills" discusses what is known about transfer skills and transfer skill acquisition, and then presents the notion of style and some of its elements as they relate to transfer skill acquisition. Chapters that follow examine the literature on cognitive style and learning style separately. Implications for research on all three of the concepts (transfer skills, cognitive styles, and learning styles) are offered within the context of a discussion teaching style. Current applications in educational and training environments are discussed and various inventories for assessing cognitive/learning styles are identified and compared to assist the reader in selecting a learning style approach. A number of literal and figurative illustrations are used throughout the monograph. (MEK)

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ED186685

Information Series No. 195

**COGNITIVE STYLE, LEARNING STYLE,
AND
TRANSFER SKILL ACQUISITION**

Patricia Kirby

U S DEPARTMENT OF HEALTH,
EDUCATION & WELFARE
NATIONAL INSTITUTE OF
EDUCATION

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The National Center for Research in Vocational Education
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1979

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**An Interim Report
On a Project Conducted Under
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**U.S. DEPARTMENT OF
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FOREWORD

As part of its programmatic research on transferable skills and occupational adaptability, funded by the National Institute of Education, the National Center for Research in Vocational Education has commissioned the preparation of papers to explore critical issues and provide a current base of knowledge to educational researchers and practitioners. This document was commissioned to review and synthesize what is currently known about cognitive and learning styles, and to examine how this knowledge may assist in the understanding of transfer skill acquisition. The author traces the conceptual development of cognitive style in the psychological literature and discusses current applications in educational and training environments. Various inventories for assessing cognitive/ learning styles are identified and compared to assist the reader in selecting a learning style approach.

It is hoped that this document will inform those educational practitioners who are interested in direct application of learning style in the classroom and the encouragement of transfer skill acquisition. The National Center invites researchers in education and other related areas to use this document as a resource for further exploration into the learning process.

The National Center wishes to thank Patricia Kirby for her scholarly efforts in reviewing and synthesizing the literature from many sources and disciplines. We also wish to express appreciation to the reviewers of the early draft of the paper. They were Michael C. Giammatteo of the Sylvan Institute of Mental Health and Family Services, Vancouver, Washington, and Jaret O. Hagberg, co-founder of the Human Renewal Center, Minneapolis, Minnesota. Additional support for the paper was provided by staff from the Transferable Skills and Occupational Adaptability Program, including Connie Faddis and Jan Lindner, who contributed to the editing and refining of the report; and Bob Abram, who coordinated the development of the paper, including revisions and final preparation for printing. The encouragement and support provided by Robert Stump, program officer from the National Institute of Education, and of Frank Pratzner, associate director of research at the National Center, is also gratefully acknowledged.

The paper was prepared under the general supervision of Dr. William L. Ashley, program director of the Transferable Skills and Occupational Adaptability Program at the National Center.

Robert E. Taylor
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The National Center for Research
in Vocational Education

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PREFACE

This monograph is for educators, trainers, and career developers concerned with transfer skill acquisition; that is, "survival"—whether on the job, in academic work, or even in life in general—through use of the generic or process skills that seem to underlie such success. It is an attempt to link cognitive and learning style research and theory to survival in the world of work, and to show how the understanding and ability to use transfer skills *or* cognitive/learning styles lead the one to the other.

If you are not familiar at this point with cognitive or learning styles, you are in good company: "... not one teacher or counselor in a hundred knows anything at all about cognitive styles despite the fact that research on cognitive styles has been going on for some twenty-five years," laments Patricia Cross (1976); and we may add "trainer" to the list of those presently uninformed.

The topic of cognitive style has been elusive, due in part to the fact that many practitioners, working with one or another type of style research, never mention the existence of other types of cognition. As a result, like the blind men and the elephant, different people have been working with different things and calling them all "cognitive style." Upon further investigation, the author found that much the same was occurring with what is called "learning style." Until now, few people have attempted to unite these scattered schools of thought.

In this paper, we will look at not only cognitive and learning styles, and transfer skills, but also related areas such as life stages and development, which have much to tell us about the periods in life when we may expect that new transfer skills will emerge or styles of cognition or learning will be augmented.

This monograph can be viewed as a springboard to further insights, since even on the last page, we will not have fully arrived at our goal. Many gaps exist in research and in practice. Recently, the performance and training world (as apart from the academic world) has begun to take notice of how cognitive and learning style information can be put to work. It is to our colleagues in both worlds that this monograph is directed.

Scientists frequently forewarn readers of their research or personal value biases in their reports. So it is appropriate for this author to reveal her own cognitive style in order that a reader can better understand why the particular format and materials in this document have been used. The author often uses a cognitive style element—or a transfer skill, if you will—called "synthesis." This is the process of finding creative new ways to relate a variety of ideas or things, whether it is ingredients in a stew or abstract analogies in a publication. She is also very visually-oriented. This explains why you will find a number of literal and figurative illustrations throughout the monograph.

At this time the author would like to thank the many persons who have helped on this project. First and foremost are the designers and practitioners who work with one or another cognitive/learning style. The chance to speak personally with those involved in the most recent developments has made it possible for the author to integrate many notions she had been developing since being drawn into the field of cognitive style five years ago.

Further thanks go to the official reviewers of the monograph draft. They are versatile practitioners, each familiar with many different cognitive and learning styles in terms of theory and measurement, and each working to train people to use their own styles to best advantage. The reviewers are Michael C. Giammatteo of the Sylvan Institute of Mental Health and Family Services, Vancouver, Washington, and Janet O. Hagberg, co-founder of the Human Renewal Center, Minneapolis, Minnesota, whose valuable contributions to the field will be discussed in the text.

Mary Ellen Shuntich of the University of Kentucky was of invaluable help as an "unofficial reviewer." Having used only one of the learning style inventories in her work with self-instructional materials, she read the draft from the standpoint of what she described modestly as "someone in the field who does not have an all-around grasp of cognitive or learning style, like those who will be reading your monograph."

Another unofficial but equally insightful reviewer was James V. Orr, who is working on a major integration of cognitive style theory for his doctoral dissertation at Oakland Community College. Jim's long-term support for this and the author's other attempts at integration has been a source of real encouragement.

Others who deserve special thanks for their time and help are Dick Baker, Madeleine Carabocone, Albert A. Canfield, Patricia Cox, Gene Donahue, Kenneth Dunn, Harryette Ehrhardt, Gerardo Franciosa, Clydia Case Garnett, Richard M. Gummere, Jacques Jimeraz, Ann Jungbludt, Warren J. Keegan, Peter G.W. Keen, David A. Kolb, Bill Leclerc, Anne Litwin, James J. Lynn, Bernice McCarthy, James W. McKenney, Lillian McMillen, Samuel Messick, James Mustachio, Thomas Niles, Otto Payton, Paul Pottinger, Gary Price, Manuel Ramirez III, Howard Russell, Judy Springer, Waino W. Suojanen, Allen Tough, Harry Wachs, Laird Warner, Gene Winter, and Donald M. Wolfe.

Illustrations were the combined efforts of Mary Vicinus, who worked with the author in conceptualizing the artwork, and Ray East, who transformed ideas into drawings.

OVERVIEW

The Case of the Missing Transfer

Acquiring knowledge and skills is an important part of the educational process. It is also equally important that students learn to use and apply the knowledge and skills they have spent all those years learning. Teaching must develop students' ability and confidence to transfer school learning to life applications. The capacity to transfer may be the most powerful one a person can possess. (Selz & Ashley, 1978, p. 1)

Because the skills emphasized in career preparation often cannot be used in a real work setting exactly as they were learned in a school setting, persons of all ages need skills to help them transfer what they know and modify it to fit the new situation. What are these special kinds of skills? They are the ones that help people move through life "in the fast lane," enabling them to deal with the many changes from one context to another—especially in jobs—that they will face.

Such skills have been called "transfer skills," or "process skills," since they allow us to move from job to job, location to location, or activity to activity, with as little confusion as possible. We are expected to have them, even though we rarely are taught or trained in them. We are promoted and admired if we have them, but are penalized if we don't.

How do we develop transfer skills? What kind of training is needed? No school or advanced curriculum can prepare us with *all* the skills we need for a lifetime or for even a few years ahead (Pelz, cited in Messick & Associates, 1976). With this realistic awareness as a starting point, we can then take steps to learn whatever skills we need and to keep our skills updated, not rest contentedly with a degree, a certificate, or other proof that we spent a certain amount of time learning things.

We do not want to imply that knowledge is not essential. Indeed it is. Rather some knowledge seems to be less transferable across jobs. It may be, however, that the possession of an ability to access knowledge is an important key to changing jobs or higher level jobs at relatively the same level. (Stump, 1979)

Training for flexibility involves skills, knowledge, and attitudes. The focus in this document is on *skills*. It is the use of skills that allows us to maintain and increase our original knowledge, no matter what the circumstances. For instance, people who are "street smart" have a knack for figuring out what they need in a situation and then finding ways to obtain these necessities. This is what we mean by flexibility, or exercising transfer skills: being able to find the way to meet the challenge from among alternatives, not remaining set on just one route that is helpful sometimes, maybe most of the time, but not all the time.

The emphasis here is on *conscious choice of which available skills to use*. This means we must know what our options are. And to know our options means, in turn, that we need training to recognize them and increase our ability to use them. Such training can be done systematically in

regular school settings *or* in special outside training. Educators and trainers are just beginning to see how they might engage in such programs. The focus of this monograph is on how "cognitive" or "learning" style may assist in this endeavor. Considering that the *average* adult in this country annually undertakes five major learning efforts whether formal or informal (Tough, 1978), imagine how helpful it would be to people to know how to act on information about their styles!

Whatever else such training programs involve, it appears that they must take an increasingly technical approach to the training, as we understand more and more what works and what does not work toward our aims. Training need not be only *behavioral*, breaking down performance into small steps for the student to carry out; it can and should also be *developmental*, encouraging the transformation of the student into a curious, motivated, person by use of challenging training materials (cf. Harmon & King, 1979).

If we succeed in designing and using such an approach, students of all ages will have a better chance of attaining the virtues that so many school catalogs predict for their graduates: "openness to a changing world," "self-confidence, maturity, readiness to lead," onward and upward! For some reason, "virtue" has come to mean only the set of *moral* transfer skills such as faith, hope, and love. What about high-level *cognitive* skills such as analysis, synthesis, and evaluation too? Or *affective* skills such as responding to others? Did anybody ever directly teach you "how to evaluate" as you were growing up? "How to empathize?" "How to deduce?"

"Virtue" is an apt word to use in describing transfer skills. The word literally means "strength." A "virtuous" person in this sense will be able to transfer knowledge and skills effectively into any new context. Imagine what it would look like to get a report card grading such transfer skills. Figure 1 is an example that the *Brain/Mind Bulletin* (1977) calls a "Report card for the other side of the brain."

Where schools *have* taught transfer skills, directly and systematically, it has usually been in religious schools; and they have almost always focused on the moral transfer skills, which are only a large part of the whole set of transfer skills. Recently there have been attempts in various quarters to teach cognitive and affective skills too—or to rename moral transfer skills, such as "humaneness training" (e.g., teaching children to be kind to animals in hopes that they will then also be kind to other humans; see Ashby, 1979). Alternative training is another avenue for transfer skill acquisition, but that has usually been available only to those who need special remediation (for instance, students receiving perception help) or else those who already show talent (for instance, managers receiving training for further responsibility or promotion).

Going in "Style"

Using information about cognitive or learning styles can help in transfer skill acquisition, particularly for the cognitive transfer skills (although other skills are measured on some style surveys). With style profiles—"maps"—of an individual's favorite or most-used learning or cognitive route, the person can view not only the strengths but also any gaps he or she needs to work around or to fill. Facilitators—teachers, trainers, counselors, and even supervisors—can use the maps individually, collectively, or as a group. The maps can then serve as a guide for acquiring other styles or style elements to some degree. It should be possible to train people to use a conscious strategy for increasing their options. A small amount of work is now being done in this line, sometimes called "augmenting one's map," "learning to style-flex," or "becoming bicognitive."

GRADE	<u>5</u>	SCHOOL	<u>Da Vinci Elementary</u>
SEMESTER ENDING	<u>June</u>	PRINCIPAL	<u>B. R. Fuller</u>
	<i>Mid-Semester Mark</i>	WORK HABITS	
SPATIAL RELATIONSHIPS	<u>B</u>	Able to transcend space/time limitations	<u>C</u>
INTUITION	<u>B</u>	Is flexible	<u>C-</u>
INSIGHT	<u>C</u>	Listens attentively— with third ear	<u>C</u>
GENERATES IDEAS FREELY	<u>C</u>	Follows directions unless better idea occurs	<u>B</u>
DAYDREAMING/REVERIE	<u>C</u>	Completes assignments— when useful	<u>B</u>
GESTALT PERCEPTION	<u>B+</u>	Makes good use of time:	
ESTHETIC SENSIBILITY:	<u> </u>	Fantasizing	<u>D</u>
Color	<u>C+</u>	Creating	<u>D</u>
Form	<u>C</u>	Meditating	<u>C</u>
Music	<u>B-</u>	CITIZENSHIP	
Poetry	<u>D</u>	Accepts responsibility	<u>A</u>
<i>Teacher's comments:</i>		Respects authority—if there is justification for respect	<u>B</u>
<i>School psychologist suggests remedial imagination</i>		Respects rights and property of others	<u>B</u>
<i>Explanation of Marks:</i>		Shows empathy/telepathy	<u>B</u>
A—Outstanding		Teacher's Signature	_____
B—Very Good		Parent's Signature	_____
C—Satisfactory			
D—Needs Improvement			
F—Unsatisfactory			

FIGURE 1. "Report card for the other side of the brain." *

* Courtesy of *Brain/Mind Bulletin*, published by Interface Press, Box 42211, Los Angeles, CA 90042; \$15 a year. Send stamped, self-addressed business-size envelope for sample issue.

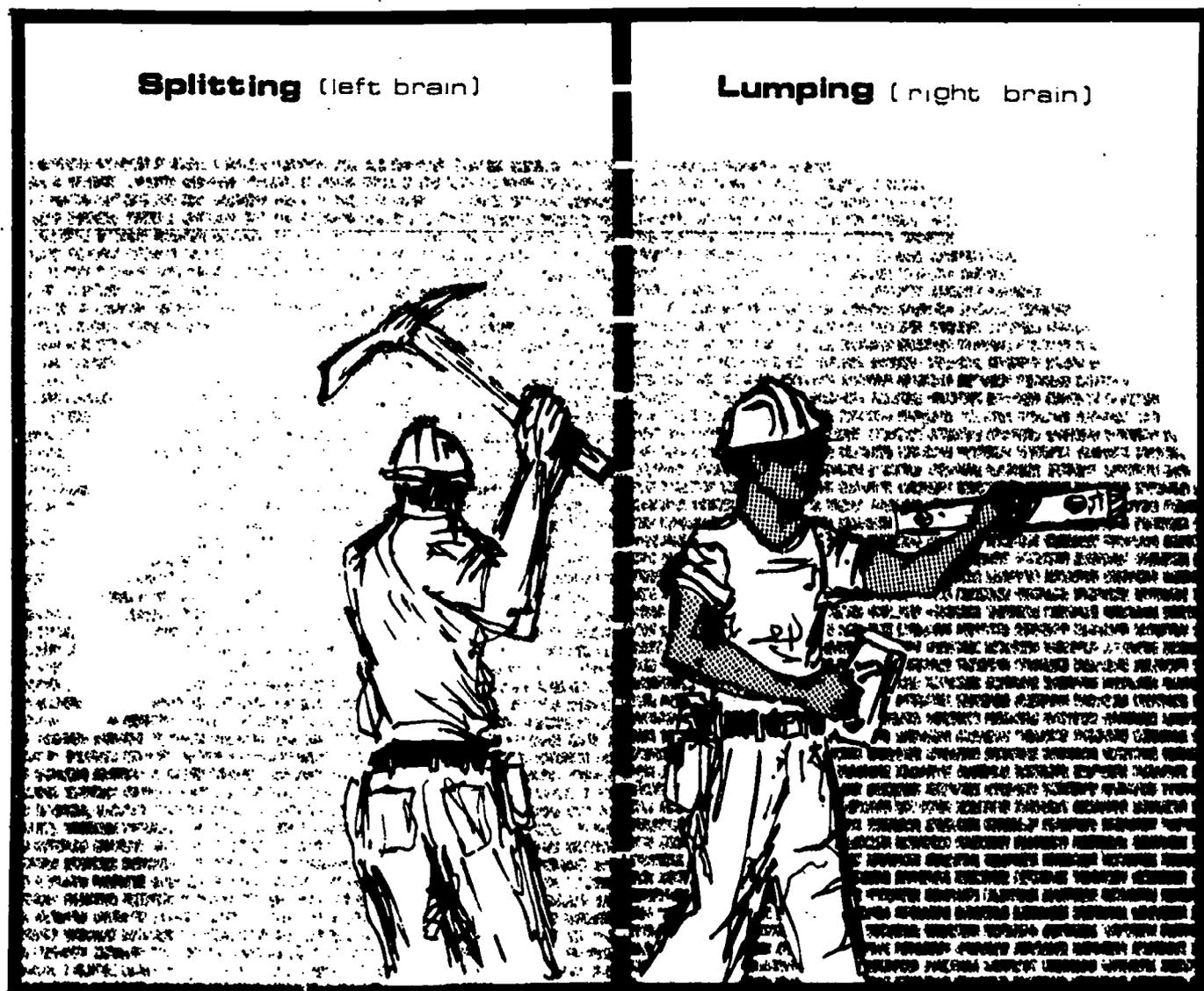
An increasingly popular comment these days is that perhaps the ultimate transfer skill is *learning how to learn*, to keep up with our changing society and changing job demands. If this idea is true, using cognitive or learning style maps should make learning how to learn, or how one *could* learn, much easier. The result would be a "learning society," in which all the members keep on learning all their lives, at each stage, informally as well as formally.

Clearly, then, knowledge plays a vital role in acquiring transfer skills. It is important, though, to learn how to access knowledge by many routes. Yet individuals usually emphasize just one main route, with possibly a single backup route that is rarely used half as well as the main route.

How Is Knowledge Accessed?

One of the most basic distinctions between people in terms of how they access information and what they do with it is what Cohen calls the "splitter" and the "lumper" distinction (Cohen, 1967). This should be kept in mind in examining cognitive and learning styles, and their relation to transfer skills. The splitter/lumper distinction overlaps "left-brain" and "right-brain" activity, respectively, which may be somewhat more familiar concepts.

The question asked in distinguishing splitters from lumpers is, "*Does the person look at reality by splitting it apart into small pieces . . . or by lumping it together into a big picture?*"



Do you tend to look at details? Or do you usually try to look at "the big picture?" Here is a basic cognitive style distinction.

If you focus on details, you most likely get information best through a series of clearly marked steps, perhaps even something as formal as a logical flow chart. You must want to know what to do, probably not bothering to discuss it much. Perhaps you even prefer to learn on your own. You are primarily a *splitter*.

If, on the other hand, you look at "the big picture," chances are you'd rather find out how to do something by watching someone else do it. You probably enjoy discussion about it with other people. You are primarily a *lumper*.

No matter which cognitive or learning style you use, you probably find that you use it in informal moments as well as in formal education. If you focus on details, you may be one who loves to follow the packaged instructions for assembling a home listening center. If you prefer the "big picture," you may well tear up those instructions, saying, "Just *show* me how it's done."

Some Vocational Correlates

No matter which kind of style individuals use most, they probably have chosen the sort of study and work that capitalizes on the way they access information. People who like detail often go into fields using math and logic, such as computer work, management analysis, research, and advanced teaching. People who like a big picture are often artists, performers, writers, or such, as they usually appreciate the arts to at least some degree. Other fields they may enter are the social sciences, school teaching, and counseling.

"Splitters" seem to be more specific and clear in their vocational choices; "lumpers," less so (Clar, 1971).

Cognitive and learning styles predict the *direction* people will pursue for achievement, not general levels of achievement. Style is thus a potentially powerful basis for career guidance (Messick & Associates, 1976).

A number of studies (Kolb, 1977; McKenney & Keen, 1974; Niles, 1974) examine cognitive style as it relates to job characteristics or traits found in successful or unsuccessful performers, but the main concern in this document is transfer skill acquisition. There is a movement, however, toward considering generic transfer skills of job applicants as much as, or even in preference to, direct vocational skills. Many employers prefer to give new employees their own vocational skills training; and one of the best indicators that employees will learn the needed skills is their flexibility in using one or more selected transfer skills. The emphasis on transfer skills as job entry indicators is encouraged by an increasing number of "how-to-land-a-job" books or programs like Columbia University's "Project DIG" (Deeper Investigation of Growth). This program assists people to identify and list skills they have as assets for consideration by employers. Compiling a list of transfer skill assets is much easier if the person already has a good idea of his or her cognitive or learning style, for information from the style "map" can be put directly onto the list.

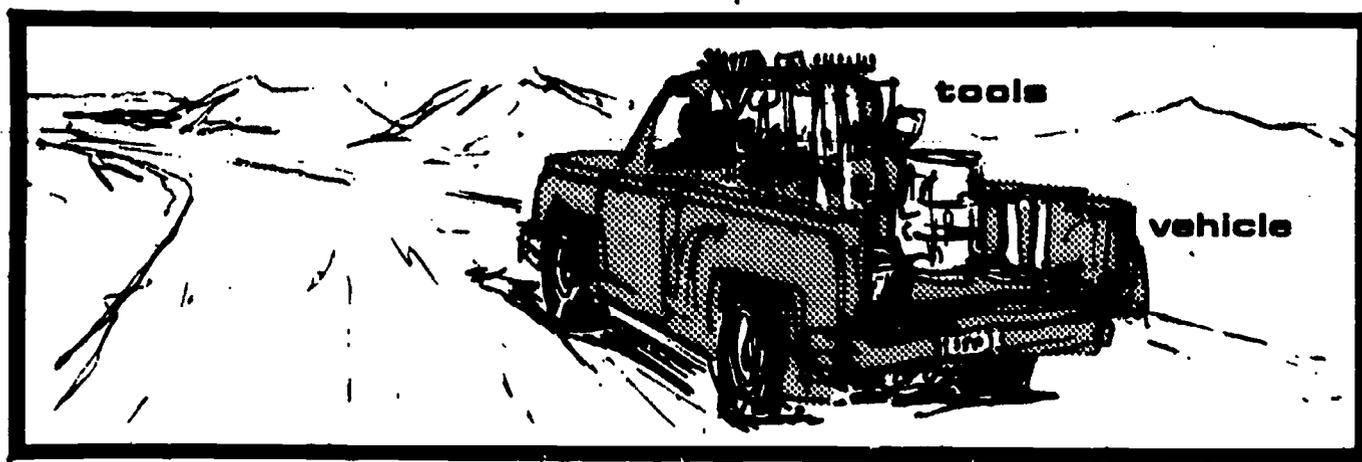
Coming to "Terms"

As on every road, it's important to know what the signs on one's style map mean when we encounter them. In this monograph, there are at least four to watch for. We will look at each set now, and return as needed to look at them more closely later.

Transfer skills versus transferable skills. In a nutshell, both types of skills underlie success or failure on the job or in school. These skills may be thought of as similar to a vehicle and cargo: transfer skills are the "vehicle," and transferable skills, the "cargo," a cargo of tools—work tools and study tools, tools to get things done.

The idea here is that transfer skills help people adapt, cognitively or otherwise, in going from a learning situation to a new situation where they will have to make the adaptation by using their transfer skills. Of course the new situation will not be 100 percent like the original. For this reason, people need to carry over, to generalize, from the first to the later situation.

The transferable skills are like good tools that can be used in different situations, even for different purposes. A person's favorite tool is no doubt one that serves several purposes, such as the all-purpose Scout knife. So too with transferable skills. If a person had a cargo of some tools that could only be applied in *one* situation (although very well in that situation), the person would not be very well prepared to deal with many situations. But having one-situation tools is the case for the mentally retarded; they don't perceive the opportunity in a new situation to use a skill they used well in a previous situation. They do not generalize. In a certain sense, they might as well not have the skill unless they find themselves in the very same situation over and over again, where it is clear to them that this is the place to apply the skill.

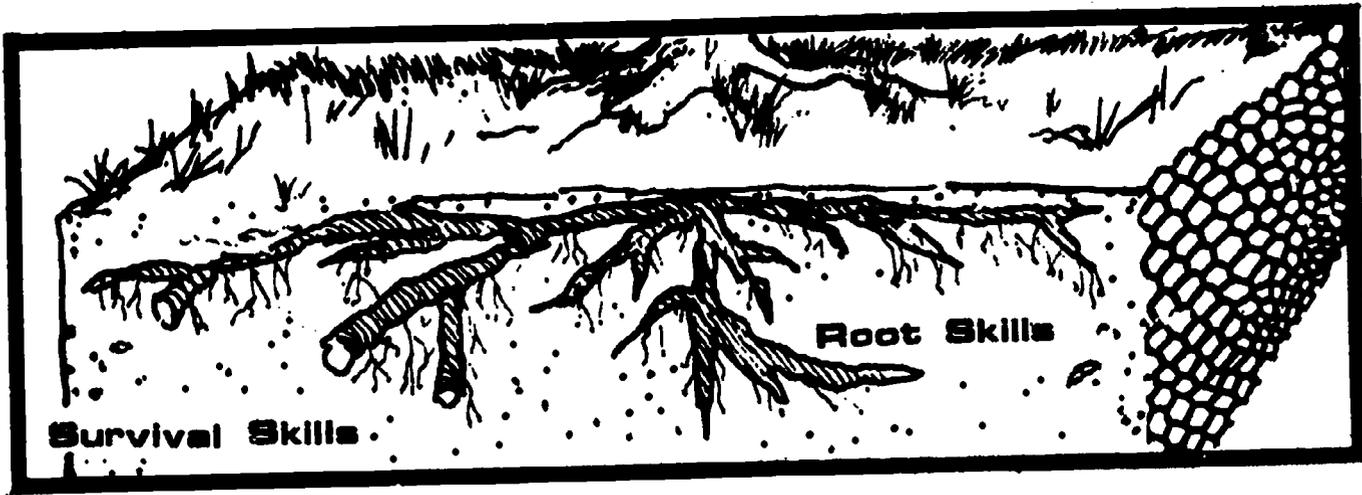


Transfer skills are thus more general process skills to get us from one situation to the next, where we can apply our transferable skills.

Imagery that may help define the difference between transfer and transferable skills is used by Hagberg and Leider (1978), who call them "survival" and "root" skills, respectively. Survival skills (transfer skills) are like plant soil, because they provide nutrients for growth. They are "really your ability to read yourself and your environment. These skills are so important that they are most often the prime factors in hiring, firing, demotion, and promotion." We might add, "... in school or many everyday interpersonal situations."

Root skills, by contrast, compare to "transferable skills." They grow out of the good soil of the survival skills. They are

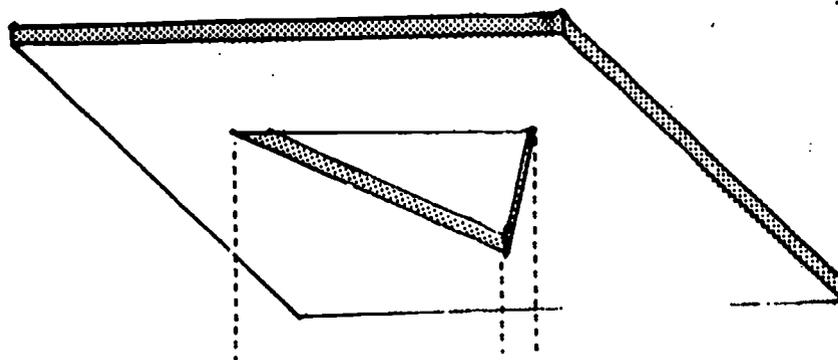
... not always obviously visible, but they are your essential tools in performing in the world of work. Your root skills are your portable, transferable, usable skills. They are treated as actual things you can do (skills you have), and they express the action you actually perform in work situations. (Ibid, p. 98)



Cognitive versus learning style. Again, these are terms that seem alike at first. They both refer to *how* people move toward a destination, that is, toward attaining a certain desired piece of information or a skill. We do not really know how much a style reflects preference or how much it reflects ability.

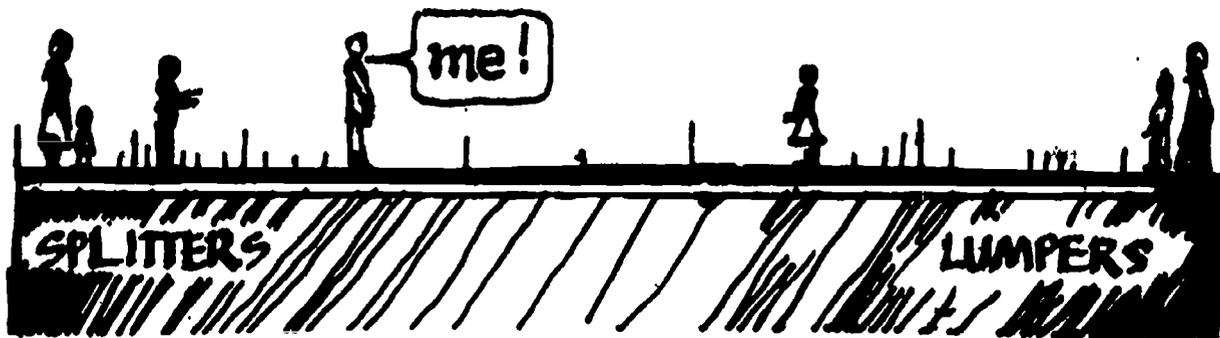
The earlier of the two terms to appear in research literature is "cognitive style," and there has been more experimental research done on it than on learning style. Both cognitive and learning style have been measured on various kinds of self-report or observational instruments, most of which have been validated and found reliable to varying degrees of refinement. By reviewing individual or group scores obtained from such instruments, trainers or educators can design and individualize learning or training experiences more easily and completely.

Cognitive style. "Characteristic ways of using the mind," (Cross, 1976), or "a person's typical modes of perceiving, remembering, thinking, and problem solving" (Messick, cited in Claxton & Ralston, 1978), are two definitions of cognitive style. Taking a problem-solving interpretation, cognitive style could be thought of as the application of a person's preferred style to all problems, as though superimposing a pattern or even "personality" onto all problematic situations (Ewing, 1977).



This "diverse assortment of characteristics having to do with the different ways people perceive and conceptualize the sights and sounds, words and meanings, with which the world confronts them" (Tyler, 1978, p. 148), crystallizes into an overall "construct that is involved in many cognitive operations, and that accounts for individual differences in a variety of cognitive, perceptual, and personality variables" (Vernon, 1973, p. 139). In other words, cognitive style is the HOW, the way the behavior occurs, not the WHAT, the abilities or the content.

When we start thinking of people as similar or dissimilar in their use of one cognitive style or another, we are thinking of them in terms of a "type." Almost all of the many cognitive style types that have been proposed suggest two polar extremes, here called "splitters" and "lumpers." Though people could fall more or less anywhere between the poles, they usually tend more toward one side or the other.



Learning style. This is similar to cognitive style in most regards, but the context is more specific—"the student's consistent way of responding and using stimuli in the context of learning" (Claxton & Ralston, 1973, p. 1). This context is broad: "a personally preferred way of dealing with information and experience for learning that crosses content areas" (Della-Dora & Blanchard, 1979, p. 22).

There are many different kinds of learning styles that have been proposed, just as in the case of cognitive style. But each proposed learning style includes many more elements. This means that there are larger sets of elements in learning style, and thus, many more possible styles based on combinations of elements.



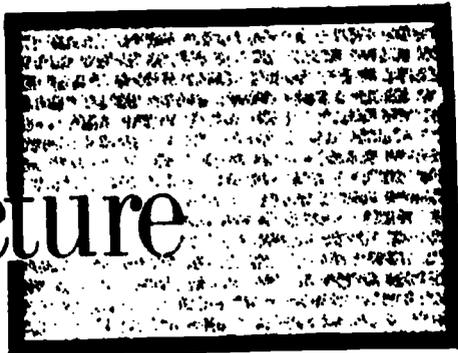
Visual • Independent • Deductive • Theoretical verbal

(Someone who needs to see things; who profits from study alone; who works from the top down from general principles; and who deals well with abstract words.)

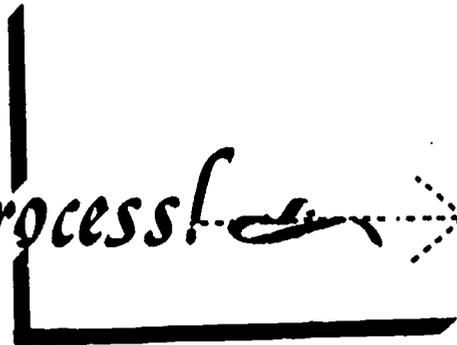
The research on transfer skills and transferable skills conducted at the National Center has much in common with research on cognitive or learning style. In both, inquiries are made into the underlying skill(s), and these underlying skills are somehow bound up with adaptability, a basic process skill.

Process, structure, and content. These terms differ in important features. "Structure" and "content" refer to something solid or stable, "process" to something changing. Stability and change in turn offer a choice of how to look at just about anything in the world. Figure 2 shows how cognitive and learning style can be looked at in each way.

Structure



Process



<p>Cognitive style as STRUCTURE:</p> <ul style="list-style-type: none">● Relatively stable, acting on the environment.● Cognitive style shapes the environment.	<p>Cognitive style as PROCESS:</p> <ul style="list-style-type: none">● Flexible, interacting with the environment.● Environment shapes cognitive style and vice-versa.
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FIGURE 2. Ways of looking at cognitive style.



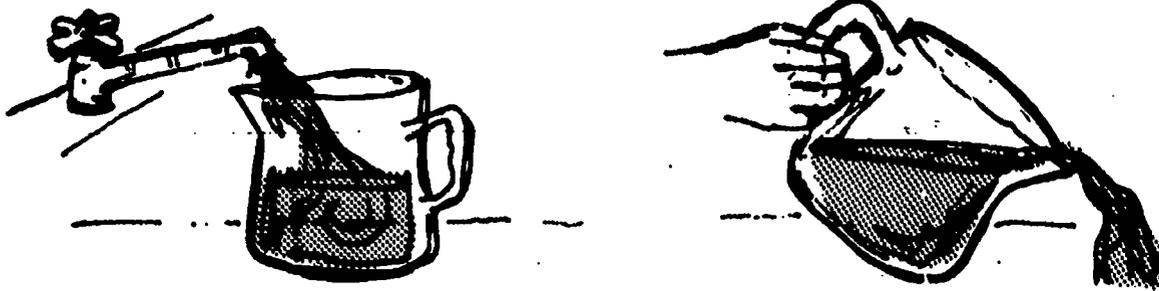
Implications: *If cognitive style is viewed as structure, the focus is on its stability over time; as such, style is a "given" in a training or an educational setting. Once the style in the setting is identified, the training material can be adapted or "matched" to the style of the trainees or learners. Cognitive style can also be thought of as having component parts that can be taken out from the structure for further study.*

If cognitive style is viewed as process, the focus is on how it changes; as such, trainers may even try to foster that change. Style areas can be built upon, and can be used to compensate for gaps (or missing style elements). Style is seen as dynamic, not "frozen forever." This is the concern of McKenney & Keen (1974), when they explain their choice of the term "style" rather than "structure" to show their belief that style develops out of people's experience, which keeps "congealing" the style till it sets.

Of course, cognitive style can be viewed as both process and structure. It may be relatively stable, not changeable like water with no form of its own, yet at the same time always in flux. In such a view, style structure is continually modified as new events influence it directly or indirectly. Such a view bears out Messick & Associates' (1976) notion that cognitive style tends "to function across a variety of areas as a process variable."

What about content? It is not part of the cognitive style structure but affects it. For instance, math is not part of people's cognitive style, even though using math may change their abilities and, in turn, their style.

Learning for mastery versus learning for transfer. Transfer skills allow people to take what they have learned (i.e., a transferable skill) in one context and apply it in another one. Transfer skills are crucial, then, in "learning for transfer" as contrasted with "learning for mastery." Both kinds of learning are important, but "learning for transfer" appears to be at a higher level than "learning for mastery." The difference is shown in Figure 3.



LEARNING FOR MASTERY	LEARNING FOR TRANSFER
<i>Performance focus:</i> here and now.	<i>Performance focus:</i> the future.
<i>Instructional focus:</i> get students to pass tests, to prove themselves to the instructor (most likely).	<i>Instructional focus:</i> get students to look beyond passing so they apply a skill, not worry about tests.
<i>Skill focus:</i> accomplishment of transferable skills such as how to fix a flat tire.	<i>Skill focus:</i> applying what has been accomplished here to a different situation later—thus adaptability at the service of any given transferable skill.
<i>Burden of responsibility:</i> usually ends up more on instructor (but doesn't actually have to).	<i>Burden of responsibility:</i> usually ends up more on learner.

FIGURE 3. Learning for mastery versus learning for transfer.

Having made these important distinctions between sets of terms that are used in the monograph, we are ready to move on.

II. LINKING STYLE AND TRANSFER SKILLS

So little effort has been made in the literature to link cognitive and learning style, especially as they relate to transfer skill acquisition, that this monograph is truly in pioneer territory. Before venturing further, however, it is important to be alert to the advantages and disadvantages of attempting to make such linkages. These are listed and examined in Figure 4.

	<i>Liabilities</i>	<i>Assets</i>
RESEARCH	1. There has at present been little done in the area of transfer skills as such. Much of what has been done is exploratory.	1. Transfer skills would seem to include cognitive and learning style components. If so, we are well along in transfer skill investigation because much has already been done in style investigation.
TRAINING FOR TRANSFER	2. We don't know much about training for transfer due to many unresolved issues—for instance, are these skills better acquired through direct or indirect procedures? in a school setting or outside training setting?	2. Some initial efforts have been made which can be joined to other efforts by other names in the training world—for instance, imagery-building.
SPECIFICITY OF TRANSFER SKILLS	3. We don't know how specific to get when we discuss any given transfer skill—for instance, how much analytic prowess means we now have that skill? Evaluation and training for transfer suffer if we can't be more specific.	3. Further research is obviously needed, and there is an open field for would-be investigators looking for important areas to study. Meanwhile, we can be guided by personal styles when trying to determine how much specificity may be individually required.
STYLE DEFINITION AND MEASUREMENT	4. We don't find complete agreement on what style is, how many or how complex the elements, or how to measure it. There seem to be a number of correlates that may not really be part of style at all.	4. The earlier scattered efforts are beginning to be integrated now. We are also beginning to see how to separate a broad view from a narrow view for different purposes of looking at style.
DEVELOPMENTAL OR "SET" STYLE	5. We do not know to what extent style is innate and to what extent it can change. Therefore, considerations of sex and life roles are confusing. Also, we do not know how to deal with style at different developmental or life stages at present.	5. We can take a moderate view of cognitive or learning style as <i>somewhat</i> set and <i>somewhat</i> modifiable. We need not be locked into either a completely "process view" or a completely "stable view."

(continued)

(continued)

**SITUATIONAL
CONSIDERATIONS**

Liabilities

6. Style may be influenced to some degree by who and what is involved in a given immediate situation. It would thus be difficult to measure and predict style in all circumstances.

Assets

6. We are increasingly aware that in training and education, nothing is unaffected by its context. In this regard, style is no different than anything else we might investigate.

**PRACTICALITY
OF STYLE
RESEARCH FOR
TRANSFER SKILL
ACQUISITION**

7. Much of the earlier work in cognitive style was psychological, followed by investigation of learning style in academic settings. It was not investigated from a training standpoint. Where style considerations were used to design a learning experience, they were more to match up learner characteristics with teaching style, or task and format characteristics. So style may not be all that helpful to transfer skill training.

7. The later work in style has become increasingly practical and more training-oriented. In addition, some performance and training specialists have begun to use cognitive or learning style in their own work, as have some college or school counselors and instructors with an interest in transfer skill training (by whatever other name it is called). We are ready to move ahead on the lines already drawn.

FIGURE 4. Liabilities and assets in linking cognitive/learning style to transfer skill acquisition.

This chapter examines what is known about transfer skills and transfer skill acquisition, and then presents the notion of "style" and some of its elements as they relate to transfer skill acquisition. Chapters that follow examine the literature on cognitive style and learning style separately, and finally, some implications of research on all three of the concepts (transfer skills, cognitive styles, and learning styles) are offered within the context of teaching style.

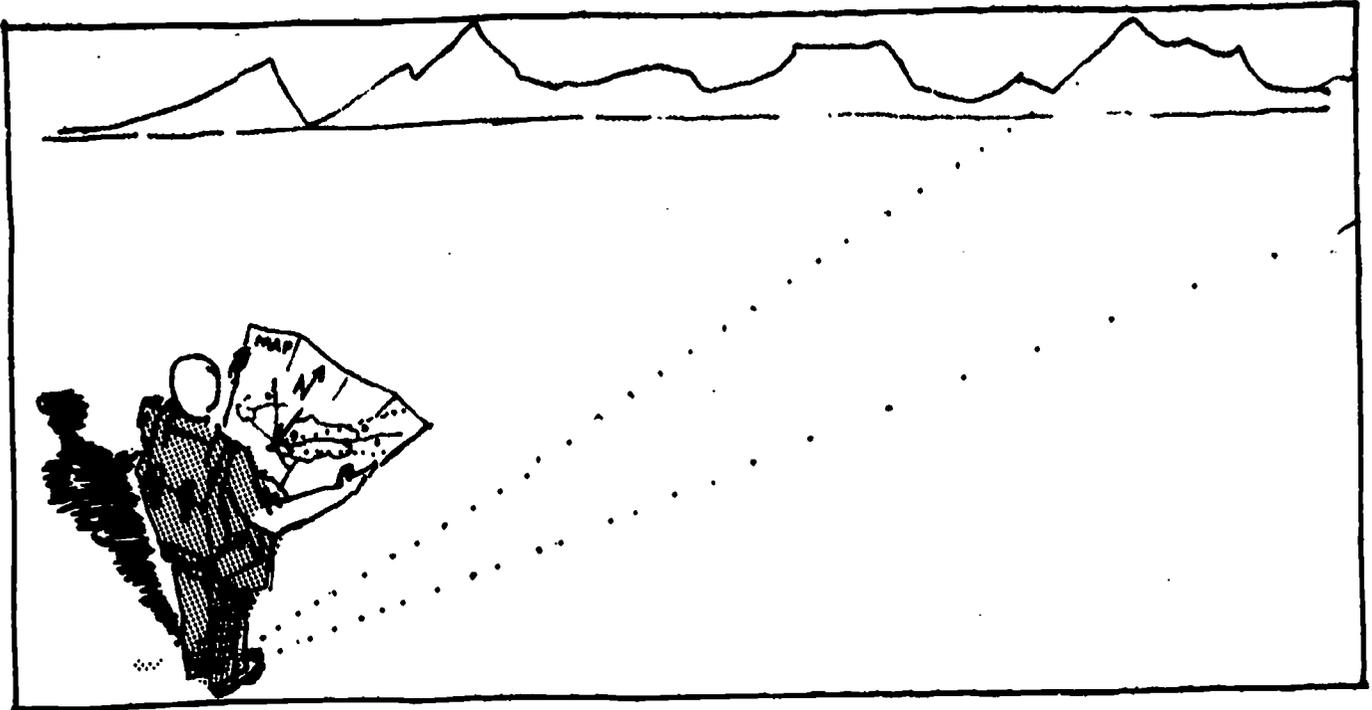
Transfer Skills

The Career Journey

If one's working life is viewed as a journey from job-entry to retirement, we might compare the well-equipped worker (in terms of his or her transfer skills) with a gypsy. Gypsies lived by their wits as they moved from land to land (at least before the advent of fences, passports, and other inconveniences). Often facing obstacles along the road, they learned to carry only the essentials.

Perhaps the picture of gypsies conveys more spontaneity and less pre-planning than should be the case with persons who must make a living within the confines of jobs and societies. So let us turn to another picture—that of a hiker. This is the image used by Hagberg and Leider in *The Inventurers: Excursions in Life and Career Planning* (1978). Their hiker (an "inventurer," one who takes the inward road of self-reflection) refers to a map to recall the point of origin and the terrain ahead. Through the ability to interpret this map, the hiker can more easily select side trips and stopover points.

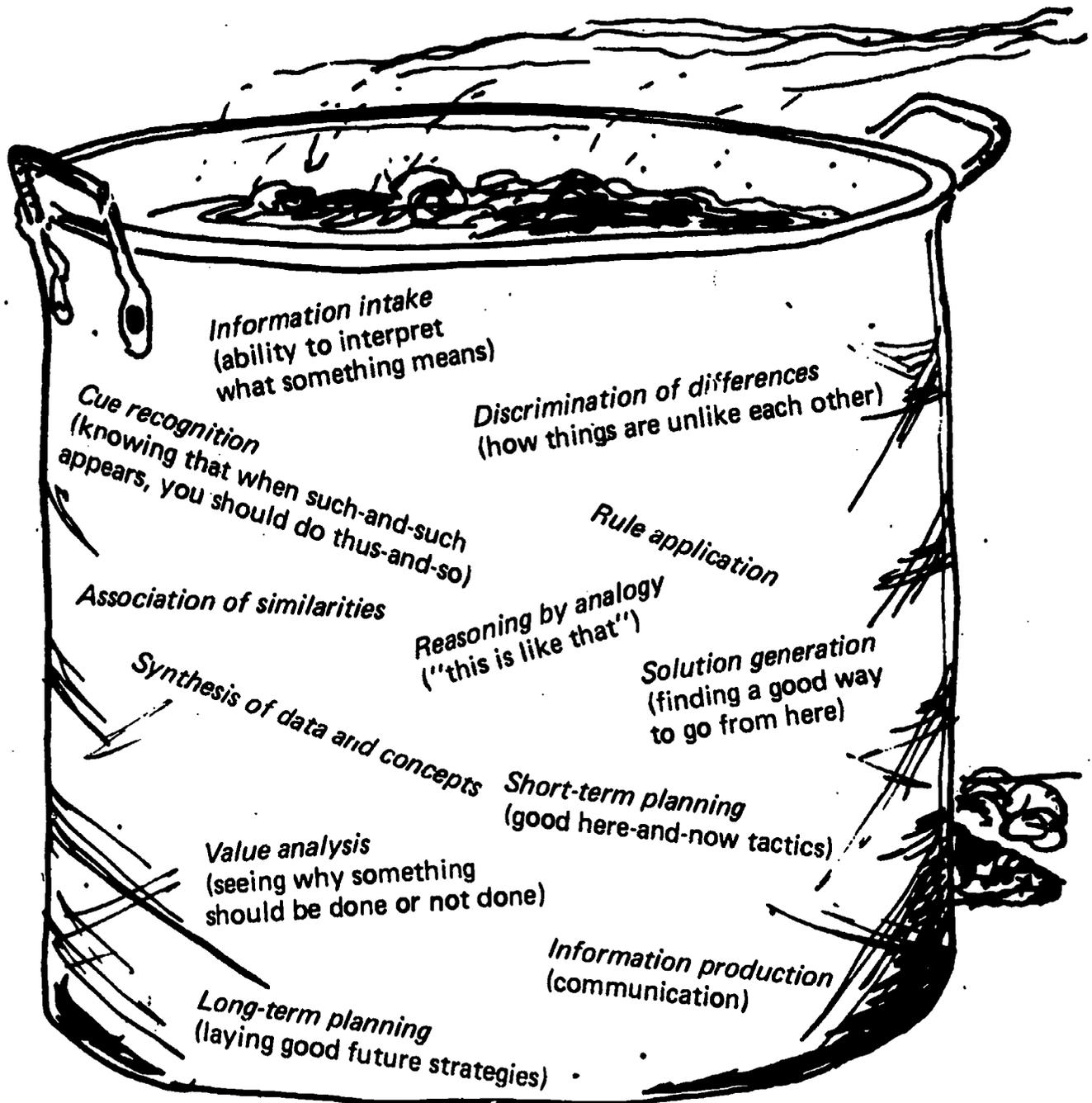
Whether hiker or gypsy, the image is that of being on the road, in process, adaptable—and in need of meeting whatever challenges present themselves. As we shall see, the "map" has special relevance for us; it portrays the cognitive or learning style elements (transfer skills) that people can expect to call on while "on the road."



The Career Journey

Some "For Instances"

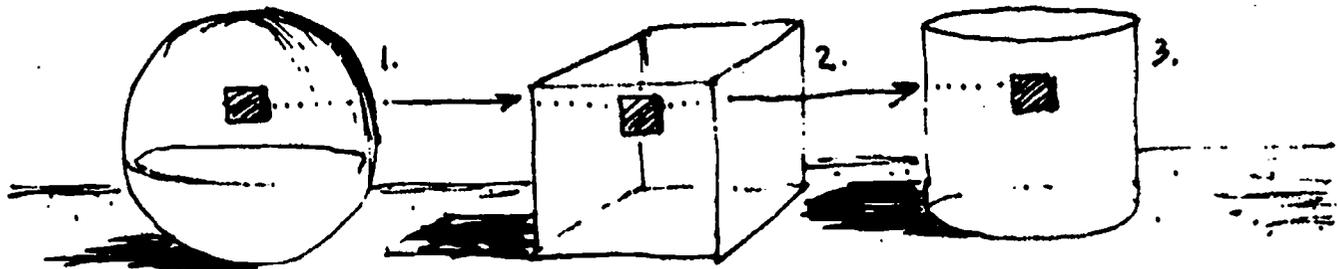
Having bandied the term "transfer skills" around for some time, let us try to pinpoint some specific examples (recognizing that there is no agreement on an all-inclusive list at this time, and that some of the relevant literature has used different terms to mean transfer skills). Transfer skills just may be thought of as "basic life skills," general skills that anyone needs in any kind of work or study—whether simple or advanced, factual or conceptual, technical or managerial. Here are some cognitive transfer skills:



How do we get these skills? Or transfer them?

Teaching/Learning for Transfer

Trainers understand the need to start from a job goal and work backwards to find the best way to move a trainee from a state of deficient performance to one of mastery during training (or shortly after with on-the-job practice). The focus must always be on moving the skill into the work setting; that is, the skill must transfer into the setting where performance must occur.



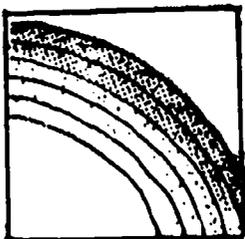
Teaching for transfer means providing practice beyond mastery to application in varying contexts and under differing conditions. It is not simply the next step in the sequence or chain of learning. It is the step of applying prior learning to life's performance situations. While it would be impractical to try to provide practice for all conceivable situations, it may be feasible to teach application under enough varying conditions so that the skill of transferring-to-performance is learned. (Selz & Ashley, 1978, p. 4)

If you are teaching for transfer, you must point out the cues that the learner/trainee can learn to perceive, understand, and respond to in a different situation. You then allow the trainee to practice this skill, instead of waiting for the "someday [when] you'll have to do this" to occur in the distant future. Adult education may have some advantage over childhood education for the reason that "someday" has come—and that is why the individual is seeking further training. Since the need to learn is self-acknowledged, adults are usually in a good position to direct their own learning for transfer once shown how to do so; the skill is usually understood as relevant and necessary. (Selz and Ashley's *Teaching for Transfer* (Ibid.) briefly summarizes the principal "how-to's" and theories in transfer learning, for readers interested in further study.)

Grouping Transfer Skills

It would be useful to find some way to arrange the most basic transfer skills so as to avoid continually referring back to the "pot of stew" illustrated earlier.

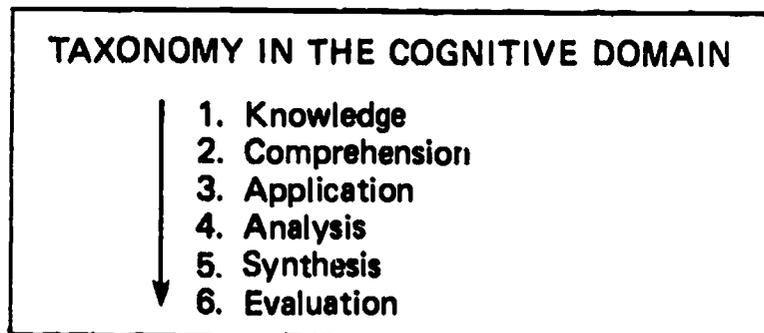
"Taxonomies" can be used to good advantage in this endeavor. These are hierarchical lists ordered so that each item is assumed to be at a higher level than the item just below it. They show us the range of skills, as it were, from the lowest to the highest degree.



If you have ever seen a Government job classification, you are familiar with this sort of taxonomy. Cognitive skills are listed at the higher extremes of any given job. If there are more cognitive skills than other sorts of skills, then that job is likely to be accorded higher status and/or salary. We can compare a whole gamut of jobs, from janitor to President, according to taxonomies of what are really transfer skills.

Educators have been using taxonomies to increase their ability to deal with the complexity of the objectives in their teaching. They can take a "process" view of a subject by using taxonomies, challenging their students to reach levels of cognitive functioning far beyond rote learning of a lecture and parroting it back. Educators can even use taxonomies to evaluate students in terms of their learning of content (at the lower levels) or process skills (at the higher levels); that is, to measure how much beyond the mastery level and into the realm of transfer the students have gone. It may be possible to predict later performance for any given student on the basis of how high up on a taxonomy of process skills he or she had gone during instruction.

Bloom's Taxonomy, well known in the educational world, is one way to arrange the cognitive skills (Bloom, 1956):



Whenever we use taxonomies, of course, as in any list, the question always comes up: How fine-lined do we want to get? We've deleted details from the taxonomy above; Bloom refined it much more completely within each of the six categories. Almost all of the cognitive transfer skills that are listed inside the "pot of stew" seem to find a place somewhere in Bloom's Taxonomy. But what do we do with "communication"?

Giammatteo (1967c), a clinician working with educational problems, considers communication the highest skill on his own taxonomy:

THE COMMUNICATIVE MODEL*

BEHAVIOR LEVEL	SKILLS
1. Fact Assessment Behaviors	Observational Skills
2. Grouping and Sorting Behaviors	Form Recognition, Color Recognition, etc. Skills
3. Attending Behaviors: Sight Sound Kinesthetics Taste Touch	Synthesizing Skills
4. Reality Checking Behaviors (problem-solving in part)	Generalizing Skills
5. Internalized Behaviors	<i>Intrapersonal Skills</i>
6. Communicative Behaviors	<i>Interpersonal Skills, involving:</i> Words Writing Notation Symbols Manipulation

* This model can serve as a troubleshooting guide to use in assisting an individual who is experiencing difficulties in communicating. Giammatteo (1967a) has pointed out that persons of lower social or economic status are often blocked from using various of these processes, resulting in a "neurological overload" that may require clinical attention to avoid increasing the negative self-image from inability to cope with the blockage. Giammatteo has developed remedial exercises to assist in acquiring the blocked transfer skill.

Giammatteo viewed communication as an exchange of meaningful information between an organism and its environment. The exchange need not take place between human beings. We do not see all of Giammatteo's model here; his taxonomy, like Gagne's full model, gives a broad behavioral level, then specifies particular skills at each level. These two transfer skill taxonomies are similar up through the fourth level on Giammatteo's list (above). At the fifth level Giammatteo adds the skill of internal preparation to share with someone else what the "reality check" turned up (fourth level) as the communicator reviewed the things he or she wanted to tell someone else and decided upon the best way to tell it in this particular situation. At the sixth level, the person actually does communicate in one of several output formats.

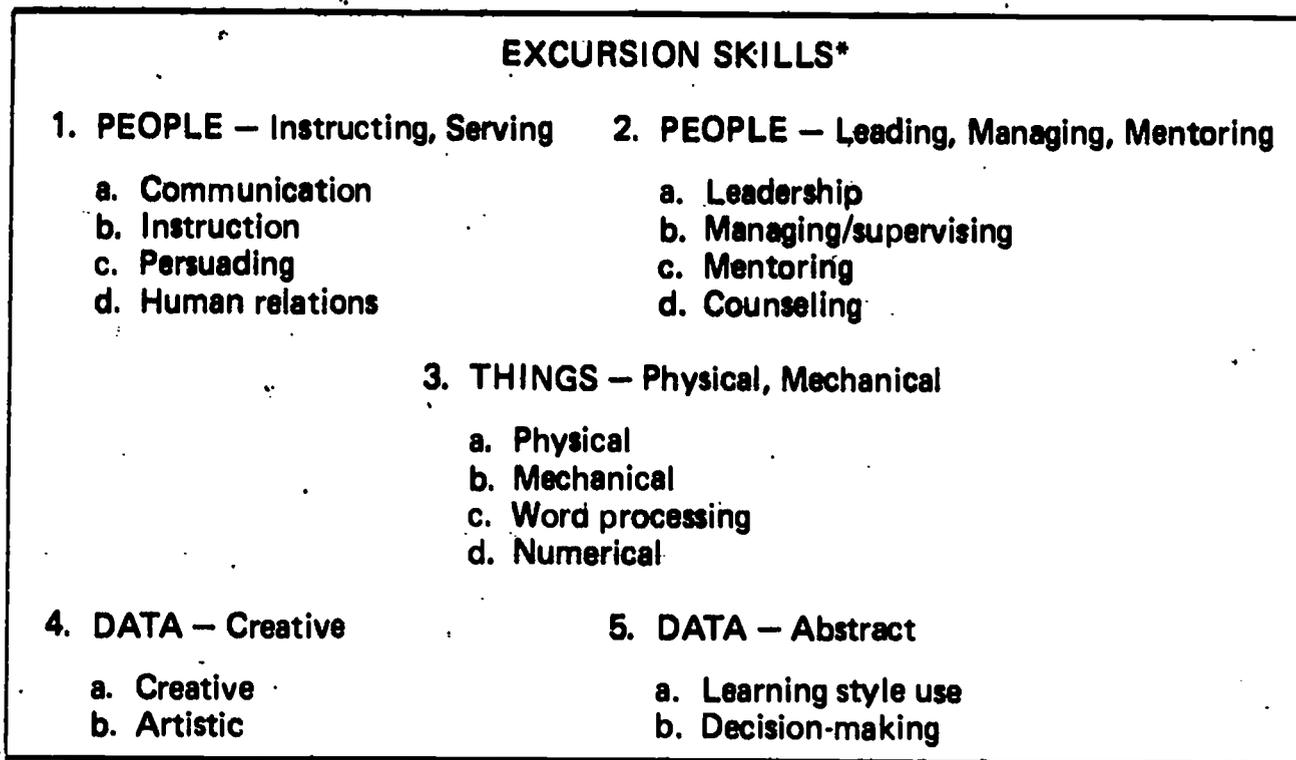
Of course, communication can be viewed as an interpersonal or affective skill as much as a cognitive transfer skill. This type of skill has also been placed in a taxonomy by Krathwohl (cited in Hunt & Sullivan, 1974):

TAXONOMY IN THE AFFECTIVE DOMAIN

1. Receiving (Attending)
2. Responding
3. Valuing
4. Organizing a Value or Value Complex
5. Characterizing by a Value or Value Complex

We could group transfer skills according to stages of behavior a person must go through, as Altman does in *Transferability of Vocational Skills* (1976). It is also possible that mastery of various moral transfer skills is correlated to developmental or life stages. (We will deal with these stages later.)

A simpler way to view transfer skills is in terms of how they fit within three main clusters, as Hagberg and Leider (1978) propose in their list of "excursion skills" that their "hiker" needs on the road. These three clusters remind us of the well-known "data-people-things" categories found in the *Dictionary of Occupational Titles*.



* Derived from Hagberg and Leider (1978, pp. 100-107).

The Total Performance

Taken by themselves, transfer skills will not guarantee success for the person who has acquired them. For instance, they might not be used for the right purposes, or at the right time and place. Just "knowing how," then, does not mean a person is competent (Klemp, 1979). To predict competence, we have to look at knowledge, skills, and attitudes or feelings, and see how they all relate to performance.

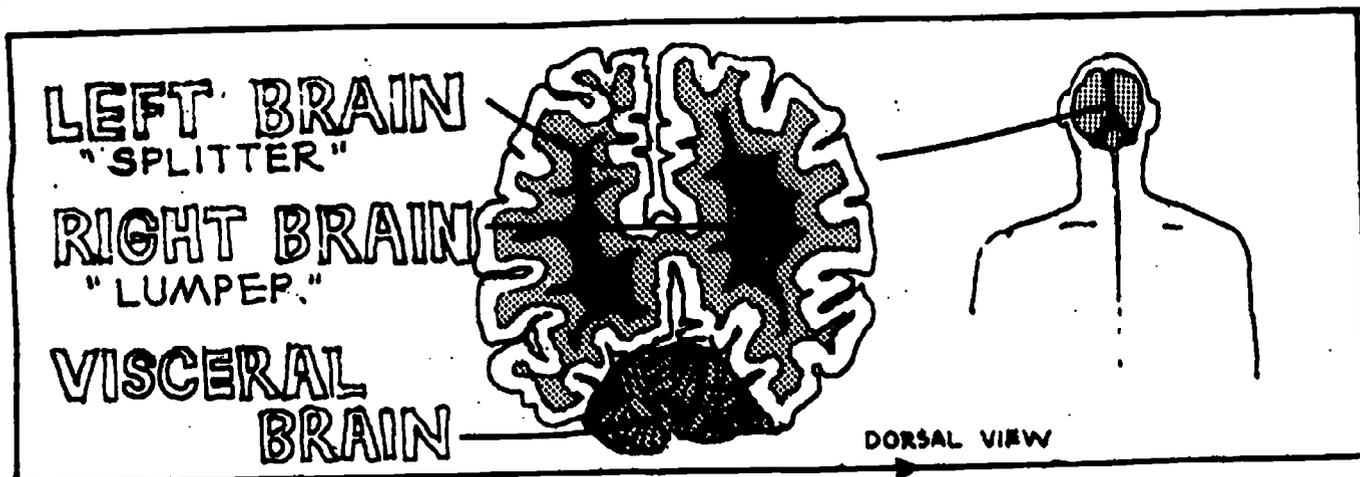


We could hardly expect a change to occur on one side of the triangle without a change on the other two sides as well. Knowledge and attitudes or feelings may help or hinder the application of skills. Knowledge of how one operates in the world, for instance, should surely affect the application of skills. Could cognitive or learning style—or rather, the knowledge of one's own style—be what influences that application? If this supposition is true, it would be the decisive argument in favor of considering cognitive or learning style necessary in the *application* of transfer skills, as well as in *acquiring* them.

To build up to this view, let us look at Klemp's (1977) short list of transfer skills:

1. To see the consistencies in diverse information, and to organize and communicate them. (To "lump"? Also, "to communicate"?)
2. To reorganize and understand many sides of a controversial issue. (To "split"?)
3. To learn from experience (to integrate left-right brain information into good decision-making?).

This list of transfer skills overlaps almost exactly the "Star Trek" model of decision-making, problem-solving, and opportunity-feeding behavior by Suojanen (1980), in which Dr. McCoy is the intuitive, behavioral science mind ("lumping"), Mr. Spock is the analytical, management science mind ("splitting"), and Captain Kirk is the decisive managerial mind. In relation to the service he renders the Starship *Enterprise*, Captain Kirk is the one who channels information from the other two and thus "learns from experience" (to use Klemp's item), moving everything ahead. It is clear how much this triune decision-making overlaps the left-, right-, and visceral-brain model. (We did



not mention "visceral brain" at the time we first noted the "splitting-lumping" distinction. Many people who are familiar with left- and right-brain notions are not familiar with the concept of visceral brain, but it is in this area—in the lower back of the head—that decision-making occurs.) And in such decisions, based on input from "splitting" and "lumping" information, it is crucial to know *how* one learns from experience.

As Hagberg and Leider (1978) see it, the role of cognitive or learning style (their own "excursion style") is paramount among "survival" or transfer skills. Knowing one's style and its implications may be the key to reaching the personal goals that can be attained through learning—formal and informal alike—as well as to dealing with change.

Your single most important survival information is your knowledge of your learning or excursion style. ... This is the way in which you process and learn new information in your environment. You can work well with other people of other learning styles if you can be somewhat versatile (use other styles) and appreciate the difference in styles. You will survive well if you capitalize on your most enjoyed style and blend it with the styles of others when you work as a team. (Ibid., p. 109)

We can easily see the importance of considering cognitive or learning style as possibly the most vital transfer skill of all. Before we discuss style, however, there are some remaining transfer skill issues we need to understand. If we understand transfer skills better, we will be able to see how

cognitive and learning style "fit" in the acquisition of those skills, since it is the author's belief that we can equate the elements found on style profiles or "maps" with certain transfer skills. In both style and transfer skills we are concerned with *adaptability*, being able to put something to use in various situations. Adaptability is a concept that comes up in discussing either style or transfer skills.

Adaptability: Me to the Situation, or the Situation to Me?

Much of the literature concerning adaptability has focused on the person's adaptation to the situation, but the situation can also be adapted to the person. Let us take the case of Sam, a student who is very *visual* (he has to see things, not just hear them), and also *very peer-oriented* (he likes to discuss issues with classmates and friends). Sam is taking a course from Mr. Jones, who lectures all the time, rarely writing anything on the board or referring to charts and pictures. Mr. Jones does not meet Sam's visual needs. Nor does Mr. Jones hold small group discussions; he speaks to the group as a whole. He does not meet Sam's peer-relationship needs. Sam has a few choices he could make in this situation:

1. Sam could ask Mr. Jones to accommodate himself to some of Sam's needs. Sam could say, "Would you mind putting that on the board?" to meet his visual needs. Or he could say, "Can we hash that out in small group discussions?" to meet his need for peer discussion. And so forth.

Conscious Choice/ by Me



* Of course, another option that may be open to Sam is to find another instructor who is teaching the same kind of course. This kind of adaptation is discussed, along with the first two options, in Faddis (1979).

2. On the other hand, Sam could try to accommodate himself to Mr. Jones' teaching style. He could decide, "I'll just have to put up with merely hearing things, instead of seeing them written on the board. I'll have to rely on my ability to take notes to look at later. I can draw some charts for myself." Or, "I can go find others to talk with later when I need to bat an issue around."*

Usually it is not the student so much as the teacher (in traditional schools) who makes a conscious choice about how much accommodation of situation to person, or person to situation, will occur. It is usually the same in training, counseling, and supervision. Note the emphasis on "conscious choice." It would be most desirable to know our own skills, or style, and accordingly make decisions in each situation: "How much should—or can—I adapt myself to this situation?" "How much should—or can—this situation be expected to adapt to me?"

What is crucial is that people see the implications of these choices, and also have the skills needed to carry out their decisions. Of course, seeing the implications is made possible by a person's perception. Perhaps perception is the most basic of all transfer skills or cognitive style elements, underlying even awareness of one's own style—something like "prime matter." A person who can perceive, who can see through what seems difficult in a new situation, is a "specialized generalist," not locked into just one type of expertise or use of skills. Such a person is one you can count on to adapt easily in any context, one you want on your problem-solving team, one you predict will meet new challenges in any guise.

One way in which people may learn how to adapt self to situation, as well as situation to self, is to "pick up" transfer skills—to acquire elements that are not on their cognitive or learning style "maps"—along with the academic and/or vocational course content in schools. In other words, maybe it's possible to become personally more adaptable while learning other content matter and to be able to transfer those skills out of the original learning environment. Sometimes this sort of thing is a clear goal. (For instance, a number of ghetto schools today are resurrecting the notion that if you learn Latin, you will also learn logic and the grammar of your own language. There have been sufficient results from this research to show that, in fact, this goal is being reached.) But can we assume that adaptability will occur as a result of learning *all* sorts of content matter, or under *all* sorts of learning formats? Can we expect them to learn to be adaptable without making explicit to the learners themselves what is expected to happen? How much do we have to "break down" the transfer skills into elements with which learners can work? (Edward T. Hall's *The Silent Language* (1959) may provide some perspectives on this problem.)

Technical versus Other Learning

Technical learning is usually transmitted explicitly—from a teacher to a student, orally or in writing. There is often an outline showing logic and coherence in what is to be presented. The learner tries, makes a mistake, is corrected, and tries again. This is "two-way learning," requiring a learner and a teacher, or something in the place of a teacher, such as programmed instruction or a teaching computer. The process is not charged with emotion; it can be quite detached and "Adult"—in Transactional Analysis parlance—with both learner and instructor working closely together to ensure that learning takes place.

This type of learning contrasts with two other sorts, informal and formal. *Informal* learning does not have an official teacher but uses a *model* for imitation. (The model need not even know that he or she is serving in that way—can you not recall a classmate who served as an unwitting role-model for yourself?) In informal learning, "Whole clusters of related activities are learned at a time, in many cases without the knowledge that they are being learned at all or that there are

patterns or rules governing them" (Hall, 1959, p. 72). This type of learning occurs, for example, when children watch television and see patterns of adult behavior that they accept as "normal," whether or not such behavior has any bearing on real-life behavior patterns.

Formal activities are taught by means of "do's" and "don'ts," in no uncertain terms as to what the speaker (i.e., "teacher") believes to be right. But the framework of right and wrong is not presented "up front," as a model; this is usually revealed only when a mistake is made and a correction is given. Even though technical learning also begins with mistakes and corrections, they are administered in a completely different manner. In formal learning, the person who is giving feedback is usually either very upset or very pleased, for either a taboo has been broken ("You DON'T say ain't!") or a way of life must be upheld ("The Smiths ALWAYS stick up for each other!"). Hundreds of small details add up until, Hall explains, they make a formal system that nobody questions.

Which is the Best Type of Learning for Transfer Skill Acquisition?

Transfer skills can be acquired in any of these three modes—technical, formal, or informal. If they are to be acquired alongside regular course content in schools, does one of these types of learning seem to be more beneficial? If they are to be acquired in special training, does another type seem best?

When transfer skills are acquired within the regular course content in schools, the emphasis is on formal or informal learning (learned after a mistake has been made and correction given, or learned by watching success and failure modeled by others). There are a few examples of direct technical transfer skill acquisition within schools; the Suchman and the Taba programs are two examples. Cognitive skills are built into the exercises to enable the students to develop gradually increasing conceptual abilities in natural science (Suchman, 1966) and social science (Taba, 1962). Suchman's Science Inquiry Development Program training kits provide puzzle-type material that draws the students into the inquiry process by presenting a situation, then requiring the learners to find out about it by devising yes/no questions to ask their instructor.

Similarly, but more simply, there is Giammatteo's *Beyond Relevancy* program (1967b), which can be used in the classroom to allow for students to rehearse alternate modes of problem-solving. The modes are "beyond relevancy" in the sense that the students are allowed to find out what is productive and do not merely imitate problem-solving the instructor might have modeled (which might not always be productive outside the classroom).

Yet another direct technical transfer-skill acquisition program is Project Talent's training exercises (Instructor's Manual for Talent Training Materials, 1977), initially used on junior high students to allow them to qualify for apprenticeship programs in technical or mechanical areas. Teachers (who need special preparation to use the program) can bring their students to heightened levels of spatial and abstract visualization.

In Washington International College, the technical learning of transfer skills goes on in a career/life planning and orientation seminar, with any individual learning contract becoming the "application opportunity" for skills acquired. Thus the skill-building goes on in the school context but not in the actual course, except as a direct application to be evaluated by both student and instructor.

Technical learning for transfer skill acquisition is most clearly the format we find when we look at special training outside the regular school course setting. We may expect at least short-term performance improvement in a given transfer skill as a result of technical learning, for the technical mode is well-suited to such results. We cannot predict the same for long-term results, however. Further, it may be that we would place learners in the same kind of "lock-step" problems that many of them have confronted in traditional classrooms if we set up transfer skill acquisition in rigidly sequenced steps, requiring that each step be passed before attempting the next level.

This nontraditional approach to "sequencing" would probably draw criticism from developmentalists such as Piaget. Developmentalists would not rule out the need for guided assistance, but might be concerned that acquisition of skills cannot occur unless the learner personally discovers how the skill must be used. Since transfer skills may underlie success in more traditional school subjects—general and fine motor abilities, perception, etc.—developmentalists would probably insist that such transfer skills be acquired in childhood, not later, for best life results (although adults can be guided to the same acquisition).

How much self-discovery is necessary and desirable for transfer skill acquisition? How much guidance by a facilitator? How much transfer skill acquisition can or should occur in regular school courses? In outside training? We do not know. One thing we do know: If we do not allow sufficient personal discovery, if we grade only on final results and not on the process of solving problems, if we reward only the correct answers and not the creative attempts at solutions, or if we value only the instructor's opinion, not the learner's, then we devalue persons who have gone beyond mere rote learning (Thibodeau, 1979).

What about transfer skill acquisition for skills to be applied on a job? In this case, we know that a person's motivation to acquire those skills is likely to be much higher than for others. Relevancy and payoff are here and now. By contrast, if the skills are to be applied mainly in a school setting, even with encouragement to use them outside (because they will help "someday" or "on a later job"), motivation may not be the same. Application seems too far away. For this kind of reason, Moore and Anderson (1969) suggested the creation of a "transfer room"—a place halfway between the world outside and the learning environment. Such a center could be used when the outside world does not appear to provide adequate opportunity for learners to apply their still-developing skills, but where learners could produce something, such as a classroom newspaper, to apply their new reading and writing skills to something tangible, "here-and-now," and interesting.

In noting the greater chances for transfer skill acquisition in more relevant contexts, we see once again how much the motivation (or attitudes and feelings) side of Kemp's (1979) triangle (see page 18) influences the other sides.

Technical learning perhaps is best used in the beginning stages of any new skill acquisition attempt. It may not matter whether acquisition of transfer skills occurs along with other course content or in training separate from the regular classroom or learning contract, unless serious remediation seems warranted. If learners or trainees are apprised at the start of course content of the need to pick up specific transfer skills, it should be made clear to them how important such skills are in order for the optimal skill acquisition to take place.

It may be also that both an educational (knowledge) and a training (skills) context can be used at the same time to reinforce each other, whether the training is remedial or merely enrichment of transfer skill building done in the regular classroom. In such a double learning context, the gradual removal of the structure from transfer skill acquisition would allow the learner to assume increased responsibility—to "fly solo." At this point, greater self-discovery might enter in. This turning over

of the control for skill acquisition to the learner follows guidelines suggested by Malcolm Knowles, Ivan Illich, and Paulo Freire, all of whom urge that adult learners (especially the disadvantaged) must emerge from the "helped" position to the position of helping themselves and others.

As we will see, cognitive or learning style maps should provide a basis for finding the areas where transfer skill acquisition seems most desirable. We can thus set up the desired degree of learner or facilitator control at the appropriate stages of acquisition. This will become clearer when we discuss Messick's model of style (match or mismatch) as a means to encourage transfer skill acquisition along with content acquisition.

Caution should be used when attempting to link content and transfer skill acquisition, however. Without a clear understanding of technical, formal, and informal learning, problems can occur despite the best intentions.

Misadventures in Transfer Skill Acquisition

Here are two hypothetical cases in which little or no understanding of the difference between transfer skills and content acquisition could backfire (where linkage is attempted). These examples occur in school settings, although they could as readily take place in training sessions or on the job. (Classroom examples are used so that we can later demonstrate how correct classroom technique could encourage acquisition of transfer skills from the earliest school years forward, with the result of increased career potential.)

The focus of the examples is on two well-meaning social science instructors. One of them is going to "go through the mill" in trying to bring about transfer skill acquisition. The other one will make an effort, but it may be of no lasting avail.

Mr. Black, who is concerned with students' ability to synthesize, notices that a student, John, has not compared common aspects of several peasant revolts in a paper John has written. Mr. Black asks, "Didn't you find anything in common among these revolts?" It's only obvious to the instructor, of course, that comparison of common elements is a basic expository technique. But it has never occurred to him to mention this expectation along with content-related course objectives. That, to his way of thinking, would be "too obvious."

John realizes from Mr. Black's question that there *must* be something in common among the revolts or the instructor wouldn't have bothered to ask about it. After a moment's thought, John says, "I suppose the revolts were started mostly by people who had begun to 'make it' in society and weren't willing to risk losing what they'd gained." Having given a satisfactory response, John settles back contentedly.

John would not have reached that insight by himself, or at least did not appear to be headed in that direction. He needed Mr. Black's question to catalyze his discovery. Instructor-posed questions are part of a decent teaching strategy, but only a part. Here are some problems:

1. Mr. Black may not pose such a question again, because he now assumes that John will henceforth realize that one should routinely make comparisons in:
 - a. this class; also
 - b. other classes; also
 - c. life in general

2. John may not encounter other instructors who pose questions in quite the same way. The next instructor, for example, may confront John on another paper with the question, "What do you see that is *different* about these situations?" To encourage the noticing of differences as well as common points is also part of a decent teaching strategy. But if John has not perceived the continuity in either his synthesizing or his analyzing ability, he will not see these questions as two points on a continuum. He will know only that he has been asked to perform in two contrasting performance settings.

Mr. Black was not actively aware of the value of encouraging the transfer skill of synthesis, except perhaps as an unconscious memory of being asked as a student, "compare X and Y." Mr. Black's objective is not training for *synthesis*, but for social science *content*. All that he requires in this case is that John be able to make *this particular paper* "better." If John is primarily concerned with passing the course, and concentrates only on giving answers that seem to please the instructor, he may never be aware of the transfer skills that can be learned through the course, and how they might work for him elsewhere.

Now let's take Ms. Green's case. This instructor *is* aware of the value of teaching certain skills in addition to "mere content" so that both the skills and content can be transferred to other situations. She believes very strongly in the value of good communication as a crucial part of any student's work. Occasionally, in passing, she mentions this. She is a stickler for spelling, grammar, and punctuation on all papers. When students get their papers back with requests to "please rewrite," they complain, "But this is social science! We're not supposed to have to worry about our English!" True to their Western upbringing, they approach a situation—the class—as though it were completely separate from all else in life.

Despite Ms. Green's warnings that she expects everyone to edit their papers well, the students do not take her seriously. Like John, they expect to learn the content matter for mastery, and little else. Unfortunately, in this situation, many students feel that Ms. Green is being picky and unfair. To them, rewrites only mean more work. It does not occur to these students, as it does to Ms. Green, that attention to clarity in communication can be good practice for later jobs where, for instance, they may be expected to write coherent memos. Or even more basically, that attention to detail is helpful in transfer of things such as rules of grammar. Ms. Green has not effectively taught for transfer because she has conveyed only a vaguely stated abstract principle, that developing good communication is a part of student work. Her students, as a result, feel resentful rather than enlightened.

Roles of Awareness and Conscious Choice

There are some exceptions to this rather haphazard skill acquisition process. Washington International College (WIC), in the nation's capital, requires that seven "competencies" (WIC's term for transfer skills) be included in each "learning contract" that students make with their faculty members. No matter what the course content, students are marked on their comprehension, analysis, appreciation, evaluation, creativity (or synthesis), implementation, and communication. In fact, students help set up performance standards for evaluation of these skills. Their final report, in contrast to the "Report Card" earlier in the monograph (p. 3), is mutually arrived at with the instructor.

Here, then, we find institutional commitment to exercising transfer skills during the mastery of course content. Students are made aware of this goal from the beginning, and are supported by all faculty members. To what degree transfer skill acquisition actually occurs is an area for further research, but this system represents an attempt at *technical learning* as the way to achieve transfer skill acquisition.

To embed skill acquisition within course content is a reasonable course of action. It would seem important, though, in teaching transfer skills (especially to adolescents and adults), that the learner be an active participant, consciously aware of the skill he or she is seeking to acquire. To expect a student to acquire such skills automatically without ever consciously identifying them is like sending a diver to look for pearls without explaining that pearls form inside oysters. Instructors must facilitate skill acquisition and help to make it a conscious process, or the pearls will simply lie closed up in their shells.*



Since transfer skills involve actions more than reactions—in particular, having a choice among several possible actions to use in a given situation—“learning for transfer” seems to imply a technical learning situation in which the learner:

1. is aware of the existence of such skills;
2. views them as an available collection, such as a matrix; and,
3. will make a conscious choice regarding which skill to use in a given situation.

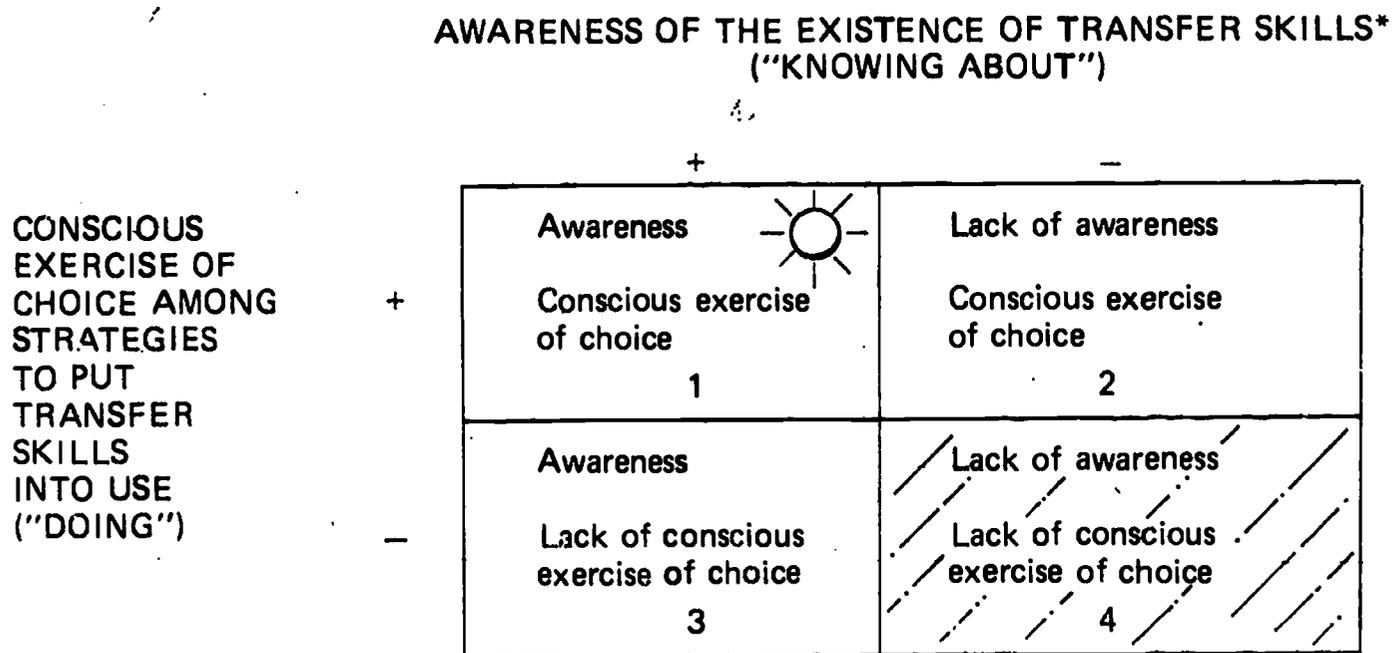
However, we must examine this idea in the context of common skill-acquisition situations:

1. Even when learners are well aware of the existence of transfer skills, and even attempt to exercise a conscious choice of strategies, the responsibility for the skill acquisition process usually remains out of their hands, at least in traditional settings such as schools and training centers. Furthermore, even where the acquisition of transfer skills is actively encouraged, it may appear that it is “only for right now”—the skill-acquirers may not be aware that they are supposed to (or able to) transfer the skills beyond the immediate situation.

*This assumption may be challenged to some degree by developmentalists following Piaget, whose work has been mainly with children. To be conscious of learning a very basic skill (such as a transfer skill) may impede spontaneity or valuable self-discovery. However, it may also be possible to blend structured transfer skill objectives so that plenty of room is allowed for individual discovery of how to apply them.

2. Full awareness of transfer skills and conscious exercise of choice among strategies lie most often in the hands of the facilitators. They decide what will be acquired, and also how (e.g., the learning format, the expected rate of acquisition, time for completion, accuracy, and so on). Facilitators may actually end up learning more of the transfer skills than are learned by the pupils. For example, "If you become a teacher, by your pupils you'll be taught," as the song goes; this is true in large part because of the preparation a facilitator must do in order to communicate effectively (one of the major transfer skills) to the pupils.

There are varying degrees of awareness of transfer skills and conscious exercise of choice among strategies, as is represented in Figure 5.



* This diagram was inspired by the well-known "Johari Window" training exercise.

FIGURE 5. Awareness and conscious choice in transfer skill acquisition.

Ideally, everyone who's been to school should fall naturally into the first quadrant or, through training, relocate there, having acquired both the awareness that there are such things as transfer skills, and the ability to consciously exercise choice among strategies in order to put them to use. Such a person *knows* and *does*. And, also ideally, nobody should fall in the opposite corner, quadrant 4 of the figure, where the person *knows not* and *does not*.

What about the other two quadrants? In quadrant 2, the person is not aware of the existence of transfer skills as such, yet puts them into use through choosing among various strategies. The person *does* but *knows not*. For example, the "street smart" person, who instinctively chooses a course of action to *get something done before deciding on the method most likely to succeed*, is in this situation.

In quadrant 3, the person *knows* but *does not*. It would seem improbable that one could know about transfer skills and not put them to constructive use; but, an example might be a student in a learning situation like the one at Washington International College, who for some reason *will not* or *cannot* put transfer skills into use, despite having gone through the career/life planning orientation in which the skills were defined.

Another interesting possibility is one we have seen in the cases of Mr. Black, Ms. Green, and their students, where the facilitator could be personally and/or pedagogically in a different quadrant from the student (at least in a school or training setting in which content, not process, is the focus). Looking at Mr. Black and John, we can see that John is clearly in quadrant 4, "in the dark" about the existence and use of transfer skills. What about Mr. Black? Pedagogically, he is in quadrant 2. He has chosen to require John to exercise at least one transfer skill (synthesis) when writing his paper, although he does not make John aware of this objective before the paper is written. Mr. Black seems *personally* to be in quadrant 2 also; that is, not very informed about transfer skills in general, just aware of the particular skill he emphasizes.

The situation with Ms. Green and her students is not much better. Although Ms. Green is articulate and consistent regarding the need to exercise a skill, she is unable to involve her students in the acquisition of it. One of her problems is that she emphasizes not so much the basic transfer skill of communication (i.e., taking care that everything possible is done to ensure accurate understanding of a message) as the outer mechanics surrounding that skill.

Since the students perceive Ms. Green's concern for communication as irrelevant, they are not motivated to acquire the basic skill. They remain in quadrant 4 despite Ms. Green's efforts. As for Ms. Green personally, she, like Mr. Black, is really in quadrant 2 because, although clear to the students about the need to exercise a particular transfer skill, she does not put transfer skill acquisition in the context of a range (taxonomy) of important basic success skills they could use to advantage.

These two instructors probably come across to their students as "Johnny-one-notes," emphasizing the use of favorite skills at the expense of others. If the instructors were informed about cognitive and learning styles, they would become aware of this "monotone." Being only human, instructors tend to encourage their students to use those transfer skills that they themselves have used successfully. Awareness of this tendency could help instructors take steps to develop other skills, both in themselves and in their students.

A learning climate in which both facilitators and learners are aware of the need to develop different transfer skills could foster an atmosphere of mutual growth and cooperation. Respect for diverse cognitive and learning styles might also stimulate teamwork (and even an effort at inter-teaching) between individuals of various styles, instead of nonproductive criticism.

If process skills become as much a learning goal as content mastery, the entire educational system could serve to teach for transfer, since the transfer skills would be put to continuous practical use. Such methods would also reinforce content mastery, since the assimilation of course content would be facilitated through conscious use of the various transfer skills. This system of learning would, in addition, favorably affect the teaching of vocational skills; that is, students who are aware of the basic transfer skills—and well-practiced in their use—would be able to transfer nearly all of their learned abilities directly into their jobs. (This would turn around the dismal vocational skills situation discussed earlier.)

The "ultimate transfer skill" has been defined as the knowledge of one's own cognitive or learning style, and the ability to apply information about that style in one's own life (Hagberg & Leider, 1978). Equally helpful would seem to be the gaining of other cognitive transfer skills (which this monograph is equating with elements found on style profiles), to equip people with more learning

and reasoning options.* A program that includes these objectives would encourage the development of strategies (as differentiated from "basic styles"), increasing the number of optional responses to any situation, as well as the chances of success.

Acquisition of this "ultimate skill" might enable individuals to "switch hit," or to be "bi-cognitive," perhaps even "multi-cognitive"; that is, they would be able to function in a variety of cognitive and learning styles. Having "the ultimate transfer skill" could also improve communication between persons of varying cultural backgrounds, since, as Ramírez and Castañeda (1974) found, different cultures emphasize different sets of cognitive and interpersonal skills, or styles. A side effect of increasing transfer options (by using sets different from one's own cognitive repertoire) might be to increase interpersonal tolerance of differences and encourage greater leadership (Ramírez et al., 1978).

Should it be any more (or less) difficult to create a curriculum for transfer skill acquisition than to create one for content acquisition? Such a curriculum could be created by using (a) taxonomies as tools for organizing levels of complexity in cognitive (or for that matter, affective and moral) skills, plus (b) cognitive and/or learning style profile information. Suchman's (1966) and Taba's (1962) cognitive skill building programs show that some preliminary efforts have already been made. There has not, to the author's knowledge, been any concerted, systematic effort made at this point, although several style researchers, thinking along the lines of (a) and (b), have named the concept "augmentation," or "learning to style-flex."

If style elements are the same as transfer skills, there are two schools of thought we should consider in regard to how such skills (or elements) can best be acquired. The first school is that of behavioral psychology ("behaviorists"), which includes learning theorists, performance technologists, and associationists; their work follows the psychology of B. F. Skinner. The second school is that of developmental psychology ("developmentalists"), including those who identify themselves as structuralists; their work follows the theories of Jean Piaget.

Behavioral versus Developmental Insights

Those who work with behavioral psychology have built up an impressive repertoire of techniques that can be used to get people and animals to perform. They believe that you can train almost anyone to do almost anything by simply following proven techniques. These techniques have formed the basis for much educational or training technology. For example, noted performance technologist Thomas F. Gilbert (1978) set out general formulas for greater performance competency in terms of valued results obtained without "too-costly" behavior. Behaviorists are usually concerned with practical, here-and-now desired behavior, in contrast to developmentalists.

Developmentalists such as Piaget believe it is a waste of time and energy to try to train a person to know or do anything before the proper stage of that person's cognitive development. "There is a time and season" to life in this school of thought. Adherents believe that the basic process of overall cognitive transfer skill acquisition is the same for everyone, and that the stages of this process follow

* However, in fairness it must be said there would be some opposition to teaching cognitive or learning style elements as transfer skills. For instance, Mountain View Community College, Dallas, is vigorously against such a move, on the basis that to do so would be to imply that the style one comes with is somehow unworthy. It could also be said that such intervention might worsen an already poor self-image that does not accept the style one now has; for instance, the Niagara Falls Adult Education Center has found that its adult learners, who come to acquire basic skills such as reading, need to feel they are "ok", and in the process of learning to read, their cognitive style maps actually do change to show such elements as better emphasis on theoretical processes than earlier. In this case, the outcome—transfer skill acquisition—might be the same, but the skill(s) cannot be overtly acquired due to the special difficulties of the learners.

predictably one after the other, each allowing increasingly complex skills to develop and build on earlier ones. The only real concern developmentalists have with direct facilitation of skills is to encourage long-term development that will stand the person in good stead for later life.

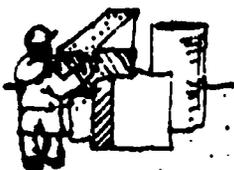
Here are the main features of each of these two schools of thought, based on discussion in Harmon and King (1979):

Behaviorists:
Associational Approach
 (Learning Theorists,
 Performance Technologists)

Developmentalists:
Structural Approach

1. Patterns of learning ...

The child stores up
 concepts as separate
 pieces.



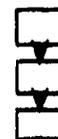
The child relates
 concepts together
 by common
 structural features.



Unpredictable
 learning patterns
 follow.

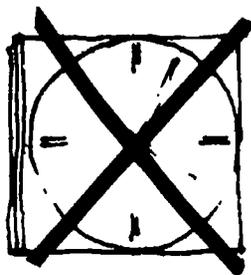


Predictable
 learning patterns
 occur.

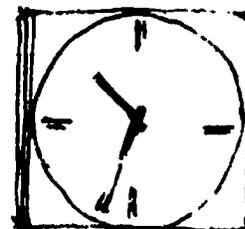


2. Time when new knowledge or skills are acquired ...

Doesn't matter,
 though it may take
 more time.



Does matter,
 because there must
 be proper cognitive
 structures.



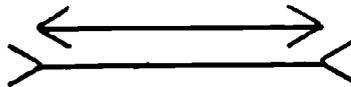
It is beyond the scope of this monograph to discuss the developmental stages in depth (although such exploration could be useful in choosing the "best" points at which to facilitate certain degrees of transfer skill acquisition). We will, however, briefly describe both the developmental and life stages.

The differences between behaviorists and developmentalists should not prevent our taking contribution from each, in order to combine planned, structured, specific instruction or training with less structured, more holistic cognitive growth experiences. In a seminal article, Harmon and King (Ibid.) explain their belief that "there is nothing incompatible" between the assumptions of each school. What is different between the schools is their emphasis. Performance or learning theorists, drawing on behaviorism, view learning as behavioral change that is measurable by observable change in rate and performance of specific acts. This learning is, for the most part, *technical* (in Hall's sense). Reinforcement is used to increase desired responses. Very specific objectives are followed in a systematic instructional program, and planned consequences occur according to responses given by the learner. By contrast, what is systematic for the developmentalist is the behavioral change occurring as a result of children's natural interactions with their surroundings—formal or informal learning, in Hall's sense. In this way, children come to "construct" their own reality continually.

Harmon and King note that one major difference between the two schools is how they use the word "generalization." Performance technologists or learning theorists may use this term very broadly: generalization—or transfer—occurs if a person is able to apply what is learned in one task to a similar one. Developmentalists, on the other hand, would argue that this is not proof that *real* transfer has occurred; generalization (transfer) must involve a much broader category of tasks, and it cannot occur until late in the developmental stages (not in terms of age as much as cognitive maturity).

The basic developmental stages are outlined below.*

1. *Sensori-motor stage*—the infant has not yet differentiated self from environment, but explores both intrepidly.
2. *Pre-operational stage*—the child has begun to differentiate self from environment. There is still some confusion about things that seem to change but really do not, such as the following perception puzzle:



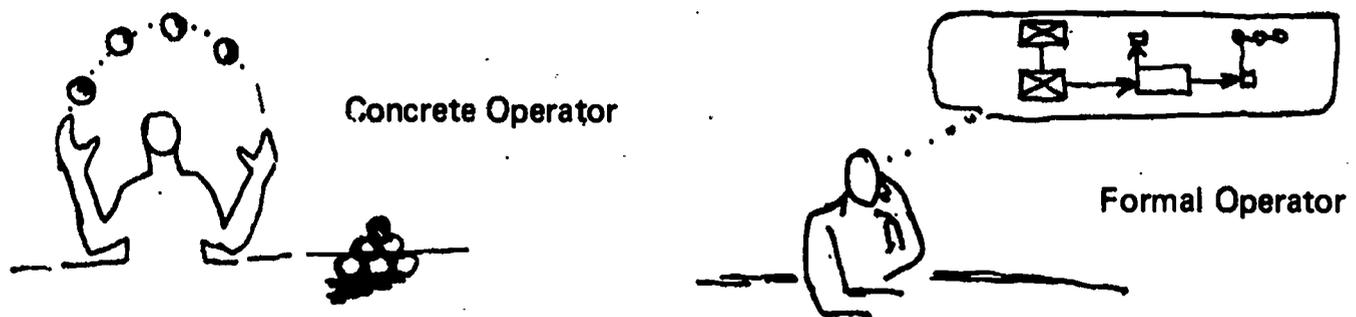
Even after the child is shown that the lines are of equal length, the distractions on the lines block the child from seeing that the lines remain identical despite the added features.

3. *Concrete operational stage*—at about six or seven years of age (later for some individuals), the child usually acquires the skills for determining that things really do stay the same despite distracting features added to the situation. These skills involve the ability to make reversals in one's mind and to imagine how something might appear "before" and "after" simultaneously in order to compare features. It is only at this stage that Piaget would say the child has in fact generalized (or transferred) conceptually from one task to another.
4. *Formal operational stage*—at about 11 to 15 years of age (later for some persons), the person usually becomes more refined in adaptation to the world. As Harmon and King (1979) point out, persons operating at this stage can control variables in an experimental design to isolate a cause; they can also identify and abstract patterns, and use their knowledge of the patterns to solve some problems systematically.

The distinction between concrete operators (at developmental stage 3) and formal operators (at stage 4) is important. Concrete operators go about solving problems in a much more random (perhaps even intuitive or casual) fashion:

A concrete operator always begins with a given problem and seeks to imagine something to add to it. By contrast, the *formal operator* begins with an abstract model or set of variables and considers both what actually exists at the moment and what other possibilities are latent in the particular situation. And, of course, those latent possibilities are derived from the *formal operators'* (sic) recognition of the abstract model or pattern that the particular problem only typifies or concretizes. (Harmon & King, 1979, p. 15)

* The subject has been covered in great detail in the work of Piaget and his school of developmental psychology.



The distinction between concrete and formal operators will be very important to keep in mind later when we look at cognitive style, because concrete and formal operations may lie at the heart of what cognitive style describes. Harmon and King, as well as Thibodeau (1979) note that there are correlations between concrete operations and "field dependence" (one major type of cognitive style) on the one hand, and between formal operations and "field independence" on the other hand.

There are no hard and fast tests of concrete and formal operational stages available, although there is a validated test for the earlier pre-operational stage (the Wachs Analysis of Cognitive Structures Test), which is more useful when testing young children than adults. But if concrete and formal operations correlate with field dependence and field independence—cognitive style tests that have been validated—we can presumably get the same information about developmental stages and use this information to design better training or education. As Thibodeau notes, since individuals do not always enter the developmental stages at the same time, and since they use concrete operations in some tasks and formal ones in others, there should be different instructional strategies for people at these different stages. "The more relevant the task is to the developmental stage of the learner, the better performance is likely to be" (1979, p. 294).

"Developmental" versus "Life" Stages

The term "life stages" seems similar to the term "developmental stages" in the sense that both types of time periods involve maturing processes that equip a person with new and different ways of perceiving the world and dealing with it. "Life stages," however, seems to refer less to cognitive development and more to adaptation to a number of key concerns in life. This is not to say that cognitive development is uninvolved, but that the focus of concern is somewhat different. Each "life stage" brings different questions and priorities with which to cope. By understanding these questions and priorities, educational designers and teachers can help students acquire skills more meaningfully and successfully, avoiding the scatter-gun approach that Chickering (1969) deplors in education—the practice of aiming the information at everyone without regard for people's individual stages of development.

Hagberg and Leider (1978, pp. 22-23) sum up the work of life stage theorists and proponents in Table 1:

Table 1. ADULT LIFE STAGES

(Summing up insights from Gould, Levinson, Erikson, and Sheehy)

1. *Provisional adulthood:* (Ages 22-29)

The first life system of one's own is in the process of construction, and the first commitments to work, marriage, the family, and other adult responsibilities are being made. The "shoulds" and "oughts" learned earlier in life are tried as individuals strive for identity.

2. *Age-30 transition:* (Ages 29-32)

Earlier commitments to a life system may be questioned and examined. The question arises, "What do I really want out of life?", which jeopardizes some of those earlier commitments in many cases, although they are not necessarily overthrown.

3. *Rooting:* (Ages 32-39)

Roots are put down into the life system choice decided on tentatively but with somewhat more definiteness than before. Around age 35 comes a desire to be established, since life seems half over. The question comes up, "Is there still time to change?"

4. *Midlife transition:* (Ages 39-43)

This is often a time of crisis as it becomes apparent that there is a gap between earlier dreams and fulfillment. Children are beginning to leave the nest. This may be a time of career change or other new directions.

5. *Restabilization and flowering:* (Ages 43-50)

A new stability emerges and is achieved in the aftermath of midlife transition. A career can "take off" suddenly. The inner voice is listened to now more than external demands. Money becomes less important. Many people pay attention to a few old values and a few friends, although in this stage and Stage 6, if there is a loss of someone close, the person may go back into provisional adulthood and search once again for life options.

6. *Renewal:* (Ages 50-65)

There is a coming to grips with oneself in terms of what one has done or not done. Questions come up about retirement and coping with the changes that will bring. The switch to a life of leisure can be very harsh for many who, for whatever reason, could not prepare for or imagine what this period would be like. Physical aging and loss of lifelong friends make this period more intense and difficult for many.

7. *Retirement and aging:* (Age 65+)

Although this stage is not developed in Hagberg and Leider's treatment of the life stages in adulthood, we do know that there can be yet another period of renewal for those who come to grips with it, especially those who have acquired various transfer skills such as synthesis and planning, and who can now integrate their lives and their view of life in general, or take off in new directions. Of course, the exact opposite can and often does unfortunately occur—especially where the transfer skills are lacking.

Training and educational programs are now being developed that aid people in dealing with various life stages, especially the need to gain knowledge and skills to prepare for a journey into the unknown of the next stage. It is clear that this sort of preparation is needed as people live longer today, and as the world continues to change to make "life in the fast lane" almost dizzying.

Stage skills. If training is now available for dealing with various life stages, it would seem possible to synthesize a learning-skills system on the basis of people's developmental readiness to acquire one or another skill. These stages would be people's "accessibility channels," to use Hunt and Sullivan's (1974) term.

If we combine *stages* with the *typical concerns* people have at each, we find that the skills they are ready to learn at each stage fall into a natural taxonomy. Each stage and each skill would presume and build on the one just above it. The resulting matrix would look something like Figure 6.

LIFE OR DEVELOPMENTAL STAGE:	TYPICAL CONCERNS	TYPE OF SKILLS TO EMPHASIZE:			TEACHING STYLE INDICATED
		COGNITIVE	MORAL	AFFECTIVE	
1. Provisional adulthood					
2. Age-30 transition					
3. Rooting					
4. Midlife transition					
5. Restabilization and flowering					
6. Renewal					
7. Retirement and aging					

FIGURE 6. Skills important for various life stages.

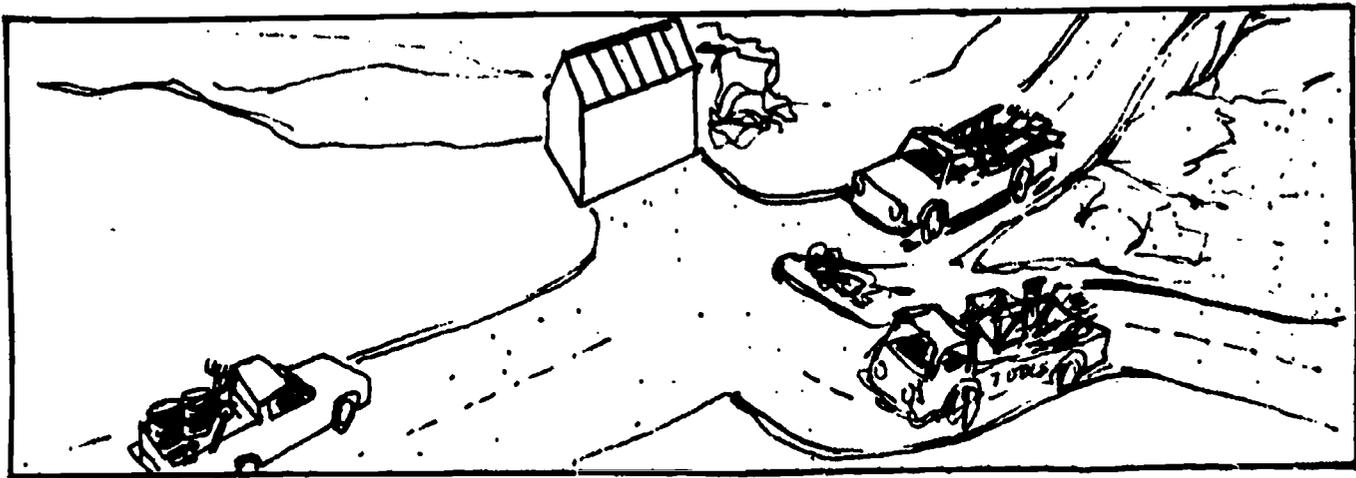
This type of integration has been underway very recently. For example, Harry Lasker at Harvard has made an attempt, which incorporates the work of J. Loevenger, to use this sort of guideline in his own teaching. It bears some resemblance to the Suchman, Taba, and Giammatteo skill-building exercises in that it operates according to hierarchical levels, but it goes beyond them in its integrative scope. It is a step toward integrating behavioristic contributions, such as educational or training techniques, with developmental insights from working with persons at specific stages. We should expect, by using such a framework, to ferret out specific suggestions to accomplish transfer skill acquisition successfully.

If, as Harmon and King (1979) hold, cognitive style is linked to developmental stages, we will have all the more guidance from using style as an important feature in our framework. This supposition will be examined in the next section, which gives an overview of style (both cognitive and learning) and its relation to transfer skill transition. Later chapters (III and IV) will examine each style area separately and in depth.

Cognitive and Learning Style

Getting Practical

As we saw earlier, cognitive and learning style both involve the way people set out toward a goal, whether big or little, formal or informal. Accepting the idea that such styles are process variables and can be classed as transfer skills, we can again use the analogy of the vehicle carrying cargo. The various styles or style elements serve as the vehicles, and the cargo is made up of "tools"—knowledge, transferable skills, and attitudes that are used to perform tasks in life and work. Picture many vehicles on many roads—all carrying different sets of tools—and we have a good idea of the situation in real life, in which people carry different job and life skills around and use them in different ways.



"Cognitive style," the earlier term to appear, grew out of work in experimental psychology.* At first this work was not concerned with practical learning or training process, but merely with explaining how people differed in cognitive traits such as perception or information-processing. It was not long before interest grew in the implications of cognitive style for the learning process, as research turned up correlations between cognitive style and other variables such as non-verbal intelligence. It also became clear that cognitive style was related to personality. Later some other variables that had first seemed only correlates of personality were included to construct a still broader framework. One major group of researchers called their framework "educational cognitive style," thus marking their approach as more scholastically-oriented than what has been called "psychological cognitive style" research. This latter group (the Hill camp) and several others use the term "cognitive style," but are more pragmatic in their approach.

Later, "learning style" investigators began to look for specific strategies for combining course presentation and materials to match the particular needs of each learner. They hoped to meet not just the cognitive requirements, but also students' individual physical and social needs. The intention was to reduce as much "static interference" with the "message" as possible. In this quest we find the greatest concern for practicality.

* An indepth review of literature on cognitive style research, to date, is given in Chapter III.

How do cognitive style and learning style relate? If surveys of learning style show more scales than surveys of cognitive style, can we say that learning style subsumes cognitive style? Is cognitive style related to intelligence? What about creativity?

Cognitive Style, Intelligence, and Creativity

Cognitive style research had its very distant roots in research on intelligence, as researchers tried to separate variations in individuals' intelligence from the cognitive processes they used, and see how each affected the other. In exploring cognitive style, one encounters a common denial: "Cognitive style is not a test of intelligence or personality." School counselors and other practitioners are often the quickest to make this disclaimer so as to reduce the possibility of "test anxiety" on the part of persons being surveyed.

Actually, we are finding that cognitive style does appear to correlate with deeper areas of intelligence, those areas that are non-verbal. If this is so, cognitive style is what I.Q. tests tried but failed to measure: the most basic, "culture-fair" process skills that allow people to transfer learning from one setting to another in order to find meaning.

In *Intelligence, Creativity and Cognitive Style* (1970), Shouksmith states his belief that we can look at both cognitive style and intelligence to understand creativity. The problem, though, is not only how much IQ or cognitive style contributes to creativity, but just how cognitive style is measured by those who make this linkage.

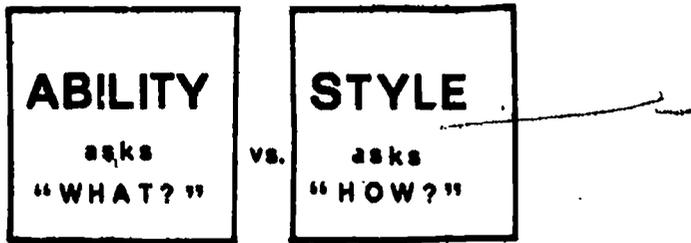
This is no small question in light of the fact that researchers now list some ten to twenty different styles. These may not in fact *be* separate styles, however, but only correlates of a few basic cognitive styles which fall under "splitter" and "lumper" types. The distinctions probably vary on the basis of *whether the person making the distinction* is a "lumper" or a "splitter" himself or herself!

Let us try to get a better picture of how intelligence, creativity, and cognitive style are linked. Messick details a potential use of this understanding:

Cognitive styles, by embracing both perceptual and intellectual domains and by their frequent implication in personality and social functioning, promise to provide a more complete and effective characterization of the student [or trainee] than could be offered from intellectual tests alone. These stylistic dimensions offer us new types of process variables to appraise that extend the assessment of mental performance beyond the crystallized notion of achievement levels to a concern with patterns of cognitive functioning. (Messick, quoted in Hunt & Sullivan, 1974, p. 71)

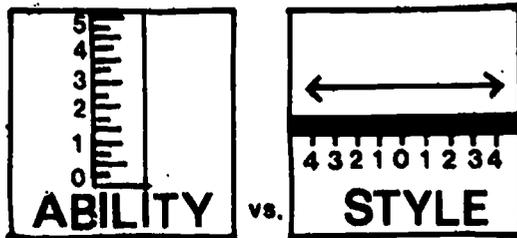
Three distinctions Messick (Messick & Associates, 1976, pp. 7-11) makes help us see how cognitive style is separate from cognitive content abilities:

1. Intellectual ability dimensions refer to the matter of WHAT; style refers to HOW. For instance, a concern for what kind of information is being processed by what operation in what form (Guilford's classification of intellect; Guilford, 1967) is a concern about ability. But style refers to the way in which the behavior occurs.



2. Ability is easier to measure than style, as ability implies measuring in terms of accomplishment or best performance. But style measures only the way someone operates in a typical performance, the process used. Ability is "unipolar," then, starting at zero and going upward. But cognitive style is "bipolar": one complex of interacting characteristics (such as those in the "splitter" or "lumper" characterizations) contrasted with the opposite style. Each of the polar types is "good," or useful; the types simply imply different results.

Since this distinction is so non-judgmental, measurement of people's cognitive style should be less threatening (or potentially inequitable) than are I.Q. tests, with their implied value judgments—even if there are some linkages with "deeper" intelligence and personality, after all.



3. Ability is used in a limited area, but cognitive style cuts across whole "domains," such as personality and intelligence. It helps the person control and organize lower-level strategies, operations, tendencies—and even abilities. Abilities, which infer that one can do something valued as "correct," cannot be easily used as measures of creativity, since there is no "correct way" to be creative. But several positively-valued style elements—fluency, flexibility, originality, and elaboration, for example—contribute to the creative process.

Style Bias

Many common evaluation devices found in schools or job testing often mistakenly measure cognitive style when that is not what they were designed to do. Let us take, as an example, the multiple-choice test. The format of five alternate responses may favor persons who prefer broad categories of response, and who may respond with quick, insightful approximations in answer to a test item. They are "close enough" to get the answer right, so they amass enough "close-enough" correct answers to do very well on such a test. By contrast, persons who prefer "narrow-range" categories of response may require more time for each question and respond only with the exact solution, even though that is not what this sort of test may be asking for. The cognitive style dimension measured here is *category width*, with "broad" and "narrow" being polar types. There may well be countless other style dimensions that are being similarly confounded with a given type of test.

The problem of the style-biased test format becomes more serious when one considers that instructors who are unaware of their own style will probably tend to give tests in a format that favors that style. For example, a logic professor who expects precise, specific responses may discount the generalized, conceptual "lumper's" answers, while a medical- or technical-oriented "splitter" student may be unable to cope successfully with tests requiring essay responses.

Research in cognitive style has shown that where there is a style match between student and teacher, or learner and materials (or format), there is mutual liking and greater chance of success for good grades or other evaluations (Claxton & Ralston, 1978; Lange, 1972; Witkin, 1973). This should not be surprising; "like attracts like." But once the bias is recognized, it is essential to take steps to compensate for it.

In many learning contexts—including many in the United States—there is a bias favoring cognitive style of a more analytical, reflective, objective, "splitting" nature, in contrast to the opposite relational, impulsive, subjective, "lumping" style. We could say that "splitting" traits are transfer skills expected of a "good student," one destined to get an "A" and do well in general. Furthermore, we tend to expect that a person will develop increased abilities in these areas simply through formal schooling and developmental maturation. This view implies, though, that as people mature they should become less dependent on concrete, direct, sensory types of experience, which are in turn seen as immature—not *bad*, but to be discarded in favor of more "adult" styles. Concrete sensory experience would be used merely for occasional learning or in everyday informal life and, even then, not at the "expense" of the more desirable analytical activities.

Similarly, many *job* biases against the "lumper" traits exist in this country. When we look at the reward system, it is the higher managerial jobs that pay well; these in turn are often occupied by "systematics," who usually have little tolerance for more right-brained "lumping" used by "intuitives" (McKenney & Keen, 1974). This bias is linked with views of *time*; in contrast to "splitters," the right-brained "lumpers" tend to be less here-and-now oriented and more concerned with getting something accomplished when its time has come (Mann, Siegler, & Osmond, 1972). Many people in jobs or schools might quickly agree with the following negative view of "lumping" (referred to as "field dependent") style:

Field dependent persons have an inability to perceive discrete parts of a situation and arrive at problem solutions through use of their perceptions. If one cannot accurately delimit the problem and identify the individual elements present; it seems highly unlikely that one could carefully consider all possibilities and test them exhaustively, as one must do when operating at the formal level. (Thibodeau, 1979, p. 296)

Left-brained "splitters" may also experience difficulty, though, in moving the job forward, if they cannot see the big picture. It is the person who can use all three parts of the brain who is needed, as we saw earlier in the Suojanen Star Trek model. "Splitter" culture may have provided the climate for hard-nosed United States business; but is it "better" in all areas than "lumping"?

It is often in discussions of cognitive styles of field dependence—field independence where we find most bias. Recently, though, there has been some awareness that field dependence does have some cognitive and interpersonal advantages, as we will see later.

The issue of alleged superiority of one style over the other is mentioned at this point to illustrate some of the assumptions that people have made in regard to the ways that cognitive style and intelligence (and, presumably, success) are linked. Such interpretations cloud the issue. A better understanding is needed of the "interaction effect" of persons with task environments and the effect on behavior. In other words, we need to know when the use of one style is more desirable than that of the other (Cross, 1976; Hunt & Sullivan, 1974).

Productive Utilization of Style

To try to determine which of the two general cognitive styles ("lumping" or "splitting") is the more desirable would be to miss the point of style awareness. The important issue is the development of style *flexibility*: knowing when to apply each style, and how to function in styles other than one's own "preferred" style. Each style holds a unique and useful view of reality. People who function in only one style are missing at least part of the total reality. Extremely polar types lose a measure of objectivity as well—the "splitters" may not be able to see the forest for the trees, while the "lumpers" may not see the trees for the forest!

Persons who identify themselves as "splitters" or "lumpers" may find it useful to work with someone of the opposite type in certain tasks. Even the person who is able to switch back and forth somewhat easily may find it more productive to team up with a person who is more apt to use the complementary style in certain circumstances. This is what Hagberg and Leider's *Inventurers* (1978) learn to do. By knowing their own cognitive style, they know how to put them to good use by selectively teaming with persons from other styles. In other words, they take into consideration the "interaction effect." This sort of adaptability should stand them in good stead on the job as well as in everyday life.

The "interaction effect" can even be fostered institutionally, as Keen (in a personal discussion) reported after taking "irreconcilable extremes" of "systematic" and "intuitive" employees, placing them in discussion groups of like style, and having each group describe a situation in question. This was done to sharpen the planning process, and it proved to be effective.

Personality, Age, Sex, and Sociocultural Correlates of Cognitive Style

"Lumpers" tend to be more "other-directed," in contrast to "splitters," who tend to be more "inner-directed." "Lumpers" thus take their cues from their immediate environment. For this reason they tend to be more socially alert. This is one trait that, if viewed one way, is a weakness, and in another way is a strength. This comment goes back to the question of bias. Here are two contrasting portrayals of field dependent "lumpers":

Field dependence is closely related to dependence in personal relationships, suggestibility, conformity to conventional norms, and reliance on others for guidance and support. Field independent subjects tend toward an active initiating, organizing role in relation to social and non-social environmental stimuli, to be made resistant to social group pressure, to show greater consistency of behavior, to use isolation and intellectualization as defense mechanisms rather than denial and repression, and to have had mothers who encouraged greater autonomy and curiosity in early childhood. (Gatewood, 1971, p. 27)

In this view, "lumpers" are reactive, not proactive, seemingly unable to differentiate themselves from other persons in their emphasis on how everything relates together. In effect, "lumpers" carry a "radar set" into every situation, while "splitters" carry a "gyroscope"; that is, "lumpers" would look to others for cues in contrast to the more predictable "splitters," whose gyroscope keeps them on a set course.

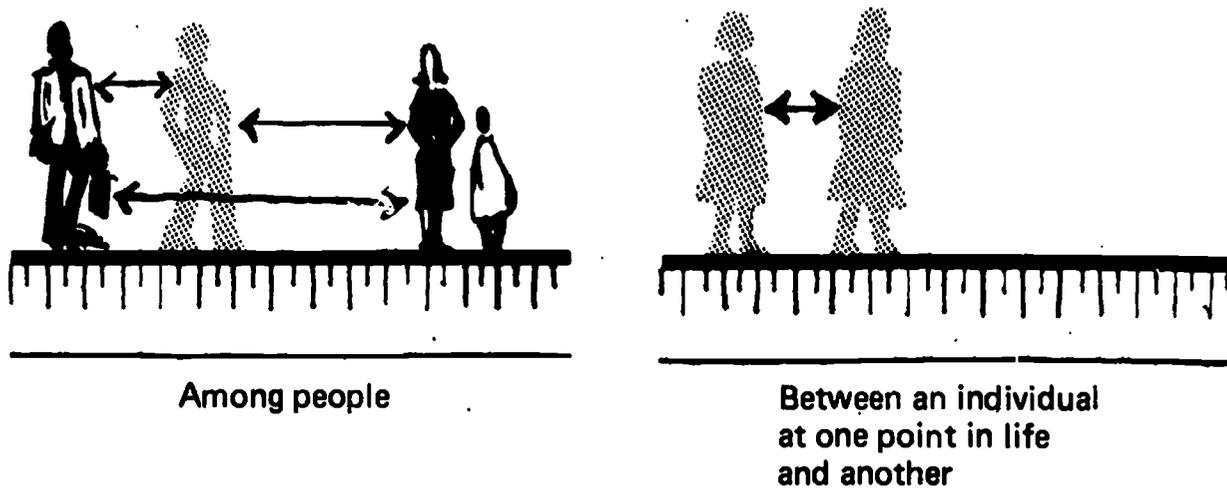
Cross objects to descriptions of field dependents such as the one (Gatewood's) quoted above:

After reading that description, most of us would probably prefer to be considered field independent. On the other hand, we might prefer to be field dependent if we were given the following definition: "The field-independent individual appears cold and distant to others, and tends to be individualistic, while the field-dependent individual makes a favorable first impression, is gregarious, affectionate, considerate, and tactful." (Cross, 1976, pp. 119-20)

The term "field dependent," which we will discuss when dealing with that particular cognitive style, may in itself be a biased word. Perhaps "field sensitive," the term adopted by Ramírez and Castañeda (1974), would be more accurate, but this is not a common term in the literature at present.

There is some confusion as to the correlation of age with cognitive style. In looking at this correlation, you will see that it is linked to what was said earlier about content, structure, and process; in this discussion, however, we must rethink what we consider cognitive style to be.

Only a few researchers, such as Hester and Tagatz (1971), have considered cognitive style as innate. Educational Testing Services researcher Herman Witkin was investigating possible linkage of the X chromosome to cognitive style prior to his death. Whatever that particular outcome would have been, he had found evidence earlier (Witkin, Goodenough, & Karp, 1967) that cognitive style was fairly well set at an early age, even though he found some change among both "splitters" and "lumpers" toward "splitting" over the lifetime. It has generally been found in cognitive style research that, in its broad outlines, an individual's style does tend to remain basically the same as it was in the earlier years, despite some change over a lifetime. Variations in cognitive style are greater from one individual to another than for an individual at different points in his or her life.

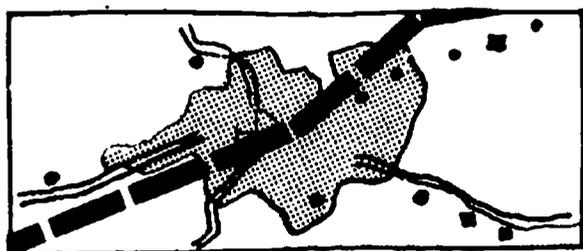


However, there is research that suggests other interpretations. Goodenough and Eagle (1963) and Ramírez and Castañeda (1974) did *not* find notable differences in cognitive style among very young children; nor could Fredrick (1968) find much variation among somewhat older ones. What may be missing is research comparing *several different* measures of cognitive style on the same individuals.

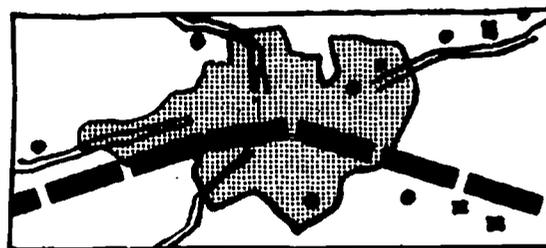
If cognitive style is viewed as process, then age is a correlation. McAdam (1971), for example, notes that a person acquires a cognitive style that involves how the person adapts to his or her own unique life situations, as well as the cognitive style the person acquires to adapt to his or her general culture.

Koskela (1973) considers cognitive style as both process and structure. For him, style is "a configuration of interrelated control principles," or constant structural parts of the personality that regulate functions such as perceiving, thinking, and recall. But he also saw style in interaction with the environment at all times because these functions operate in a variety of content areas. For example, we use the function of perception while listening to a formal math lesson at school as well as while feeding a colorful flock of birds. We are changed inwardly as a result of each instance. So cognitive style is affected as the control principles are placed into operation. This happens each time a person faces different adaptive requirements. As we get older (in fact, in each minute), content and structure change, yet the style remains basically the same. Each of us has our internal representations (our "picture" of "reality") of our dealings with our environment. These become an ordered set of attributes or concepts that we can draw on to analyze, classify, and otherwise operate on the outside world and on ourselves.

Perhaps we could use, as an illustration, the way we travel with the use of maps. We start out on a trip with a given map. As we go along the road, we note anything that may have changed—there is a new store, there is a dry hole where a lake once was, etc. We add this information to our map (or at least to the map that is in our mind if not on paper). The analogy runs into trouble because we think of maps as outside ourselves. Perhaps an even better picture of the map-updating process would be if we thought of the map as inside our minds, with a capability similar to scanning screens used in air piloting. These have fixed location points but display continually changing patterns of information en route. The different chances we have for contact with different types of people (especially multicultural contact) will be of special importance in the flexibility of our style (Ramirez et al., 1977).



Cognitive style
as a "given" map



Change in cognitive
constructs as updating
the map

Actually, such a view is not too far removed from the Piagetian developmental position we discussed earlier, wherein cognitive abilities are continually changing in the process of the person's adapting to the environment, and these abilities run a predictable course throughout life from simple to more complex operations. At least one learning style theorist (Kolb, 1977) specifically links his styles to such processes, considering styles as "fallout," as it were, from the things people do in their unique adaptations.

When we look at correlations of cognitive style and sex, we find somewhat more consistent findings. Although style varies more within sex groups than between sexes, still, females at all ages have tended to be field dependent "lumpers" (Witkin, 1975) more often than males. We must, however, consider the role of socialization in cognitive style development. A number of studies on cognitive style in other cultures, cited in Messick (Messick & Associates, 1976) and Witkin (1975), found *no* sex differentials. In less mobile hunting societies, males and females are given the same sociocultural upbringing. This striking difference is important to note and demands further investigation. However, many researchers doing neurological studies have been coming to the conclusion that behavior, especially spatial and verbal behavior, really is sex-linked; that is, the brain is "a sex organ." (A succinct summary can be found in Coleman, 1978.)

More cross-cultural research is needed in regard to cognitive style. For example, which styles are encouraged where? Why? Such studies would follow the tradition of those social scientists who favor making comparisons of various "national personality types," such as the investigation of a possible Afro-American cognitive style (Shade, 1979).

There may be a great deal to learn, in this regard, from other cultures. For instance, would we find that in other technical societies the cognitive style of "splitting" is encouraged as it is in the United States? Does the technical aspect of society help explain in part the correlation between higher levels of developmental maturity and the increased use of "splitting"? Developmental psychologists such as Piaget have said all along that maturity brings increased "splitting" or formal operations, but it may be that increased "splitting" with age is more an effect of its emphasis by our technical society than it is a developmental effect. This possibility is raised when we consider that in at least one *non-technical* culture, that of the Native American, children actually use less, not more, "splitting," as they grow up (Esprit, 1972). In this culture, non-analytical, relational thinking is encouraged.

Another culture in which we find this sort of encouragement toward "lumping" is the Mexican-American minority (an offshoot, of course, of Mexican culture) studied by Ramírez and Castañeda (1974) in the southwestern United States. Although children in this culture could be expected to tend toward "lumping," the researchers deliberately attempted to insure that they and their Anglo classmates would become "bicognitive," by training the teachers in various educational intervention strategies.

A question immediately arises: How successful are intervention strategies likely to be in changing cognitive style in one direction or another? This is a crucial question for teaching for transfer skill acquisition, since it involves identifying specific cognitive style elements with specific transfer skills, and placing emphasis on style match or mismatch.

Match and Mismatch: "I Like Your Style"

As mentioned, students and instructors whose cognitive styles are matched tend to judge each other (in regard to affect and ability) more highly than those who are unmatched. Research confirms that instructors rate their students more highly when styles are matched (Lange, 1972; Wasser, 1969) and the reverse is also true (Schroeder, 1970). This tendency also holds in other areas of life; for example, for therapists and patients (Claxton & Ralston, 1978), as well as supervisors and supervisees (Covello, 1975). Persons apparently perceive others' cognitive style within a very short time as they start relating to each other; but, style is often perceived as "personality," which they either like or do not like. People are usually unaware that what they are relating to is someone else's perspective on the world, and the process he or she used to filter it.

People matched by style feel that they "speak the same language" and "are coming from the same place." If this is the case, wouldn't it be best to match individuals (for whatever purpose) on the basis of style? Wouldn't such matching cut down on possible friction between facilitators and the people with whom they work? Wouldn't it improve training effectiveness, or performance in class or on the job? In some ways, such an idea is almost too simplistic. While life may be easier in general under such "matched" circumstances, "easier" is not necessarily "better." Before reaching any conclusions, we must first examine the "interaction effect" between style and situation.

It is interesting to speculate about the social atmosphere where a group of people all have the same style. Payton, Hueter, and McDonald (1979), for instance, found that in a nationwide sample of instructors and students in physical therapy, there were "amazingly few differences in style." Payton (in a personal discussion) speculates that faculty members were "replicating themselves through the admission process."

Are there some schools, careers, offices, etc., where this is actually the case? Does this sort of match offer a reason for why some organizations have less friction and more cooperation?

Before speculating, let us consider the consequences when people are in style mismatch. They are likely to be rated lower in terms of affect or ability because of style elements they do *not* share with the rater—a crucial matter if the rater is an instructor or job-related evaluator (as when teachers are rated by administrators). In his study, DeLoach (1969) found that highly rated teachers tended to share common style elements with the administrators who had rated them. It would appear that low achievement ratings are sometimes a matter of mismatched styles.

How, then, can we put this information about style matching to practical use? It is not always practical to try to match styles of learners to instructors, personally, but at least we could match students' style, the mode of presentation, and types of testing. However, if what is to be learned is highly complex or involves ideas that may not be easily accepted, it may be more useful to find a facilitator whose style matches that of the student(s). Advertising and evangelism have long demonstrated the value of reducing the psychological "distance" between the facilitator, the message, and the person receiving that message. Human beings are more willing to listen, to accept, or to act on information when the style barriers are down.

If not actually matching for personal style (where the mental imagery is shared between message-giver and message-receiver), another technique, used by instructors and trainers, is to provide a "hook" on which to hang the information to be learned. In doing this, teachers are, perhaps unknowingly, helping learners to compensate for a style mismatch by trying to create as much of a match as possible.

Nelson (1970) found that global students (a term here used to mean "lumper," as opposed to "analytical") did better in geometry when relevant facts that they might not have been able to pick up from the context were pointed out to them. A related study by Schwartz (1972) applied this principle to "generalizers," who also need to grasp abstract ideas. She perceived a need to help "particularizers" learn to relate things together and synthesize them mentally. Impulsive, global learners seem to need a combination of interpretations rather than a single approach (Froyen, 1970), and prefer group discussions to the discovery-on-one's-own approach that is preferred by analytical students (Wu, 1967). They need many "hooks," then—many ways to pick up information from a context.

Another important need in this area is research on the kinds of training that are most successful with the various cognitive and learning styles. Why, for example, did Froyen's (1970) study find that successful learning depended on the use of a combination of methods, and not on any one variable? Perhaps the type of reinforcement used in training was what mattered. Studies have shown that "lumpers" tend to respond well to praise while "splitters" do not seem to find it particularly gratifying. Curiously, however, a study by Baird and Bee (1969) found that children of both style preferences tended toward greater use of analytical style under random reinforcement.

Changing Styles

There is a clear, logical progression from the idea of matching for mastery to the concept of learning to "switch hit" with various cognitive and learning styles. Studies show that those who can transfer have higher levels of measured achievement than those who do not (Wyett, 1967; Yeatts & Strag, 1971).

How much success can be expected in changing from one style to another, or from one style element to another? In the analytical/global or reflective/impulsive framework, two studies involving low-SES black children (Isaakson & Moore, 1972); Sigel & Olmstead, 1968) succeeded in eliciting an increase in analytical, reflective behavior from children whose normal style was global or impulsive.

Scott (1970, 1972) took an already existing skill-building technique—Suchman's (1965) "Inquiry Strategy"—and tested to see if it would help children to become more analytical. It did, with results that were still present even five or six years after training. Suchman's technique is a basic one that involves a great deal of diversity in materials and a variety of "angles" from which the subject matter is viewed; perhaps this carries out Froyen's (1970) conclusion that a combination of approaches is needed to help people augment their cognitive style.

These studies of deliberate attempts to encourage style-flexing (or augmentation) were done with children. We do not as yet have comprehensive data on similar attempts with adults. Some researchers think that the best time to try to implement such change is in childhood. Scott (1970, 1972) believes that sixth or seventh grade is a good time—but Sabatino and Hayden (1970) believe that the first to third grades would be better. On the other hand, Coop and Brown (1970) point out that college-age students could also learn to style-flex because they have become adept at behaving according to a variety of standards and objectives. Will it be impossible at later ages to acquire a deep-seated style change (as contrasted with what Messick & Associates, 1976, call a "strategy," a learned behavior that one can act on but "it's still not *really* you deep inside")? Does it matter that style-flexing is "only learned," or "only acquired technically" (not "more naturally," as through Hall's "formal" and "informal" learning)? We must come to understand clearly the degrees of cognitive—and learning—style before we can answer (as we will attempt briefly in a few pages).

Long-term *modeling* may be a key technique in style-flexing. For instance, Yando and Kagan (1968) found that children taught by more reflective teachers were more likely to model after them (although the children's measured error rate did not go down). McAdam's (1971) study found that college students tended to do the same kind of style modeling (except that, interestingly, the students who were originally of a different style and moved toward the instructor's style did not relate any better personally to that person or voice any greater approval). Could this be similar to the tendency for many oppressed people to become like their oppressor while still not approving of the latter?

Whether or not outright new style or style element acquisition takes place appreciably, there could still be good reason to expose people to different learning experiences related to other cognitive or learning styles. "It could well enhance the creative ability of a field-dependent person to place [him or] her in an unstructured, inner-directed learning environment" (Claxton & Ralston, 1978, p. 14), which may be developmentally more desirable than remaining in a protected match situation, where there would probably be no incentive to learn in other styles.

If we know that a field independent learns best and most pleasantly in independent study, are we necessarily serving him [sic] well if we offer him a steady diet of independent work? Maybe he needs to work cooperatively with others. "Matching" him to his own style or preference may push him toward further field independence, and that may be maladaptive in certain social situations (Cross, 1976, p. 26).

This possibility of limiting the study by inappropriate matching is a cause of concern to Messick and Associates (1976). They cite four basic types of match or mismatch according to the desired result the arrangement was intended to accomplish: (a) the "challenge match," (b) the "corrective" or "remedial match," (c) the "compensatory match," and (d) the "capitalization match." Only the latter is a true match; the "compensatory" match is one that includes measures to remedy the differences, and the first two types are actually mismatches, included to allow for investigation of cognitive transfer skill acquisition.*

Although short-term training efforts to change cognitive style often seem to prove less than completely successful, more research is needed to determine the extent of success accurately. But if we can systematically train people to diversify their learning strategies—to switch-hit, to be bi-cognitive, to be adaptive in regard to cognitive or learning style—then we can expect longer-term results. This is the thrust of Ramírez and Castañeda's work (1974) (to be discussed in detail later), as well as of Messick and Associates' basic suggestion that instructions use a variety of matches and mismatches as a rule of thumb. It is also the specific goal of several training workshops** and at least one "how-to" book, *Use Both Sides of Your Brain* (Buzan, 1974).

Comparing and Contrasting Cognitive and Learning Style

Three basic uses of style information are found in Messick's multiple definition of cognitive style:

- ... (1) [As] personal characteristics that may interact with treatment variables to moderate learning, retention and transfer; (2) as dispositions to be monitored to detect any possibly undesirable side effects of instruction; and (3) as qualities to be fostered either directly as specific objectives of the instructional program or indirectly as by-products of other efforts. (Messick & Associates, 1976, p. 147)

"Learning style" seems to have emerged as a more common term in recent work of the 1970s. Those working under the umbrella of "learning style" take cognitive style into consideration, but would probably describe themselves as interested in more practical educational or training applications, and are thus more "action-oriented." Those working in "learning style" sometimes say they are not especially interested in cognitive style because they regard it as more academic. However, if cognitive style actually underlies learning style, it has quite practical implications.

An important difference between cognitive and learning style is the number of style elements considered, as we have noted. Cognitive style usually focuses on just one style dimension with two polar extremes; for example, you are either field independent or you are not (in which case you are field dependent). But learning style entails many elements, and they are not usually "either-or" extremes. One either has or does not have the element in one's style, and the absence of one element does not necessarily imply the presence of an opposite element. Some learning style inventories deal with the degree to which one possesses an element; others deal merely with the presence or absence of the element. For example, you may or may not be a visual learner; if you are not, learning may occur through hearing, manipulation, etc.

* We will take a detailed look at these after we have had a chance to examine the various cognitive and learning style measures, then consider what we may want to do with these. This brief discussion was included to allow the reader to anticipate ways that transfer skill acquisition could be enhanced by match-mismatch of cognitive or learning style.

** Cybernetic Learning Systems, Hollister, California; Harmon Associates, San Francisco; the Bi-Modal Learning Systems Approach of the Human Development Training Programs, Albuquerque; and the 4-MAT System of Excel, Inc., Fox River Grove, Illinois.

The greater number of elements in the concept of learning style allows profiles or matrices to be fashioned for any given person as a quick, insightful method of describing the type of learner that person is (i.e., which elements that person will use in learning). Having these kinds of profiles of learners or trainees can aid a facilitator in planning a presentation format, a sequence of instruction, or the like.

The greater number of elements in learning style may seem to be more helpful than cognitive style for such reasons, but may also seem less basic to the underlying cognitive activity taking place in a learning situation. It depends on the use to which the style information is to be put. Even if the most crucial information is the "splitter-lumper" distinction masquerading under a different name, this fact need not detract from the advantage of having more baseline information for planning transfer strategies. If any of the information seems unnecessary, it may be discarded after careful consideration of whether or not it is pertinent to the learning situation.

Some "temperament" surveys are actually measuring learning style, especially those using four quadrants, of which there are several. They, too, yield a great deal of information about the ways an individual may learn best. Additional elements available on these and other learning style surveys may appeal especially to designers of training packages or other curriculum materials.

Information from such surveys can be placed on some sort of profile, in at least one survey called a "map." This is an apt word in that, just as a map helps on a journey, so too does a style map serve as a *guide* for learners or trainees and their facilitators. As a guide, it gives information about a person's present learning style rather than labelling the person for life as if there were no chance to change in some degree.

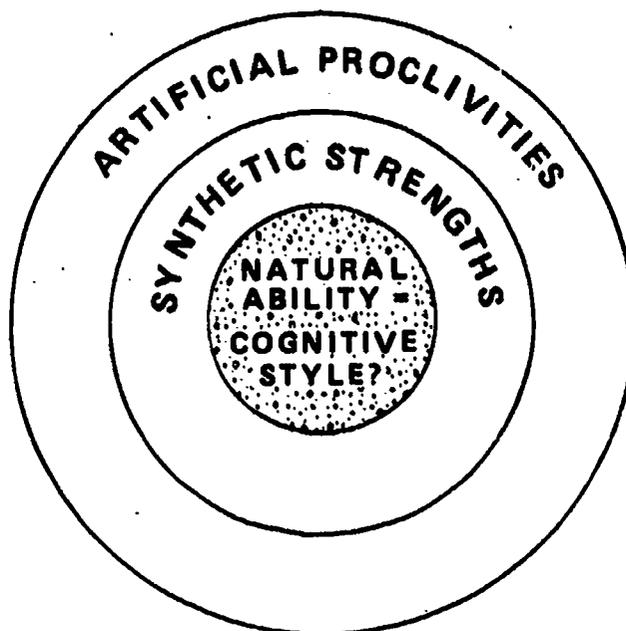
It would seem logical that the more basic elements, such as the "splitter-lumper" distinction, change less than elements such as preference for studying under certain light conditions, need to have food around to nibble on while studying, etc. The latter two elements were in fact found to differ among the young children at different grade levels studied by Dunn and Dunn (1978).

Keen (in a personal discussion) holds that where there is an attempt to change style, what really occurs is merely a change in outer *language*; that is, the person acquires only a way to talk (e.g., jargon) with persons of other styles. Perhaps this sort of thinking underlies the reasoning of those educators who encourage students to take a subject like art just "to be conversant" about it. We may yet ask if something is not changing at some deeper level, as was evidently the case with the ghetto children who learned Latin and who, *at the same time*, gained basic communication skills in English.

Gregorc (1977) discusses three degrees or kinds of style that are relevant here:

1. Natural ability—inherent in the individual
2. Synthetic strengths—which approximate the natural, but are learned
3. Artificial proclivities—which approximate the natural, but are added on

If, as Cross (1976) suggests along with other style researchers, cognitive styles remain more or less constant within the individual, then perhaps we can expect change only in outer areas of style:



The outer rings may be what Vernon (1973) believes are the focus of much learning style investigation; that is, "first-order" and "second-order" elements.

It was probably in learning style research that the idea, "there is no one best style," became prominent. A value-free emphasis is an obvious approach when there are so many different combinations of learning elements possible, representing so many chances for a person to gain information and act on it. Then, too, when learning style became a watchword, more was known about the need for a bicognitive approach. These are some of the events that encouraged the development of this view:

The increase of "how-to" programs, typified by popular magazine articles or even full-scale books on how anyone can develop one or the other side of the brain and its correlative skills (e.g., Flesch, 1973, *The Art of Clear Thinking*, for the left side; Samples, 1976, *The Metaphoric Mind*, and Edwards, 1979, *Drawing on the Right Side of the Brain*, for the right).

Edward DeBono's ongoing work in teaching people "how to think"—both "creatively" and "more logically"—has been a very important influence in its concept of whole-thinking skill endeavor, along with Suchman's (1966) and Taba's (1962) work mentioned earlier.

Sociologist O. L. Moore's Black Excellence Program at the University of Pittsburgh also took students through an innovative format to sharpen their conceptual abilities. A sort of "Junior Olympics" placed the young people in competition with other students, and, as an added but integral bonus, their success in interscholastic intellectual events gained the respect of whites.

Nearly 30 schools have been set up around the country to use the Piagetian framework to encourage younger children to "think with their whole bodies" by doing tasks that, while enjoyable, encouraged them to increasing their higher-level developmental thinking. This was to serve as the necessary prelude to later development of more complex conceptual skills, such as those required in verbal and mathematical learning. (There is some commonality with Montessori tasks, which had been used in various European and American settings, although the Montessori format is far more structured.) The success of one such Piagetian school and the developmental tasks used are described in detail in Furth and Wachs' *Thinking Goes to School* (1974). Wachs (in a personal discussion) says the tasks have also been used with adults for remediation.

Piaget's notions were increasingly taken up in the world of education to prepare younger children for later acquisition of such specialized skills as those used in musical training. Workshops originated and conducted by Madeleine Carabo-Cone, for example, have been highly successful in this regard.

The 1960s and 1970s were years when alternative schools and programs mushroomed, although not all were directly involved in teaching for style-flex in cognition or learning. However, their efforts were often relevant. A case in point is the Mead School, in Greenwich, Connecticut, with its concern to encourage the development of the "whole person" through inclusion of arts, music, and hands-on activities. Only some time after starting the program did the school personnel realize that what they were trying to accomplish was to build skills related to the left- and right-brain and to style. Such unconscious allegiance to the same goals is probably more widespread than we realize.

Of course, liberal arts schools since the age of the Greeks have claimed that they were educating the "whole person" to function on ever more advanced conceptual levels—perhaps using other than conceptual skills. At least one recent study found that this claim was borne out by seniors about to graduate from certain liberal arts schools, although it was not borne out below that level (Winter, Stewart, & McClelland, 1978).

Can cognitive training be best carried out in regular schools through special programs, or is the special workshop best? And what of training for skills less associated with the left side of the brain? Certainly workshops have gained popularity, especially in the work world. Managers have long been required, or at least encouraged, to acquire a variety of skills, such as how to process information, how to communicate it, how to be creative, now to "brainstorm," and so forth. For them, as well as for other workers farther down the line, human relations training has become very important. This particular training has sometimes been done in therapeutic sessions as well as career sessions, with the emphasis in the former more on remediation than on positive skill-building.

Remediation—going back and picking up skills that would have been more efficiently (or efficaciously) developed at an earlier stage of one's life—is indeed another type of transfer skill training. Sometimes remedial skill-building is done through the joint efforts of psychologists and educators, as in Giammatteo's (1966) diagnosis of students for perceptual problems. His diagnosis was followed up by giving the results to teachers, and collaborating in working through the difficulty by stressing audio, tactile, kinesthetic, and visual senses.

We also see a growing number of books and programs to help teachers and trainers gain self-understanding (such as Curwin & Fuhrmann, 1975) and to adapt their strategies for specific desired effect (such as Joyce & Harootunian, 1967).

It was in such a climate that "learning style" arose as a special area of interest, drawing on the earlier cognitive style research.*

Sharing Results of Style Information

The "bottom line" for anyone interested in skill acquisition is, of course, what use people make of the style information. As mentioned elsewhere, we do not know all the effects of sharing the information—whether knowledge of a certain type of information (such as, "I use a style that I am glad I have")—makes for different skill acquisition than knowing "I don't have this or that element on my map that I wish I did," or even, "No kidding—so *that's* what this year's crop of students (or trainees) looks like!"

A few results of sharing style information are useful to us at this point to see some of the possible things that can happen.

After a learning style inventory was given to dental hygiene students, Shuntich and Kirkhorn (1979) found that both the students and their instructors were able to profit from use of the information about the results. Basic procedures could be set up for implementation and learning activities,

* An in-depth look at learning style appears in Chapter IV.

as well as evaluation, for the class as a whole or for individual students. Students and instructors alike could use the survey results in carrying out the learning units and in counseling. These students usually seemed eager to get the results of their tests, in contrast to the physical therapy students (who did not seem to be curious) in the study by Payton, Hueter, and McDonald (1979). The difference in student reaction is very possibly because the latter students were told that there was little deviation among the individual profiles; they may have assumed there was no real reason to look at their own results.

To couch information about learning problems in terms of match and mismatch between self and another person or approach can be far less threatening to a student than other ways of presenting the presence of learning skill "gaps." Laird Warner (in a personal interview) claims this to be the case when style match information was given to potential dropouts during Project Priority.

In the next chapter, a review of cognitive style research and theory is given, followed by a chapter reviewing the literature on learning style.

III. COGNITIVE STYLE

The Forerunners

An early contributor to notions about cognitive style was Carl Jung. He did not conduct research, nor is he cited in literature pertaining to cognitive style, but his work provides a prototype scheme of style division:

Function of perception: Sensing and intuiting.

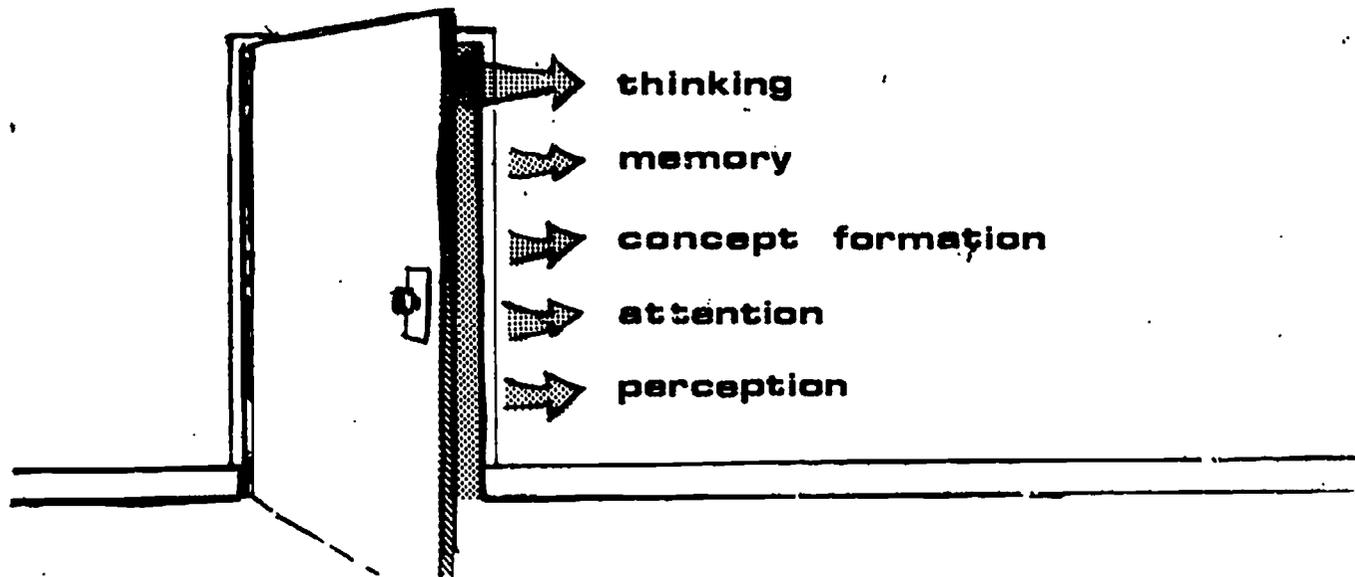
Functions of judgment: Thinking and feeling.

Attitude preferences: Extroversion and introversion.

Although this typology has been incorporated into some of the most recent work in the field, e.g., the Myers-Briggs scales classify people according to Jung's "sensing," "intuiting," "thinking," and "feeling" types, it did not underlie the first ventures therein. (It is possible that Jung's psychological work was ignored by persons who would not accept his religious notions.)

Gardner (1959) and Holzman and Klein (1954) began the inquiries that led directly into cognitive style research when they looked at "ego structures," which were presumed to be linked to the way people express, reroute, or delay various instinctual drives. Within such contexts, cognitive style at first appeared to be structural. Not until much later would it be viewed as a more dynamic *process* of adaptation to the environment.

The Gardner school became known for its work with "cognitive controls," which functioned like Freudian ego defense mechanisms, opening the door to let information pass through, or closing it to suppress the information. These controls affected memory, concept formation, attention, perception, and thinking.



The Gardner structures can be found, along with other researchers' contributions, in the following summary of the various cognitive style models (as adapted from Karen Nelson, 1976, by Claxton & Ralston, 1978, pp. 8-9):

MODEL	DESCRIPTION	KEY REFERENCE
1) Field dependent/ independent	A global versus analytical way of perceiving. Entails the ability to perceive items without being influenced by the background.	Witkin et al. (1954); Witkin (1976)
2) Analytical/ non-analytical conceptualizing	Analytical style entails differentiating attributes or qualities. Non-analytical style responses may be more relational or thematic.	Kagan et al. (1964); Messick and Kogan (1963)
3) Impulsivity/ reflectiveness	Impulsivity is characterized by quick responses, reflectivity by more deliberate, slower responses. The impulsive person is quicker but makes more errors.	Kagan (1965)
4) Risk taking/ caution	Risk taking is characterized by taking risks even when the odds for success are poor. Caution is characterized by reluctance to take chances except when the probability of success is great.	Kogan and Wallach (1964)
5) Preceptive- receptive/ systematic- intuitive	The inclination to assimilate data into concepts or precepts previously held (preceptivity) versus the tendency to take in data in raw form (receptivity). The inclination to develop clear sequential plans (systematic) versus the tendency to develop ideas freely from data and to skip from the part to the whole (intuitive).	McKenney and Keen (1974); [Schwartz (1972) has a related style that considers preceptive ("generalizing") and receptive ("particularizing")]
6) Leveling/ sharpening	Individual variations in assimilation in memory. The leveler tends to assimilate new stimuli into previous categories, while the sharpener tends to differentiate new information from old.	Gardner (1959)
7) Cognitive complexity/ simplicity	Differences in tendency to see the world in a multi-dimensional way. Complexity is characterized by the use of hierarchic integration, while simplicity is shown in the use of dimensions of difference.	Harvey, Hunt, & Schroeder (1961); Kelly (1955)
8) Scanning/ focusing	Entails identification of relevant versus irrelevant information in attempting to solve a problem.	Schlesinger (1954)

(continued)

MODEL	DESCRIPTION	KEY REFERENCES
9) Constricted/ flexible control	Constricted control shows more susceptibility to distraction; flexible control is characterized by resistance to interference.	Klein (1954)
10) Broad/narrow category width (equivalence range)	Preference for broad categories containing many items, rather than narrow categories containing few items.	Bruner and Tajfel (1961); Kogan & Wallach (1964); Pettigrew (1958)
11) Tolerance for incongruous or unrealistic experiences	Individual willingness to accept perceptions that vary from conventional experience. Tolerance is characterized by a greater adaptation to unusual perceptions. Intolerance is revealed by the demand for more data before the unusual is accepted.	Klein, Gardner, & Schlesinger (1962)

Into this categorization structure we should place those cognitive styles Messick found in the literature not already accounted for above (Messick & Associates, 1976, pp. 15-22):

MODEL	DESCRIPTION	KEY REFERENCES
12) Conceptual differentiation	Relative multiplicity of distinctions among concepts (as contrasted to the extent of a single concept's range of reference).	Gardner, Lohrenz, & Schoen (1968)
13) Compartmental- ization	Discrete and relatively rigid categories involving a certain inertia in thinking and possible limitation in production of diverse ideas.	Messick & Kogan (1963); Wallach & Kogan (1965)
14) Conceptual articulation (conceptual discrimination)	Extent to which stimuli or items of information are treated in dimensional rather than class terms; i.e., extent to which instances of a concept are discriminated from each other in a number of intervals or ordered categories within a concept's range of reference.	Bieri, et al. (1966); Schroder, Driver, & Streufert (1967)
15) Conceptual integration (integrative complexity)	Extent to which categories or dimensions of information are perceived to be integrated in multiple and different ways.	Harvey, et al. (1961); Schroder, et al (1967)

(continued)

MODEL	DESCRIPTION	KEY REFERENCES
16) Strong/weak automatization	Relative ability to perform simple, repetitive tasks compared to what would have been expected from one's general ability level.	Broverman (1964)
17) Conceptual/perceptual motor dominance	Conceptual dominance is shown by relative specialization of conceptual behavior vs. relative specialization of perceptual motor behavior.	Broverman (1964)
18) Sensory modality preferences	Reliance on the different sensory modes, especially kinesthetic (leading to figural or spatial thinking), auditory (leading to verbal thinking), or enactive, iconic, and symbolic modes.	Bruner, Olver, & Greenfield (1966)
19) Converging/diverging	Thinking aimed toward logical conclusions and uniquely correct or conventionally best outcomes, versus thinking aimed toward variety and quantity of relevant output.	Getzels & Jackson (1962); Cronbach (1968)

We can see from these models that there is great diversity as well as some interesting similarity in them. Field dependence/independence, with its emphasis on a global versus analytic way of perceiving, sounds somewhat like the nonanalytic versus analytic style of differentiating qualities or data. A person's tendency to be impulsive or reflective is rather like the inclination to be either a risk taker or to be cautious. The preceptive-receptive/systematic-intuitive dimension is rather like the leveling/sharpening tendency. And the person who has a nonanalytic response style and watches for patterns rather than the details as they are. (Claxton & Ralston, 1978, p. 9)

As noted in the Preface, until very recently little effort has been made to integrate these dimensions, with noteworthy exception of Claxton and Ralston (1978), Cross (1976), the "Project Priority" conference of 1974-76 (Martens, 1975; Rotundo, 1975), and in a more methodological vein, Vernon (1973).*

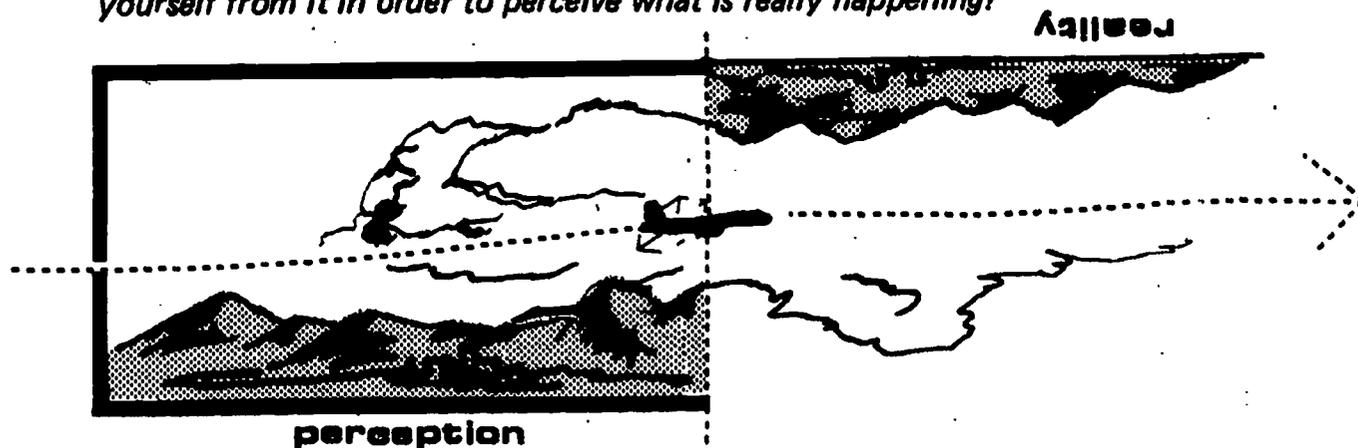
* The most notable attempt of all became known to the author just before the press deadline of this monograph. Bernice McCarthy, a long-time high-school instructor, was able to call together a number of theorists and practitioners in learning style applications, neuroscience specialists in "split-brain" research, and some well-known management specialists such as Peter Drucker and Chris Argyris. The conference allowed indepth discussion that produced a working draft of a large-scale pictorial integration of various left-brain/right-brain and style typologies. Even dance and art styles were found to be linked, along with management and social structure typologies. Nothing has been published from this conference for release, but the contact is through Excel, Inc., P.O. Box 6, Fox River Grove, Illinois 60021.

Psychological Cognitive Style

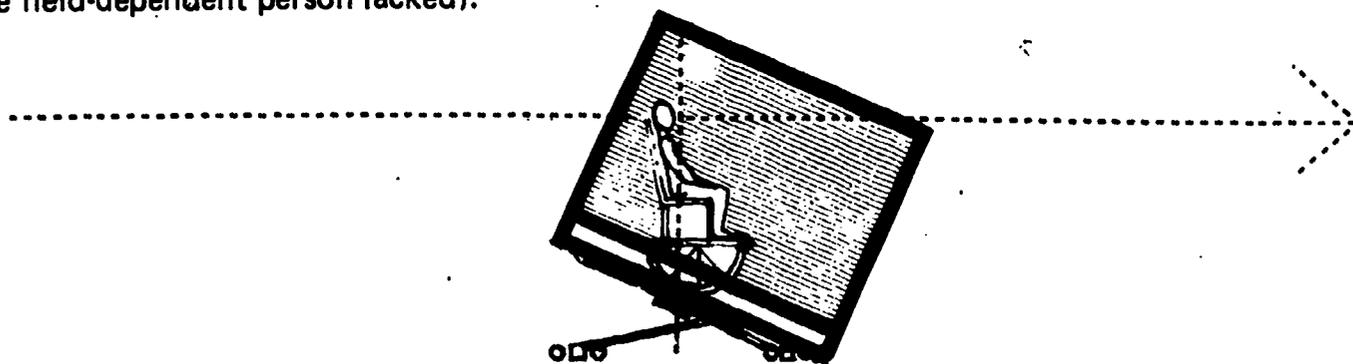
Witkin (1967)

Probably the most famous researcher in the field—often called the “Father of Cognitive Style”—was Herman Witkin. He coined the well-known terms “field independent” and “field dependent.” For him and his followers, the question of interest focused on *perception*:

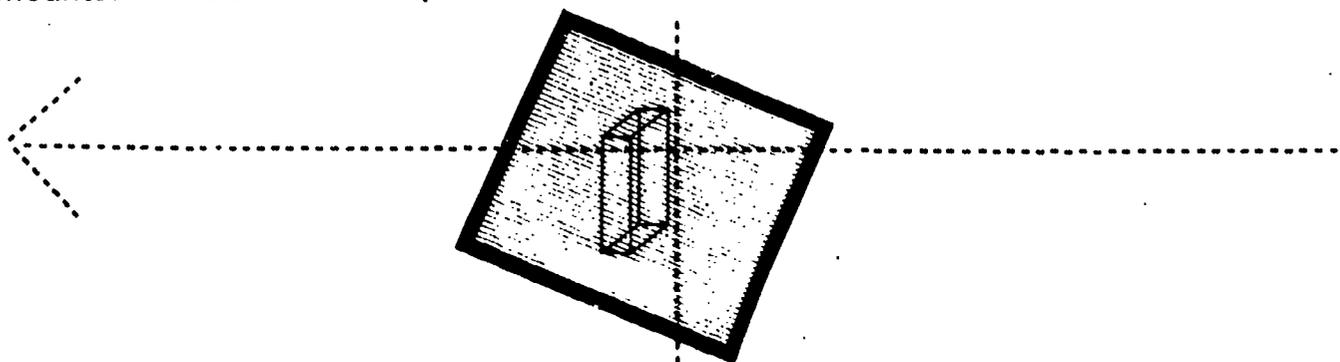
How embedded are you in your environment? How much can you separate yourself from it in order to perceive what is really happening?



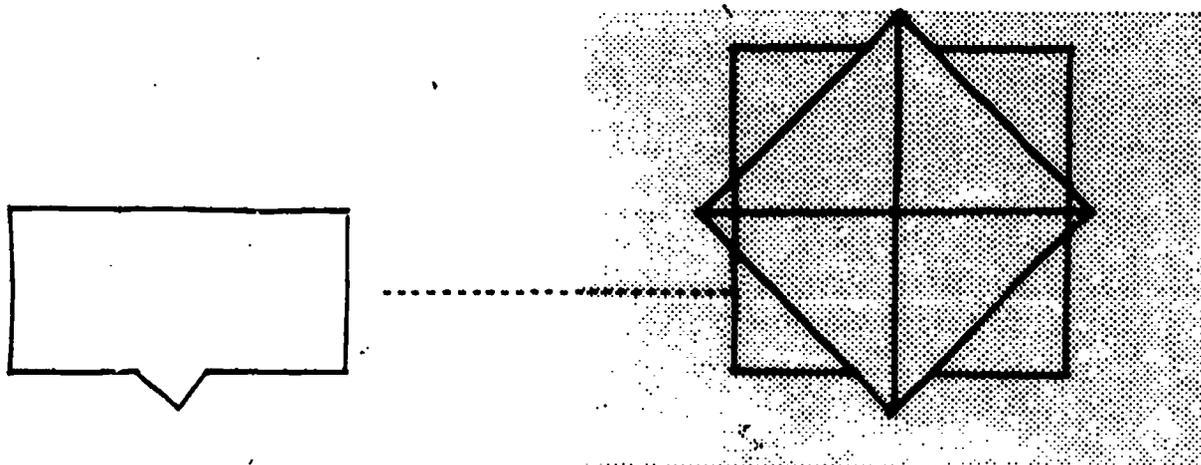
It started in World War II, when certain pilots, flying through fog, consistently emerged from it flying upside down. Others came out right side up. Witkin found he could test for people's ability to align themselves to a true vertical axis by having them sit in a specially designed chair in a specially designed room, both of which would be tilted at varying angles. Test subjects were asked to locate their body in relation to the true vertical, no matter how angled the chair, room, or both really were. People who could determine “which way was up,” despite the interference, were called “field independent.” Those who could not were called “field dependent.” The beginnings of a negative bias toward the field dependent are already apparent in this definition (in terms of what the field-dependent person lacked).



In time, Witkin's testing became simpler. All the subject had to do was to adjust a luminous rod mounted inside a luminous square to the true vertical axis.



Later still, Witkin simplified his procedure by having the subjects locate a simple figure in a complex pattern. People who had trouble overcoming the influence of tilted rooms, chairs, frames, and roads also had trouble overcoming the influence of complex superimposed designs such as the one below.



The basic test is called the Embedded Figures Test. Varieties of tests using this sort of pattern have been designed for different age groups, or for use with groups rather than individuals. Most such tests use geometric figures, though some use meaningful designs, or add colors.

Whereas field independence and dependence were viewed at first as something of an "either/or" arrangement, it later became more common to look for gradations of type—"more" or "less" field independence, for example. Witkin began to consider the interaction effect as he researched how persons who applied one basic style most of the time would, in other contexts, apply the contrasting one. For instance, a field-dependent who would normally use intuition might have been trained in school to apply a logical process while doing math; but once home, may revert back to intuition.

Kagan, Moss, and Sigel (1963)

After Witkin's early work, Kagan, along with Moss and Sigel, developed tests to measure how people categorized objects. Kagan's group looked at cognitive style according to how people sorted things—information—now in terms of a more basic interpretation of sensory perception. Kagan found two main types of styles (he found a third, but did not elaborate upon it).

Analytical/descriptive:

Finds similarity in things based on manifest objective physical attributes of the stimulus outside the self.

Able to discriminate—to sort out irrelevancies or distractions.

Thus the self is not so much involved, since categories "outside" are used.

If you were given a description of things by several analytical descriptives, it would be very similar.

*Relational/contextual: **

Uses concepts of functional or thematic similarity so that no stimulus stands by itself. Thus all stimuli are made to "go together."

Thus the self is involved, since the way things "go together" depends much on how the person thinks of them.

If you were given a description of things by several relational contextuels, it could differ considerably.

* Also called "global" or "nonanalytic."

Let us take a concrete example. If Kagan placed meat, cheese, and bread in front of test subjects, here is a typical description that each type of person might use:



A later test that was devised to measure information processing was the Matching Familiar Figures Test. Subjects group familiar figures into meaningful categories.

It is easy to see some linkages between Witkin's and Kagan's work, and Kagan himself noted this. There is still a "splitters" versus "lumpers" aspect, despite the fact that Witkin was concerned with basic perception and Kagan with information processing.

Like Witkin, Kagan found no connection between his own "splitters" (analytical/reflectives) analytical abilities and success at highly verbal tasks. He reasoned that they might employ their style when working with visual arrays, but not with verbal concepts. He felt that reflection would help them most during advanced phases of problem-solving tasks, such as in making hypotheses and evaluations, rather than down at the level of simple encoding and memory. Here we are presented with the idea that, even if people have a basic cognitive style, they may employ it at different points, rather than all the time.

It should not be surprising to find that analytical/reflectives are generally faster at learning analytical types of concepts. They are good at disregarding what they feel is irrelevant to a situation. Relating this to the list of cognitive style summaries on pages 52-54, we can see that by this selective discarding, they are also using narrow categories (cognitive style #10) and taking little risk (cognitive style #4). In so doing, they may be going more deeply into a situation than relational-contextual persons, who grasp an immediate overall picture of things but whose perception could remain superficial, skimming only the top layer of detail.

Others

Pages 52-54 show many other typologies of cognitive style. We will not detail them all, but highlight a few and look at some that did not make that list.

First let us look at Kagan's response tempo—impulsivity/reflectiveness, which is cognitive style #3 on the list. This style is often associated with whether or not a person is able to determine the correct answer.

Reflective

Stops to reflect before responding to stimuli — and usually gets the answer correct as a result.

Impulsive

Responds quickly to stimuli — and as a result is often incorrect.

Since not all reflective people always get the right answer, and since not all impulsive people always get the wrong answer, another refinement (Gatewood, 1971) on this typology becomes this:

Fast-and-accurate	Fast-but-inaccurate
Slow-and-accurate	Slow-but-inaccurate

The above typology may be a crossing of cognitive-style-as-preference and cognitive-style-as-ability. The preference aspect would be the tendency to respond quickly or after reflection; the ability aspect would be whether or not the response is accurate.

Similarly, it may be of interest to us to follow up on a refinement Witkin (1975) made of his own field dependent/independent style:

Highly verbal field independent	Highly verbal field dependent
Low verbal field independent	Low verbal field dependent

A typology that would seem of special interest to us in transfer skill acquisition is Schwartz' (1972) generalizing versus particularizing model (shown below). For some reason it is not reported elsewhere, but bears a relationship to the McKenny and Keen's (1974) preceptive versus receptive cognitive style. A person acquiring transfer skills would need to use a generalizing learning set in order to find meaning in the learning situation and thus be ready to use that meaning again later. A particularizing style might lock the person into learning for "here and now" content mastery.

Generalizing

Comes with a learning set that is already meaningful, which helps to find potential meaning in new instances.

Particularizing

Comes ready to engage in rote learning, to learn for this subject only.

We should note the thin boundary separating typologies such as Schwartz' from "educational cognitive style," to be considered next. Also at the boundary are the contributions of Jerome Bruner (1960, 1966), whose concern was with what people do as active learners. He focused on "hypothesis testing" as his point of departure, but thought of this activity as going on in everyday life, not only in educational endeavors. That is why his contributions are cognitive styles involving =10 and =8 (on pages 52-54). In both of Bruner's typologies, we can see a certain "splitting" and "lumping" tendency in one or another style.

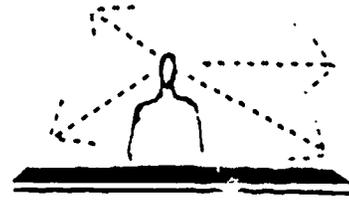
Conservative Focusing

Restricts the facts attended to.



Successive Scanning

Looks at a number of facts, but in some order.



Simultaneous Scanning

Uses great latitude in investigation.

Narrow Categorization

Restricts the amount of information that can be put in a classification.

Broad Categorization

Includes a great deal of information to put in a classification.

This last typology relates back to our earlier discussion of how test questions can reflect a built-in bias toward one or another cognitive style.

Educational Cognitive Style

Hill's Hierarchy

This name is given to only one type of cognitive style testing, a massive effort to integrate loose ends from earlier cognitive style and other educational and psychological references. Educator Joseph Hill, the originator, could probably have called his work "learning style" but he kept the popular term, adding "educational" to "cognitive style" to show that it had practical advantage in the academic setting. He incorporated everything into a large framework he called the "seven educational sciences," which he saw as a hierarchy (Hill, in preparation) in which each "science" presumed to build on the one(s) just below. Cognitive style, fifth on this list, was regarded by Hill as comprising the first four:

1. Symbols and their meanings
2. Cultural determinants
3. Modalities of inference
4. Educational memory (neurological, electrochemical, and biological aspects of memory functions)
5. **COGNITIVE STYLE**
6. Teaching, administrative, and counseling style
- ▼ 7. Systematic analytic decision making

Hill did not view this framework as being a complete picture of the Educational Cognitive Style; in fact, he left his style framework open to later developments, much like the early chemists, who allowed space for unknown but logically-predicted additions to the many empty boxes of the original Periodic Table of Elements. Toward the aim of "filling in," Hill encouraged scores of doctoral students to take up a research area using small samples and case studies. To encourage building up the overall framework from the many research areas, Hill also formed the American Educational Sciences Association (AESA). This group spread research results through a journal and also through conferences such as an annual career symposium, linking cognitive style to career choices or successful job traits. The AESA, its journal, and its conferences are the only examples known to this author wherein the tools of dissemination have been as closely allied with research. The base of inquiry is itself unique—an entire college (Oakland Community College—OCC—in suburban Detroit's Bloomfield Hills).

What Hill wanted to accomplish with his project was to provide students with an understanding of their personal cognitive style so that they could plan more effectively for their own learning venture. They would know their strong points and their gaps, with the emphasis on the former. No doubt Hill would agree with the idea that the "ultimate transfer skill" is knowledge of one's own cognitive style. He has pointed out how nonthreatening this sort of testing is, since everyone has some elements he or she emphasizes more than others—it is a question of finding out what those elements are.

Hill's main purpose was to match learner with learning environment, to make learning less problematic than it had been. Toward this end he planned that OCC would have five learning modes available in which each student could take each course: traditional lecture, individual programmed learning, audiotape, videotape, or group seminars with peer tutoring. Students would make their choices, after counseling sessions, on the basis of the match between their style maps and the learning mode.

The question arises: Is this not simply individualized learning? Hasn't this been attempted for some time elsewhere? Yes, of course. Hill saw mapping as an extension and integration of various approaches that need to be considered together in laying out learning strategies. Hill's adherents believe that using the mapping offers the greatest potential to bringing learners to the "90-90-90" learning mastery model; that is, 90 percent of the learners can learn 90 percent of the material 90 percent of the time. To do so would disprove the traditional, often anxiety-provoking, learning curve that has done little to bring learners to mastery, let alone prepare them for transfer.

Actually the optimum goal of five modes of presentation for *each* course has never been reached at OCC or anywhere else; but that was the ideal. It remains to be seen whether it will be attained. It also remains to be seen whether the Hill camp will move toward "augmentation," their term for developing elements on the cognitive style map that are weak or negligible. This possibility has been foreseen by Hill, but the main style of instruction, as mentioned, was to be matching by strengths. Augmentation would be a next logical step in use of educational cognitive style.

Meanwhile, counselors assisting students in the use of their maps have made various individual attempts at helping them to learn to "survive," which is a rather important skill in itself. For instance, given a student like Sam and an instructor like Dr. Jones (the visually-oriented student with the rote-lecture instructor; see p. 20), who are mismatched in terms of learning and teaching styles, a counselor, with no expectation that either Sam or Dr. Jones is going to change, might at least show Sam some optional strategies to use to get through the course. The counselor might suggest that Sam try to get Dr. Jones to meet some of Sam's needs for visual learning by writing major points on the board, as an example. Or Sam can attempt to meet some of his own visual needs by devising his own charts on which to place the major points of a lecture. Perhaps after Sam practices the skills of persuading the instructor to meet his needs, and trying a little accommodation toward "the way the teacher is," Sam would be a potential candidate for concerted attempts to "augment" his cognitive style map. He would not lose the elements he already possessed, but would gain strength in his less emphasized ones, or even learn new ones.

As Hill saw it, the best use of cognitive style maps would be to use them for diagnosis or review, just as doctors look over patients' x-rays as a guide for action. Doctors do not rely on test results alone, nor even on direct diagnosis, omitting tests altogether. They need both kinds of information to present a comprehensive picture of the condition, in order to make an accurate diagnosis and treatment plan.

Maps

A profile or "map" is drawn up for each individual. On this map are about 27 different variables, or elements. The number may vary, depending on the addition of new elements, which occurs through the enterprise of field workers accepting Hill's invitation to develop the framework. The map shows to which of three degrees the person puts a style element to use: *major use*, *minor use*, or *negligible use*. Since there are three degrees to which each of the 27 variables could be used, there are many different possible combinations of style maps.

Educational cognitive style maps may be constructed not only for an individual but also for a class or other learning group; for example, a work group (Covello, 1975). These "collective cognitive style maps" can describe the group as a whole in terms of general tendencies to use certain learning modes. They also serve as a basis for diagnosing the styles of any given individual in that group.

As we have seen, maps can serve as a basis on which to match a learner to a learning format. When we are talking about a whole class or other sort of group, collective maps can help us understand how a certain format will tend to be accepted by that group; or, if there was a lack of success, we can better understand where the difficulties are in terms of mismatch.

Although Hill emphasized that no one type of map was better than another, it has been found that the more "majors," or easily utilized styles, that a person has, the more chances for success in a learning task or under a learning format (Lange, 1972). To have many "majors" allows a person to switch-hit, to be more adaptable. In some cases, however, the map may show only a few majors, a fair amount of minors, and many negligible elements. This is true with many disadvantaged persons. What then? Chances for success in many learning environments are reduced but not entirely eliminated. It is then, as in every other case, a question of finding the few ways that would best enable the person to acquire and process that information. Here is one such example.

A math teacher had a student who was failing in his class. Both teacher and student were discouraged. One day the teacher passed the youth shooting baskets in the schoolyard. He noticed how the student "came alive" on the court, and how coordinated he was.

The teacher knew about Hill's cognitive style mapping and realized that the student clearly had a "major" in the element corresponding to use of coordinated motor activity. The teacher worked out a learning strategy for the youth based on bouncing the ball to represent various math principles. As the teacher explained to the student what he had in mind, the student perked up noticeably. He did in fact pass the course through using that path. And his sense of self-esteem was sharpened, which would help insure less fear in future learning.

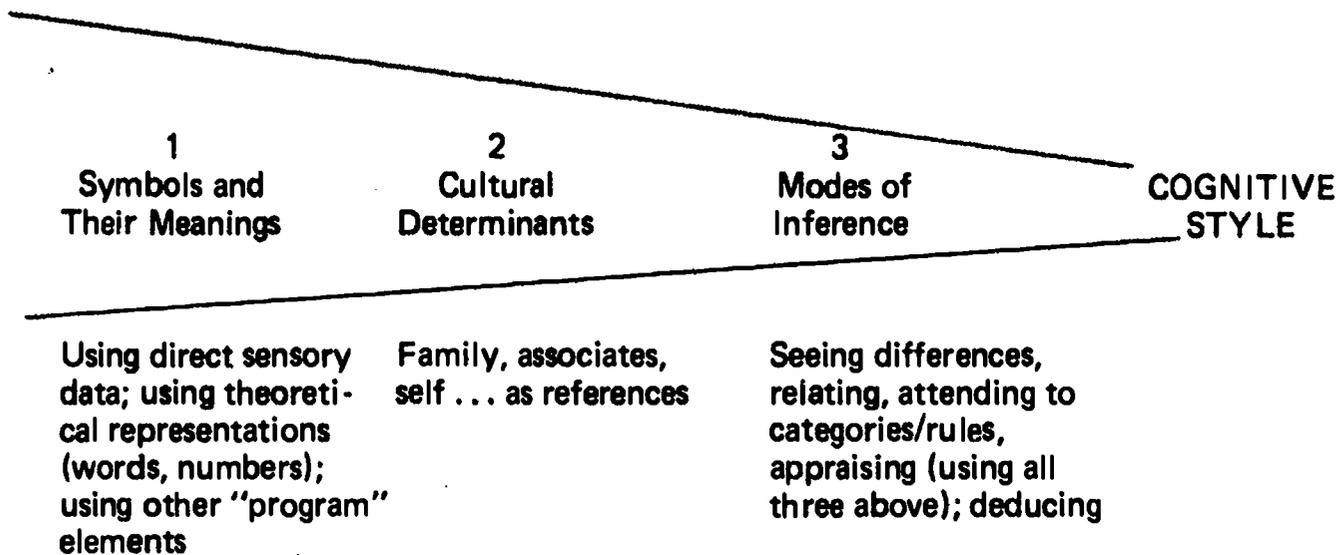
Those of us interested in transfer skill acquisition no doubt hope for another happy ending: that the student will be guided toward acquiring those style elements that will increase his flexibility, enabling him to need less special instruction, and to succeed in a world requiring use of several more elements than he now has.

Let us look more closely now at the way in which Hill thought of educational cognitive style.

The "Cartesian Set"

Drawing on the first four "educational sciences" in the hierarchy (page 59), Hill looked at cognitive style as a "Cartesian set" with three interacting subsets. In set theory, a whole is greater than the sum of its parts; everything interrelates to make something new that cannot be found by merely looking at each individual part.

A Hill cognitive style map placed all the elements under these three main headings. (The fourth item on the list, "educational memory," has not been developed to any extent, so it will not be treated here.)



We can see that Witkin's and Hagan's emphases on perception and information processing, respectively, are linked to Hill's first and third subsets, namely, "Symbols and Their Meanings," and "Modes of Inference." Hill's second subset, "Cultural Determinants," involves psychosocial concerns: determining which people act as a "filter" for new facts perceived through symbols before the actual information processing occurs. Let us look more closely at these three subsets of educational cognitive style.

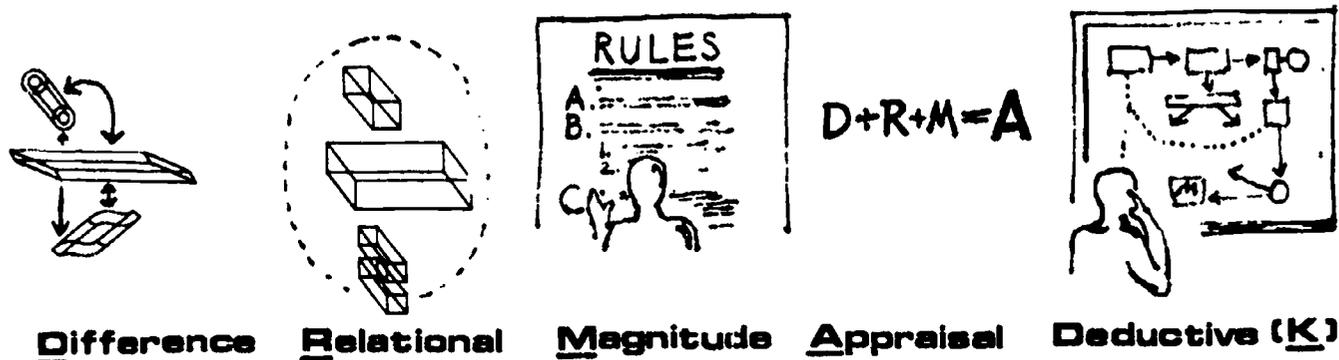
"Symbols and their meanings." A person takes in information—perceives it—through one of the five basic senses or a combination thereof. This information may be directly received through the senses (one sees a *flower* in the grass), or indirectly through "representational" symbols that stand for the real thing (one sees the *word "flower"* and reads about how it looks).



Cultural determinants. People filter their perceptions through the self or other people, who may be actually present or else acting as a social reference group ("What will Mary think?"). Some people get meaning, or learn, mostly on their own; we say they are "individualistic." Others turn to a peer group. Still others turn to their family or a family surrogate such as a teacher, trainer, or other authority.



Modes of inference. How do people process the information that has been filtered through the "Cultural determinants"? Some prefer to see how one thing differs from another. Some prefer to see how things relate and are alike. Some want categories and rules ("Do Step #1, then Step #2"). Other people mesh all three approaches into an "appraisal" mode, which usually takes longer to act on than any one of the above approaches alone. Still other people like to be given a general principle from which to deduce more information, as with a geometric proposition.



We can find the "splitting" and "lumping" categories in educational cognitive style also. They are in two single elements within "Modes of Inference." They are the "Relational" and "Magnitude" elements. Several practitioners using the Hill framework feel that these are the heart of the entire test (Berke, 1976; personal discussion with Orr, 1979). It would be interesting if, after such a complex matrix of elements is constructed, these pervasive two style elements are shown to discriminate best among all the various types of learners. This remains to be seen.

Instrument variations. Most work done in the Hill camp outside of Oakland Community College involves the Cognitive Style Interest Inventory. This is a self-report of what one usually does or believes, with three possible choices per question: "rarely," "sometimes," or "never." Questions, though many, are fairly simple to answer; for example: "When I go shopping, I read the price of each item and keep a running total in my head;" or, "Life is simple if you go by the rules." There can be confusion as to how to enter responses on the special scoring sheet. This is not an insurmountable problem, though. A modified version of the inventory can also be given to junior high level youth.

In the earlier days of OCC's educational cognitive style inventorying, a two-day battery of observational tests was used. Today, only part of it is still used there. These tests caused a spate of great interest outside the college, often coupled with amusement. For example, a direct measure of the degree to which people are "kinesthetic" (able to use motor skills) is to ask them to walk a straight line between two separated points.

Yet another variation of the Hill survey involves simplifying the reading level and using several senses at the same time, rather than only visual, for input. The Niagara Falls Adult Education Center, aware of the reading problems of their adult learners, devised a system in which the respondent sorts cards with the simplified questions into three piles: "most of the time," "some of the time," and "hardly ever;" the cards may have an audio component on tape that can be run through a Language Master machine so the person can hear as well as see the question. The action of physically sorting into three piles allows for more motor involvement.

Today, OCC uses a combination of the self-report, some commercial tests (Tinker Reading Survey, Raven Matrices, etc.), and direct observation. The results are usually scored by a computer, although it is possible to hand-score the self reports.

Methodology. Although himself a statistician, Hill earned some discredit among certain methodologists who could not accept his method* of using small cases, not large numbers, in a sample; in addition, Hill's method did not take the survey results at face value but allowed them to be "contaminated" with interpretation. Because results are not to be taken by themselves, then, the kind of validity associated with Hill's survey is "construct validity." Not everyone accepts this sort of validity as scientific. Furthermore, Hill pointed out that there will be systematic variations in the testing, such as a person's growth and practice in the survey situation. Taking such a process view meant that Hill considered reliability to be affected from one point in time to another when measuring the same individual's cognitive style; whereas reliability by definition tries to find a measure of unsystematic variation or prediction.

It is not surprising that the Hill Cognitive Style Interest Inventory (unpublished) has been taken to task for its lack of factor independence, or the way in which each sub-scale yields a separate measure (Sheriff, 1977). However, Hill would not have been surprised at this criticism. He had stated that style elements should not stand completely on their own, but must be viewed in terms of how they fit together to form a whole pattern. Hill probably anticipated such a finding when, after analysis of patterns, he pointed out that while it was theoretically possible to have some 47,520 maps, *actually* there could be "only 2,304 at most" because it is logically impossible for a person to emphasize certain style elements when certain others are also present! Furthermore, following the medical model (see footnote), Hill would not have been content to let survey results stand on their own without input from the respondent, preferably also from his or her teacher or counselor. It is noteworthy that respondents rarely disagree with survey results (according to a personal discussion with Mustachio and Orr); but if there *were* objection that "this really isn't me!", the person interpreting the survey would note this and make some adjustment in the scoring.

In this regard, we should note that the self-report sub-scale corresponding to "self-knowledge" is critical. It is important that respondents know themselves well enough to respond to questions about how they behave in various situations. Perhaps a real difficulty in using the survey would arise with persons who do not have self-knowledge to an appreciable degree. But this is true of any self-report test.

Other methodological criticisms of the Hill inventory revolve around scoring respondents by rank-order. Hill did not want people to pay much attention to the fact that one person may have scored in the 95th percentile in, let us say, tactile learning, whereas another scored "only in the 75th." Instead, Hill would simply describe both persons as having a "major" in tactile learning. While it would be interesting to devise a test that would discriminate more carefully among tactile learners, Hill sought only broad indicators of tendencies. As a result he used cutoff points between "major" and "minor" that some other researchers felt were too inclusive. Some researchers (e.g., Bass, 1972; Niles, 1974) raised these cutoff points to make what they considered more meaningful discriminations. The same concern for where to draw the line also comes up when measuring a "match" for two people. Some researchers use 50 percent as the cutoff (e.g., McAdam, 1971); others use 70 percent (e.g., Schroeder, 1970). Hill did not object to such changes since he encouraged others in the field to use his work to meet their needs.

Hill died in 1978, while president of the large-scale educational cognitive style laboratory that was Oakland Community College. His death caused shock waves in the school and the professional endeavors associated with it, followed by a period of major regrouping. A long-awaited book,

* Hill called his methodology the "medical model," in that it was based on small-sample research often used, of necessity, in medical research.

collecting much of the scattered work of Hill and his associates, is being published posthumously. This should make it easier to work with educational cognitive style and should give the movement more professional credence. It will be interesting to see whether the movement will continue with the vigor it once enjoyed despite the removal of the one person upon whom so much of it rested.

There are "pockets" of educational cognitive style endeavor that have, in fact, continued for several years. Notable among them is Mountain View Community College in Dallas, which not only uses style testing in its education and counseling but also has sponsored training sessions for those who want to learn how to do it themselves. On a smaller scale of application is Northern Virginia Community College at Woodbridge. Individuals spread out in various other schools, or even different types of work entirely, have used educational cognitive style. Typical users are doctoral students (whose topic was in this variety of cognitive style), who take the procedures to their workplace, apply them, and interest others in further application.

One of the more recent areas of interest in using a variation of educational cognitive style is in teaching style, which will be discussed in a later section. The next chapter turns to the study of learning style (in which there has also been some interest in developing teaching style).

IV. LEARNING STYLE

As we noted earlier, this term appears more recently but links many of the insights from earlier cognitive style research, while adding a number of insights we have not yet encountered. As in Hill's work, learning style research has tried to obtain specific indicators of how a person (or a group) learns in order that a prescriptive approach may be taken in specific learning contexts. A drawback to the self-report surveys commonly used to measure learning style lies in the fact that learner "interest" is not learning *style* when the subject does not in fact *do* what he or she reports having done.

The Research

Ramirez and Castañeda (1974)

We will begin with a team of researchers who, like Hill, fall at a midway point between "cognitive style" and "learning style." Ramirez and Castañeda used the earlier term, as well as the Witkin framework, and included some but not all of his testing procedures. However, their focus is clearly on developing *individualizing teaching strategies* in order to meet the needs of each learner.

The learners in the research were young (although such testing and interventions could probably be used successfully with older persons also). The interventions were an outgrowth of the researchers' concern that teachers learn how to switch between being field independent and field sensitive (read "field dependent," but with a more positive meaning). The research was aimed at the problems of Mexican-American children, who were constantly being penalized in Anglo schools, not only for cultural differences but also cognitive style differences (Mexican culture emphasizes field-sensitive qualities in contrast to the field-independent emphasis of Anglo culture). In school the children are faced with an individualistic and analytic approach that Anglo teachers reward, and the children cannot fail to note this.

Cultural Democracy, Bicognitive Development and Education (Ramirez & Castañeda, 1974) was written to document cases for teachers, especially those in multicultural contexts, and give them strategies to use with their young learners by interweaving features of both learning styles. In such learning settings, the children could be expected to become more intellectually versatile as well as more accepting of different ethnic groups. This double concern with affecting both intellectual and social change is unique in the field.

Ramirez and Castañeda propose that it is possible to intervene and affect one's style, that style is not indelibly set at an early age. Their survey procedure involves direct observation of the student and the teacher. Their simple-to-use item-checking instruments can be used to assess a person's overall style as well as to determine how he or she functions in various specific situations. The procedure is similar for both the student and the instructor versions of the instrument. An observer makes note of both field-sensitive and field-independent behaviors, not just the latter. This is done on a 1-5 rating scale. Here are examples from the Child Rating Form:

FIELD-SENSITIVE OBSERVABLE BEHAVIORS	FREQUENCY				
	NOT TRUE	SELDOM TRUE	SOMETIMES TRUE	OFTEN TRUE	ALMOST ALWAYS TRUE
RELATIONSHIP TO PEERS 1. Likes to work with others to achieve a common goal.					

FIELD-INDEPENDENT OBSERVABLE BEHAVIORS	FREQUENCY				
	NOT TRUE	SELDOM TRUE	SOMETIMES TRUE	OFTEN TRUE	ALMOST ALWAYS TRUE
RELATIONSHIP TO PEERS 1. Prefers to work independently.					

(Ramírez and Castañeda, 1974)

Information from the Child Rating Form is used by the teacher to make decisions about what style(s) to use with each learner. It is not a question here of merely matching style to style, but of getting the students to become bicognitive—an ability that the teacher should already possess, to some degree—before further work with the class. The teacher organizes groups of like-styled children and unlike-styled children at different times in the subsequent process.

The information can also be used by the teacher as feedback for needed personal change in the attempt to be truly bicognitive and not favor one style continually over the other. There were found to be some difficulties in applying this feedback, as it involved personal change on the teacher's part, but we will deal with this later in this monograph.

French (1975)

One of the simplest survey procedures is that developed by Russell French (1975). Once again, its intended users are primarily instructors interested in diagnosing students' learning styles (although it could probably be adapted for older learners to use for themselves). The instructor looks over a brief description of selected learner behaviors on two lists, then checks off the appropriate category on a behavior matrix, indicating that this behavior has been observed in this learner. The instructor then reviews a set of suggested learning prescriptions to use with the corresponding learning style. The two lists and their corresponding matrix are shown in Figure 7.

From the matrix entries for each learner, the instructor can refer to the specific style and choice of learning materials or settings that French recommends to meet this learner's particular needs (Kolb, 1977, p. 7). These are illustrated in Figure 8.

1. Sensory Intake (Perception)	Characteristic
Print-oriented	Dependence on reading and writing
Aural	A listener; doesn't say much
Oral (interactive)	A talker; learns through discussion
Visual	Must have many visual stimuli and visual representations
Tactile	Has to touch everything and everyone
Motor	Has to move about while learning anything
Olfactory	Learns through taste and smell

	Sequential	Logical	Intuitive	Spontaneous	Open
PRINT-ORIENTED					
AURAL					
ORAL (Interactive)					
VISUAL					
TACTILE					
MOTOR					
OLFACTORY					

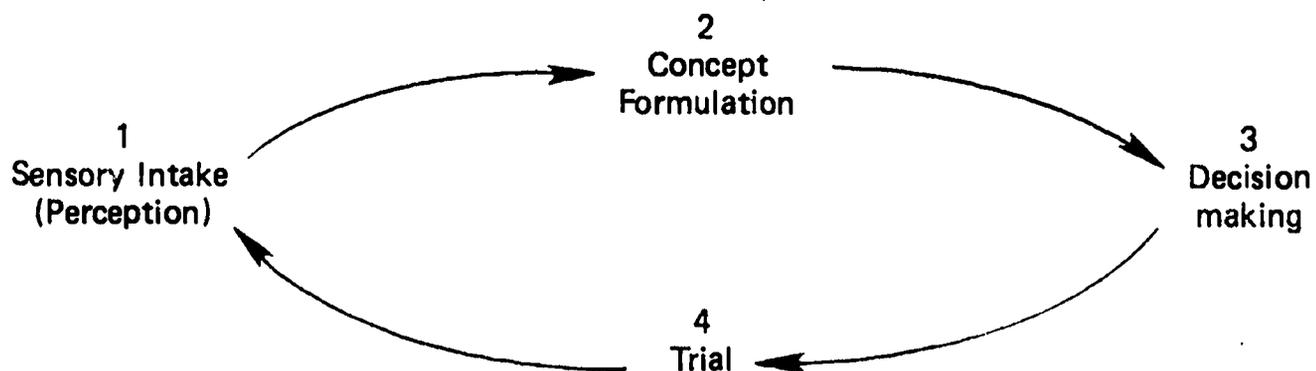
2. Concept Formation	
Sequential	Must perceive orderly relationships (B follows A)
Logical	Uses processes of reasoning to reach conclusions
Intuitive	Perceives truths and facts directly without benefit of extensive reasoning
Spontaneous	Relies on impulse
Open	Uses combinations of the above or different ones of the above at different times

FIGURE 7. French's (1975) learner behaviors lists and corresponding behavior matrix.

STYLE	MOST APPROPRIATE TECHNIQUE
<i>Print-Oriented</i>	Reading, writing about, book-based discussion
<i>Aural</i>	Lecture, listen to panel discussion, sound film, television, audiotape
<i>Oral (Interactive)</i>	Socratic discussion, panel discussion colloquy, dramatization, dialogue, interview, debate, T-group, role play, student verbal presentation, games, student demonstration
<i>Visual</i>	Slides, motion picture, filmstrips, television, still pictures, observer of dramatization, non-verbal exercises, demonstration, trips, exhibits
<i>Motor</i>	Role play, games, action mazes, non-verbal exercises, student demonstration, learning centers
<i>Olfactory</i>	Trips, exhibits, addition of taste and smell experiences to daily activity

FIGURE 8. French's (1975) learner style/teaching technique matches.

French couches his concerns in a model of learning that perceives learning as a four-step sequence. French credits Woodruff (1967) with having originated the model of learning that underlies his own work in learning style here. It is the first two steps that French is concerned with, or rather, that he asks the teacher to work with. Perhaps the idea is that having suggested ways to match the learner and the learning techniques, the learner will be able to make educational or other decisions better, as well as to try out the results of those decisions. We may be reminded of the taxonomies of Bloom and Giammatteo in looking at this model, although this model appears to be more of a continuing loop.



French (1975) constructed yet another learning style inventory describing personality type and learning preferences. These types are probably representative of a simple classification that insightful instructors might arrive at on their own as they mull over the various types of students they encounter.

Abstract
Concrete

Individual
Interpersonal

Student-centered
Teacher-centered

Canfield and Lafferty (1976)

The Canfield and Lafferty Learning Style Inventory (LSI) is geared for both younger and older adults. It is simple and direct, measuring students' self-reported and ranked preferences for estimates of:

- a. *Academic conditions* — affiliation with peers and instructor
- b. *Structural conditions* — overall organization and detail
- c. *Achievement conditions* — goal setting, independence, competition, and authority
- d. *Content* — numbers, words, inanimate things, and people
- e. *Mode of preferred learning* — listening, reading, iconic (using pictures, graphs, slides, etc.), and direct experience
- f. *Expectation of performance level* — superior through unsatisfactory

Canfield, who was familiar with Hill's work, wished to survey more attitudinal and affective dimensions. A typical question from this inventory is:

"Rank the following in the order in which you would typically like to learn about the properties of a new plastic.

- a. Hearing a lecture
- b. Reading a booklet or text
- c. Viewing a movie or slides
- d. Experimenting with a small sample"

Canfield wished to make the test scoring as simple as possible so that it might be done quickly by hand. After the inventory is complete, raw scores are placed on a profile sheet for reference. A drawback with the ease of the scoring on the LSI is that the four types of choices to be ranked for each of the 30 questions are always found in the same order, which could possibly bring about response bias. Also, the Learning Styles Inventory has been well validated, but only one small-scale study seems to have been done on its reliability (personal discussion with Payton, 1979).

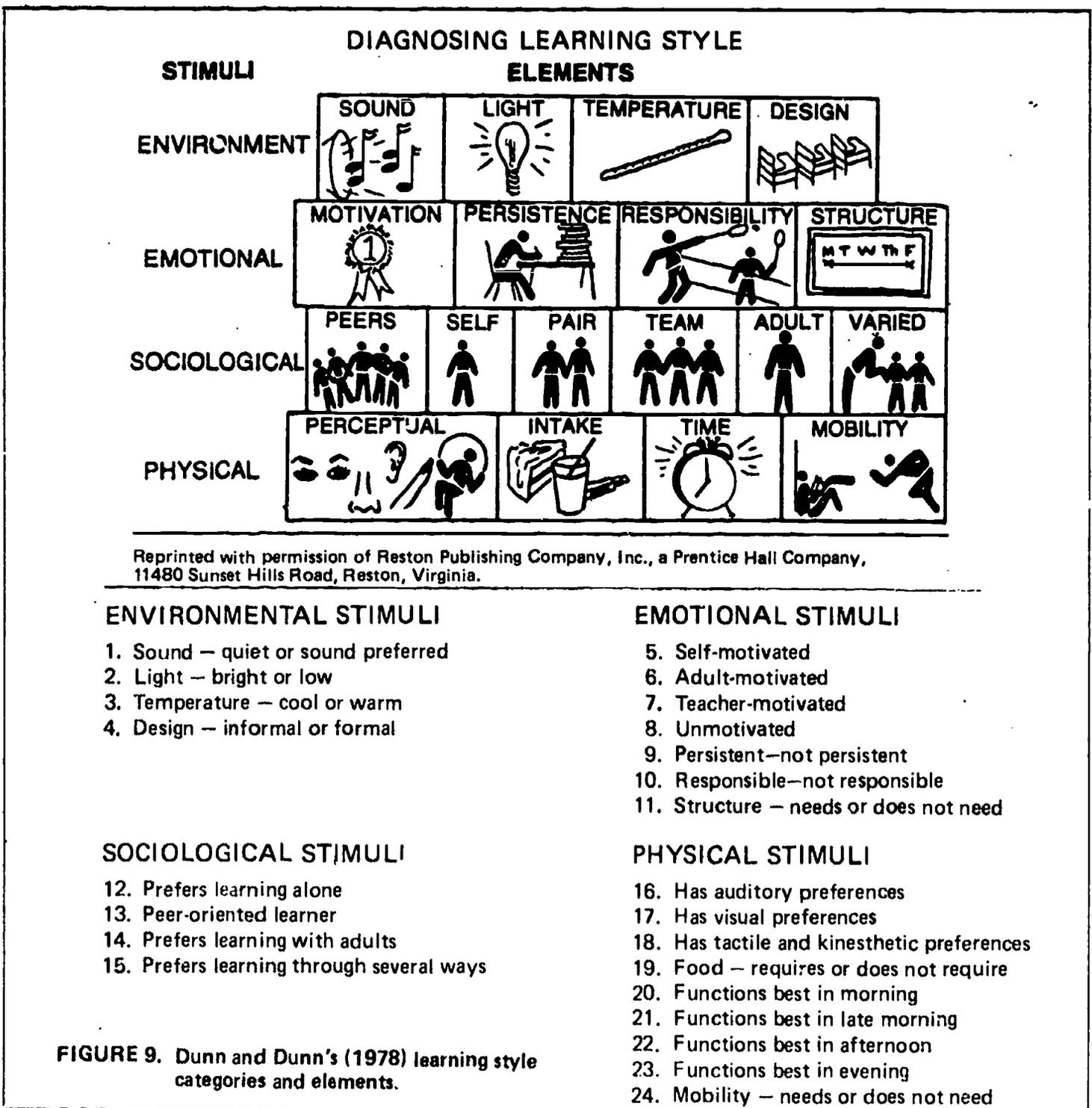
In a large project to develop self-instructional materials for dental auxiliary education, Shuntich and Kirkhorn (1979) found that the LSI could serve as a guide to setting up basic procedures for implementation and learning activities (as well as evaluation) for a whole class or for individual students. Both the students and the instructors could use the survey results to understand difficulties in carrying out the learning units and in counseling. Low performance expectancy rates were found to be one key area for information on the LSI: Preconceived notions of failure had to be countered for a number of students. Such a usage of the LSI shows the possibilities of learning style inventories in the design and development of materials.

Dunn and Dunn (1978)

The Dunns share with Ramirez and Castañeda a special concern to assist teachers in learning about options in teaching through individual or group learning styles. They have similarly published a "how-to" book, *Teaching Students through Their Individual Learning Styles: A Practical Approach* (1978), replete with detailed options for the many different learning styles yielded by their own learning style inventory. While these are primarily for younger learners, they could be translated to training environments in many instances. Especially helpful are sample case studies permitting instructors to test their developing ability to diagnose and prescribe for individuals of various styles. Available separately is a highly colorful packet that includes the survey and capsule versions of the book's main offerings.

This team of researchers takes the approach of informing students as well as instructors of the range of learning differences so they can take advantage of options in individualized instruction. It is a very complete "school of learning style" in its concern for building up a body of research primarily on younger learners (up to grade 12 reading and interest level), and it is now branching out into the adult world with another inventory (to be discussed momentarily). Price, Dunn, and Dunn (1977) have established impressive reliability and face and construct validity.

In its most recent version, Dunn et al.'s Learning Style Inventory touches on 24 elements divided into four main categories: environmental, emotional, sociological, and physical. These are illustrated in Figure 9, below. There are 100 simple questions answered as "true" or "false" on a score sheet to be submitted to a computer, which in turn yields a profile. Some typical questions: "I can block out sound when I work"; "I often get tired of doing things and want to start something new."



Dunn et al.'s commercial LSI packet allows the user to gain several additional pieces of information out of the survey data:

The class summary, a style map that lists each student beside each of the sub-scales or learning style elements, with an "x" placed within each element the learner uses. This is a more complete collective version of individual tests than the Hill type, which lists only significantly present "major" or "minor" elements.

A *consistency score* that can be drawn up for each learner as a check on whether the test subject read and answered the question carefully. This score comes from a sub-score on several questions that are repeated throughout the test.

For adults Price, Dunn, and Dunn have devised the Productive Style Inventory (PSI), so called in an attempt to appeal to business and industry, the anticipated users of this inventory. Although the 100-item PSI is present in the process of statistical analysis, Price (in a personal discussion, 1979) reports that the reliability and validity appear to be even better for this survey than for the version aimed at younger learners. Like the LSI, the PSI generates a computer printout profile.

The decision has been made to add three of the earlier cognitive style variables to the PSI: field independence/dependence; analytical/global; and reflective/impulsive. This is a highly interesting step, as it would incorporate some of the earlier work in cognitive style with one of the more recent learning style approaches. It also shows concern that even all the added dimensions that Price, Dunn, and Dunn isolated may not tell the complete story of how learners learn, so that the best profile may result from a combination of more basic cognitive style dimensions plus a combination of more "practical" but peripheral factors.

LSI findings. The following findings, based on Dunn et al.'s Learning Style Inventory, are of interest even though they are based on inventories of children up through grade 12; they may be true for adults as well, or may serve as researchable areas for training and instruction:

Both males and females became less tactile, less interested in learning with adults, and less interested in working in the morning, as the grade level advances. This may mean a developmental change, at least in the case of being touch-oriented, or else it may mean accommodation to the way courses are taught, which is more abstract and less dependent on direct contact with the teacher.

Those with a lower self-concept needed more mobility and wanted noise and adults around them. "In general, a dimension related to being unsettled, perhaps not wanting to be alone, and learning through the auditory senses seemed to characterize individuals who had a low self-concept;" whereas, "Individuals who had a high self-concept were persistent, able to stay in one place, and liked to learn in several ways" (Price, Dunn, & Dunn, 1977, p. 17).

Those who had a high reading achievement "preferred low light, formal design, were self-motivated, not adult-motivated (unmotivated was a suppresser [sic] variable), persistent, responsible, did not prefer to use tactile and kinesthetic senses, did not prefer food intake, did not function best in late morning, and needed mobility" (Ibid, p. 19). By contrast, those who were at a low reading achievement level preferred bright light, an informal design, were not self-motivated, were adult-motivated, unmotivated, not persistent, not responsible, preferred to learn using tactile and kinesthetic senses, preferred food intake, functioned best in later morning, and did not need mobility" (Ibid.).

Those with high math achievement "preferred a formal design when studying, were not adult-motivated, were persistent, were responsible, were not peer-oriented learners, did not require food when studying, did not function best in late morning, and needed mobility" (Ibid.). They are contrasted with persons of low math achievement, who "preferred an informal design when studying, were adult-motivated, were not persistent, were not responsible, preferred to study with peers, required food when studying, functioned best in late morning, and did not need mobility" (Ibid., p. 20).

Kolb (1977)

Another commercially available survey, one that is definitely adult-oriented despite its very simple format, is David Kolb's Learning Style Inventory (1977). His work is unique not only in its intricate theoretical approach (mostly Jungian), but also in the fact that it has "sold" heavily to business, management, and training concerns.

Kolb's LSI is marketed as one of a battery of surveys called the "Comprehensive Cognitive Assessment Battery." Although there are three other surveys in this series, the LSI may be used alone. What it measures is how people learn from life experience—in a word, how they *adapt*. Dimensions measured in the other three surveys are (a) how people organize and present complex information thematically and logically; (b) how much they understand the various sides of a complex issue; and (c) how they take a proactive, or dynamic, approach to problems.

Kolb's survey procedure involves having the respondent look at nine sets of four words, each word in turn representing one of four learning modes. A typical set is this:

_____ *Feeling* _____ *Watching* _____ *Thinking* _____ *Doing*

The respondent rank-orders each word. It is an extremely brief instrument to use. A major drawback is that the words to be rank-ordered are in many cases abstract, all the more so because they appear alone, out of a context. It may be difficult for many respondents to grasp the abstractions well enough to make meaningful choices. Persons applying the Kolb inventory in training contexts have sometimes expressed a need for a more concretely worded instrument.*

It is important to distinguish between two terms Kolb uses that sound very much alike: learning *modes* and learning *styles*. Learning modes are rather like primary colors, which in various combinations yield learning styles. Styles are the real focus of the instrument. Kolb's basic learning modes are:

1. *Concrete Experience (cf. Feeling)*
2. *Reflective Observation (cf. Watching)*
3. *Abstract Conceptualization (cf. Thinking)*
4. *Active Experimentation (cf. Doing).*

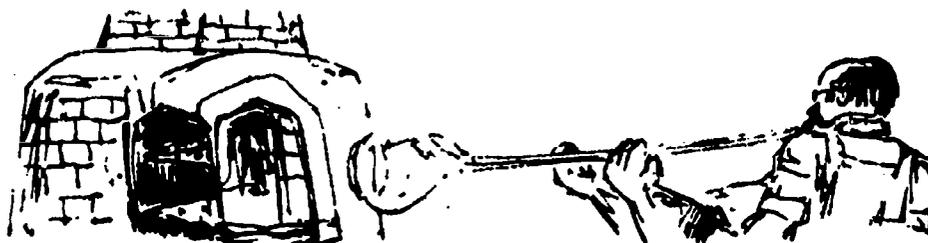
Taken in order, these four modes are actually a learning sequence. Kolb found this sequential model in the social psychology of Kurt Lewin. The model (like the Woodruff model used by French) is dialectical, and is an adaptive process in that a person constantly has to make choices among the

* As we shall see shortly, Hagberg and Leider claim to have done that. In the meanwhile, Kolb himself is working on an Adaptive Style Inventory that should be less abstract and of greater interest to the work world.

four learning modes. As a result of doing so, abilities and life orientations develop. Kolb proposes two sets of dimensions, within which one or another polar extreme must be chosen:

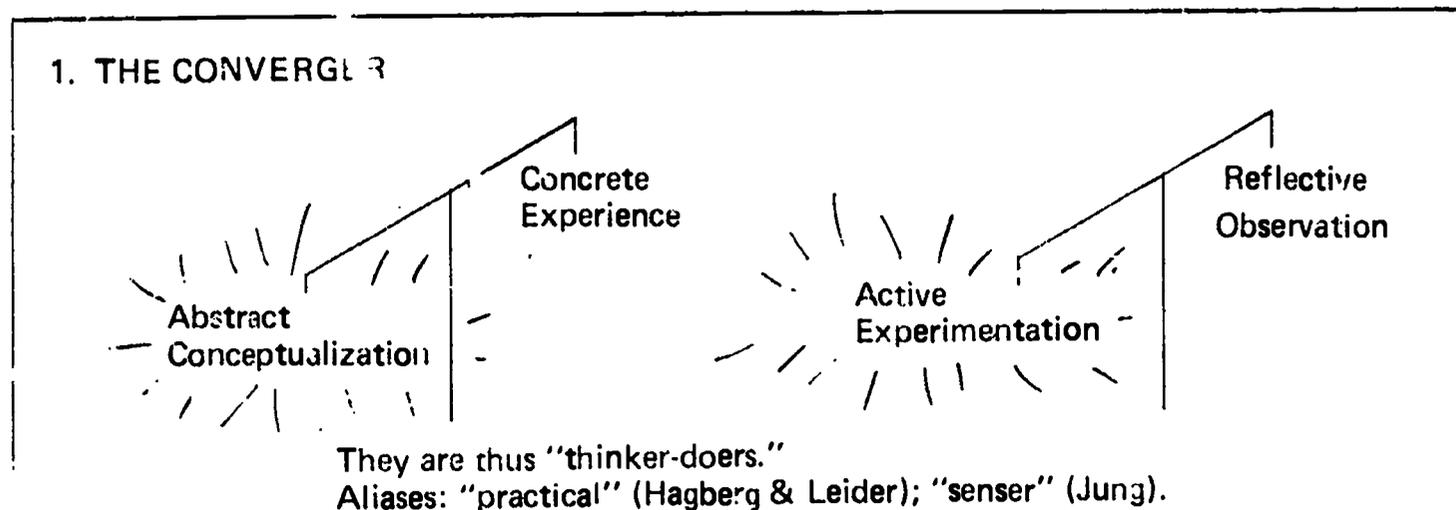
1	2
CONCRETE—ABSTRACT Concrete Experience (Feeling) or Abstract Conceptualization (Thinking)	ACTIVE—REFLECTIVE Active Experimentation (Doing) or Reflective Observation (Watching)

We see the linkage of these sets of styles with earlier work in cognitive style as well as certain learning styles already reviewed (e.g., "splitting" and "lumping" falling in the first set, Concrete-Abstract). However, Kolb is probably most concerned with the process aspect—the dialectic—involved in learning style, as he depicts the way that people gain their basic style through trying to resolve conflicts in family, school, or job. These conflicts do not have to be major or critical, as long as they involve decisions regarding whether to be more involved in immediate concrete experience or abstract analysis, on the one hand, or to experiment actively or observe reflectively, on the other. Under the pressure and habit of such decision making (comparable to the refining fire of a glassblower), the mind emerges from the resolution process shaped in one of four general patterns, or learning styles.



Kolb notes the strengths and weaknesses (again, the dialectical tension) in learning style. What causes strengths? —The fact that having this patterned style provides a tested path of action. What causes weaknesses? —The fact that one may fail to see the opposite pattern (i.e., fail to switch-hit) when such versatility may be vital to success.

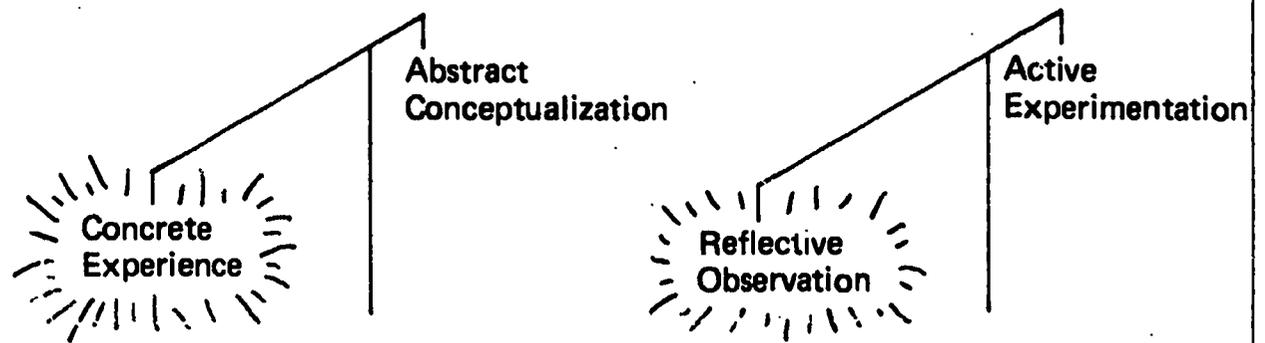
Kolb's learning styles. Kolb's learning styles, like his learning modes, are four in number. The illustrations below show the way the learner has made choices in favor of one mode in each of the sets of polar opposites, and how the learning style involves the joining of two favored choices.



Convergers seem to do best in situations like conventional intelligence tests, where there is just one right answer or just one solution to a problem. They can focus on specific problems through hypothetical-deductive reasoning.

Convergers are rather unemotional, and prefer to deal with things rather than people. They tend to have narrow interests. Their specialization is often in the physical sciences; engineering is a popular vocational choice among Convergers.

2. THE DIVERGER



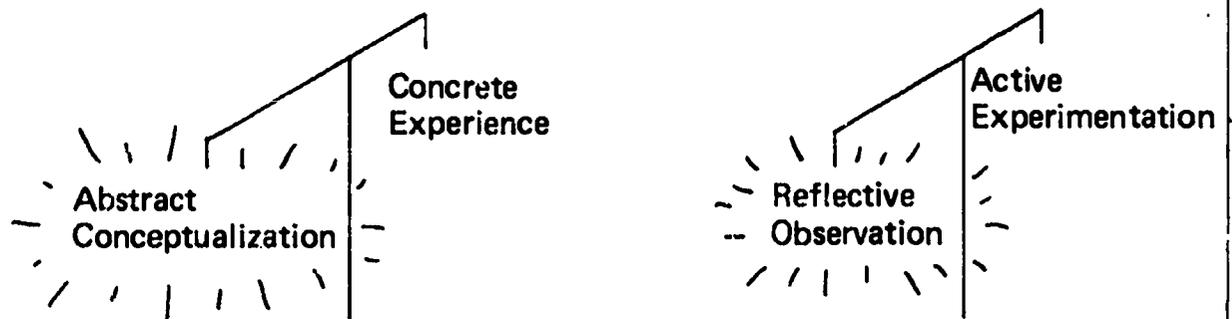
They are thus "feeler-watchers."

Aliases: "imaginative" (Hagberg & Leider); "feeler" (Jung).

These people are exact opposites of Convergers. They look at everything from many perspectives and organize them into a meaningful "gestalt." They are imaginative and often excel as "brainstormers." They are artistically inclined, having broad cultural interests, and often specialize in the arts.

Divergers tend to be emotional, and they like working with ideas in areas such as the humanities and liberal arts, or possibly counseling, organization development consulting, or personnel.

3. THE ASSIMILATOR



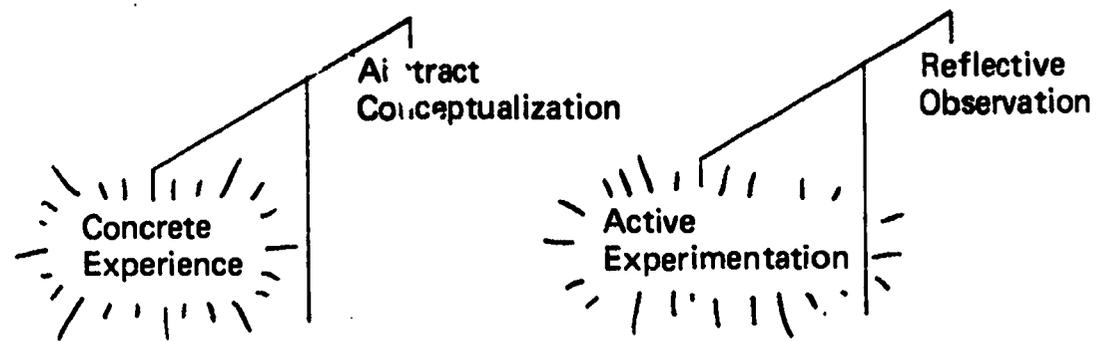
They are thus "thinker-watchers."

Aliases: "logical" (Hagberg & Leider); "logical thinker" (Jung).

Assimilators are best at taking in data and devising theoretical models. They are also very good at inductive reasoning, and in bringing together different observations into an integrated explanation.

They differ from Convergers in being less concerned with the practical use of theories. Otherwise, both styles tend to be abstract and less people-oriented than the others.

4. THE ACCOMMODATOR



They are thus "feeler-doers."

Aliases: "enthusiastic" (Hagberg & Leider); "intuiter" (Jung).

Accommodators are so called because they do well in situations where they must accommodate themselves to the circumstances. If their theories or plans don't fit the facts, they will probably discard them and seek a different approach (just the reverse from the Assimilator). They take more risks than the other three learning-style types as they capitalize on their greatest asset: carrying out plans and experiments, getting involved in new experiences, and solving problems on a trial-and-error basis.

In this active experiencing, accommodators tend to rely on other people for information to a great extent, rather than on their own analytic ability. Accommodators like people and are at ease with them, but can sometimes seem impatient and demanding. It is not surprising to find them in technical or practical fields such as business—more specifically, in action-oriented jobs such as marketing or sales.

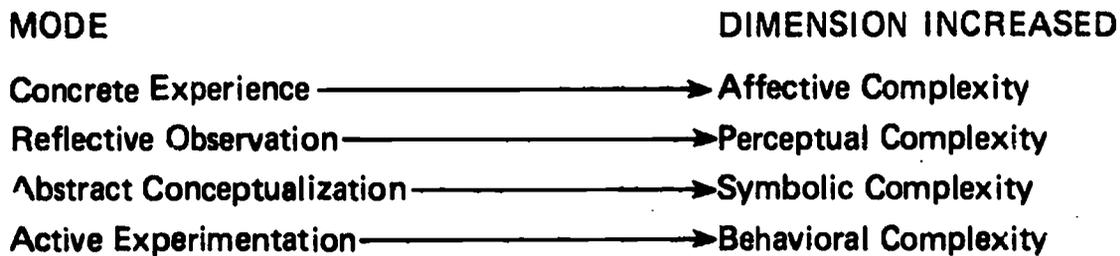
Kolb now has an Adaptive Style Inventory (in preparation), with the same theoretical underpinning, but a larger set of items and a more independent measure of the four modes. This survey will allow the researchers to find a person's use of different modes in different situations. It is being analyzed statistically as of the writing of this monograph.

Life stages and learning styles. Though Kolb does not tie his process directly to developmental psychology, there clearly is some overlap; for example, let us take the way Kolb divides the broad human growth process:

- Acquisition*—(from birth to adolescence). The child acquires basic learning abilities and cognitive structures as the dialectic of adaptation begins.
2. *Specialization*—(through formal education and/or career training, and early experience of adulthood in work and personal life, ending about mid-career). The person follows paths that accentuate a particular learning style. Kolb chooses the word "paths" very intentionally: "Individuals shaped by social, educational, and organizational forces develop increased competence in a specialized mode of adaptation that enables them to master the particular life tasks they encounter in their chosen career (in the broadest sense of that word) path" (Kolb, 1977, p. 7).
3. *Integration*—(in later years, as a quest for "missing parts"). There is a completion of the person in the completion of the dialectic: "[Re] assertion and expression of the nondominant adaptive modes or learning styles. Means of adapting to the world that have been suppressed

and lay fallow in favor of the development of the more highly regarded dominant learning style now find expression in the form of new career interests, changes in life styles and/or innovation and creativity in one's chosen career" (Hagberg & Leider, 1978, p. 26).

In developing through these three life stages, people take on increasing complexity and relativism vis-à-vis the world and life experiences. They move toward ever-higher levels of integration of the dialectical conflicts between the basic learning modes. Each mode in turn stimulates major dimension of personal growth:



Younger people can progress more easily along one of these four dimensions separately from the other dimensions. In other words, they can specialize more easily. Example: a youth who becomes highly symbolic and abstract, but remains undeveloped emotionally, such as a Whiz Kid on a TV game show who has few friends. Such independence among learning modes does not continue, Kolb believes, as a person gets older and graduates to higher degrees of development. He reasons that this is due to a strong need to integrate all four modes, so that any development in one mode increasingly brings on development in the other modes. Creativity and growth are marked by integration of conflicts in this development.

Kolb sums up his ideas in a rather complex diagram, shown in Figure 10. Time, represented by the three life stages in sequence, is shown on the vertical axis. Thus, one would start at the bottom of the diagram and read upwards.

The small figures in Figure 10 represent one person in the process of developing, stage by stage. The person starts off, just for illustration, in Concrete Experience.

Let us start off, then, at the "CE" point that you will find at the back of, and at the bottom of, the cone. We will call our example Celia. As Celia continues onward and upward in her life, she develops in "Affective Complexity." That is, she is a very *feeling* type of person, encouraged to be so by loving family and friends. As a young adolescent, Celia develops a love of poetry. In so doing, she moves over toward "Perceptual Complexity" as she learns to look at the world through the eyes of others. Now, a little higher up on the cone, she is reaching out toward "Perceptual Complexity" as she begins to enter the artistic world of poetry and, by extension, art and music. She is between "Affective Complexity" and "Perceptual Complexity." Below that point on the diagram she is poised above "Divergence." It is as though the act of reaching from one line to the other ("Affective" to "Perceptual Complexity") facilitates Celia in moving into the "Divergence" space. This has happened through her resolving opposed learning modes. She is truly, as the caption to the right of the diagram puts it, "self as content—interaction with the world."

Celia goes on to major in English in college. During her early and mid-adult years, she does much writing. In time, having raised a family, she begins to want more education in order to feel more "fulfilled," and so takes a course in real estate. Soon she is happily selling houses. This is a challenge to her because she never did anything quite so active. Celia has thus moved over around the cone—still moving onward and upward—to the line of "Behavioral Complexity," and is now

poised over the learning style of "Accommodation." She adds this style to her repertoire, while not losing the "Divergence" she already had. In this way she is becoming more integrated. It is entirely possible that by the end of her life, she will have gained the other two learning styles as well.

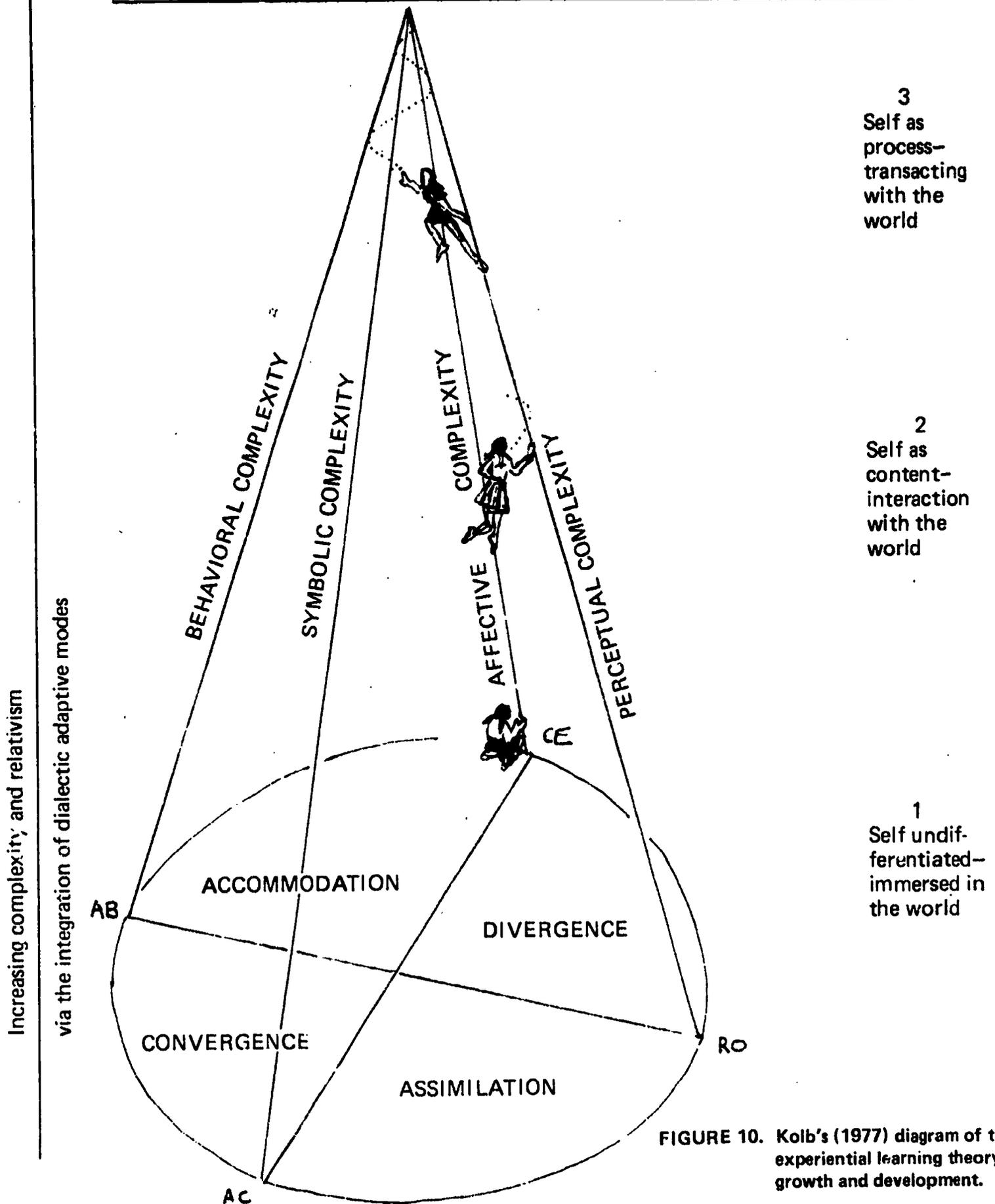


FIGURE 10. Kolb's (1977) diagram of the experiential learning theory of growth and development.

Kolb's Learning Styles Inventory can, of course, be used to assess development like Celia's at different periods of life. This sort of assessment is presently being made in several pieces of research that Kolb and his colleague, Donald Wolfe, are working on as of this writing (personal discussion with Donald Wolfe, 1979). One such study focuses on how engineers and social workers learn at different stages in their careers: in formal school settings, through other people, or through themselves. The different informational contexts are being researched to see how they did or did not match the person's learning style, and how they helped or inhibited the learning of needed skills.

Another study, using a different model, deals with mid-life transition. This study is concerned with the ways that having a great deal of structuring in the early adult life period correlates with ease or difficulty in making a transition later to other learning styles (career paths?). Wolfe notes at least one hypothesis being confirmed by early research results so far, i.e., that people may shift from "outer" to "inner" directedness (field dependence to independence, as Witkin and others believe to occur). Another hypothesis is that there are sex differentials in the mid-life transition; namely, that men become more reflective and women become more active. It could be, Wolfe suggests, that men were into active and abstract specializations earlier, whereas women emphasized concrete and reflective, or emotional, specializations earlier; and that each changes in the attempt to integrate other, less used learning modes in later life.

Hagberg and Leider (1978)

Paralleling Kolb's work very closely—in fact, specifically designed to make it more usable in the training world—is Hagberg and Leider's work in "excursion styles." Their instrument mirrors that of Kolb's in that it asks respondents to choose among sets of words that they believe describe them best. However, the format involves only polar extremes of each variable, with four blanks lying in between each pole. Respondents are forced to make a choice of only one position per set of opposite words. A typical example of one of the 28 sub-scales is this:

	A	B	C	D	
Finding solutions	_____	_____	_____	_____	Identifying problems

For Kolb's "learning modes," Hagberg and Leider substitute the words "learning abilities"—feeling, observing, thinking, and acting. In turn, these learning abilities represent the following:

1. *Feeling*: Some of us choose and digest learning information primarily because it feels good (we "just know" it when we feel it). We use our emotions or feelings to guide us in deciding what to do in situations and how to proceed. We may use more body movement and speech to learn and communicate. We like having real experiences to get involved in.
2. *Observing*: Others of us use our imaginations to observe and digest new material or ideas, seeing them in new ways or drawing mind pictures. We would rather think through ideas using visuals and analogies or write about ideas off the tops of our heads. We react to the ideas of others.
3. *Thinking*: Still others of us primarily scrutinize or analyze information, pulling it apart and putting it back together logically. We design models and symbols, taking as much information into account as possible.

4. **Acting:** Some of us see information primarily as part of action, to help solve a problem. We use words and acts to promote a project or a solution. We like to learn while it's happening. We make things happen.

Hagberg and Leider point out that people's moods and life stages affect the way they answer, but that usually they are fairly consistent.

Drawing on Kolb's dialectical approach, Hagberg and Leider popularize it in presenting the assets and liabilities of each of the four styles, showing "problems in change—what will hold you up" (liabilities) and the "best use of style in learning and change" (assets). This outline (Hagberg & Leider, 1978, p. 26) is shown in Figure 11.

<i>Problems in Change</i> What Will Hold You Up		<i>Best Use of Style in Learning and Change</i>	
Enthusiastic	No organization or goal setting; impulsive; so involved, they become splintered; loose ends are not always taken care of; becomes unbelievable to other people; changes jobs too quickly	Enthusiastic	Gets others involved; operates on intuition, "gut" reactions; takes risks with new experiences; very active when motivated; will talk to other people and get inspiration in process; may try several options
Imaginative	Afraid to change relationships; creates conflict or hurts people, so stays same; no change results with all the efforts, just good ideas; security with status quo; won't be pushed; waits too long for inspiration	Imaginative	Will generate lots of options for change; observes how others have made the change; uses creative hunches, plays with ideas; fantasizes, can see images; lets ideas integrate or come together before changing; can wait for the best timing
Logical	Needs too much evidence before acting; too cautious, slow, methodological; doesn't get involved with people; too bogged down in theory; wants too many guarantees; takes risks very slowly	Logical	Gathers relevant facts, logical order; very organized, feels more secure in change; reads books, looks at several approaches, double checks; uses resources well—libraries, information-search programs; analyzes options, calculates probabilities; can map out on paper before jumping in; works well alone
Practical	Doesn't use caution in action; task overrides people; hard to wait for anything, impatient; needs to control and do it alone; doesn't listen enough to others	Practical	Sees change as problem to be solved; uses detective skills to get facts; evaluates options; sets up trial situations; sets goals and acts; not bogged down; works well independently

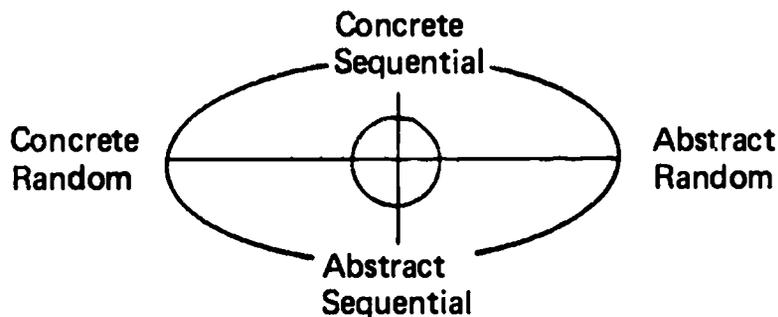
FIGURE 11. Hagberg and Leider's table of assets and liabilities for each of the four learning styles.

(Hagberg & Leider, *The Inventurers: Excursions in Life and Career Renewal*. Copyright 1978, Addison-Wesley Publishing Co., Inc., p. 131. Reprinted with permission.)

Other Styles

As in the case of cognitive styles, there are a number of investigators of learning styles who are not included for lengthy discussion in this monograph. Notable among these are Fischer and Fischer (1979), Reichmann and Grasha (1974), McCarthy (personal discussion), Gregorc (1977), and McKenney and Keen (1974). The latter three share much in common with Kolb and therefore, Hagberg and Leider, and (underlying it all) Jung. McCarthy's "4-Mat System" (Excel, Fox Grove River, Illinois) comes up with a feeler-senser-thinker-intuiter categorization that is based on the relevant findings in neuropsychology as regards masculinity and femininity. This instrumentation stems from many years of teaching in a high school that later implemented the system, using as the survey technique a forced-choice questionnaire. The high school was able to guide students into one of four "schools within a school," based on curriculum and instructional methods (which the survey indicated), and found that those students who followed the indications of the survey did significantly better than those who did not.

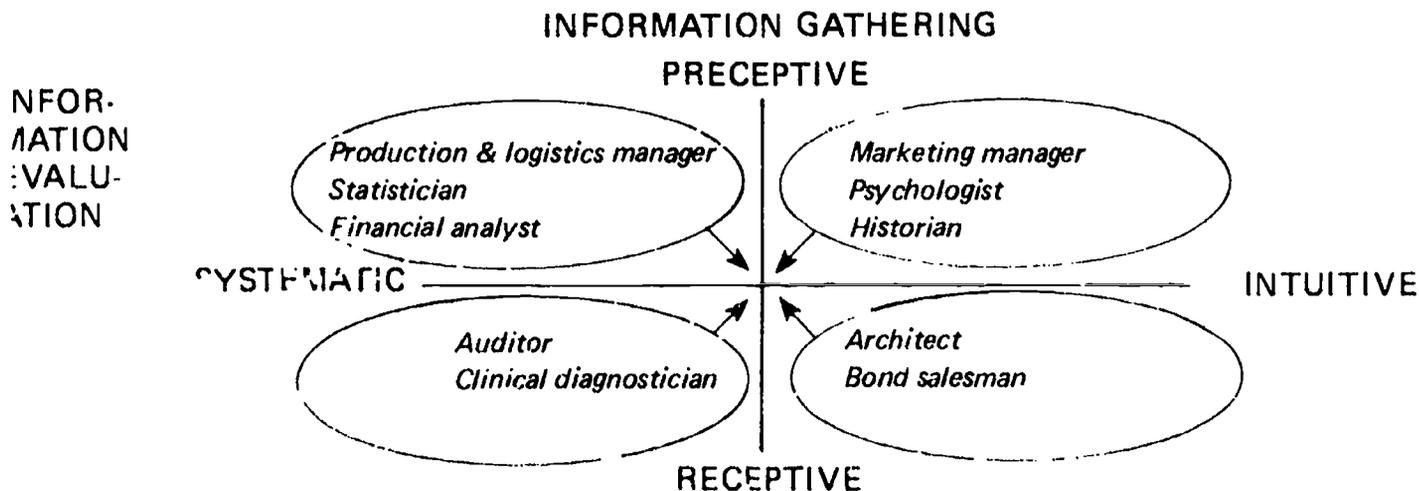
Gregorc (1977) shares with Kolb an "abstract-concrete" dimension, but Gregorc is concerned with whether the learner uses a random or a sequential information intake. His model looks like this:



McKenney and Keen have a typology that once again is four-quelled and ties in with similar concerns. However, they call their work an investigation of cognitive, not learning, style. Ewing (1977) calls their work "problem-solving style," as that is what it deals with in the managerial world.

McKenney and Keen emphasize that decision-making is situational, and for this reason it includes problem-finding, -recognition, and -definition. These factors are often overlooked; and yet managers scan their environment and organize the things they perceive, showing that they have some leeway as to just which problems they choose to deal with, and how much effort and risk they will put into solving them.

This team of researchers is concerned with the degrees of fit between an individual's type of cognition and the work that he or she does, because certain modes seem better adapted to use in some contexts than others. Some of these job types are shown on their basic model itself below:



Although they are concerned about the fit between jobs and types of problem-solvers and decision-makers, McKenney and Keen take pains to show that managers can use other than the systematic style, which has been the commonly respectable style in management (as noted in the emphasis on planning objectives, precise evaluation standards, etc.). Intuitives can also "make it" as managers; it is not fair to downplay their decision-making just because they do not think as linearly or are not as able to explain exactly how they come to their decisions as their systematic colleagues, since they both come up with the same results. McKenney and Keen, like McCarthy, Kolb, and Hagberg and Leider, would like to see a world in which everyone could recognize the different styles as useful in different circumstances, and as able to be used accordingly.

McKenney and Keen's instrumentation, which once included a Witkin field independent/field dependent measure and several Educational Testing Service tests (along with the Myers-Briggs test based on Jung's types), has been simplified to use primarily the latter.

In our discussion of styles, we have completely omitted the many sorts of style that were well known in bygone days, as far back as ancient history. Vernon (1973) details some of these. Among them are the "sanguine," "choleric," "melancholy," and "phlegmatic" temperaments known to the Greeks. It is possible, of course, that these temperaments correspond to the fourfold classifications we have been looking at. It would be especially interesting if they could be linked with styles in areas such as four basic dance styles found by dance instructor Elizabeth Wetzig of Staten Island, a participant in McCarthy's conference in 1979, at which style investigators noted the similarities between body movement types and cognitive or learning style.

Of interest to those concerned with transfer skill acquisition in regard to moral skills as well as cognitive skills, LaHaye (1977) has taken the four styles of sanguine, choleric, melancholy, and phlegmatic, and illustrated (with a Biblical character) with each style the "before" and "after" aspects in each case. These characters—Peter, Paul, Moses, and Abraham, respectively—depict cases in which weaknesses (lacks) became strengths. Thus the title of LaHaye's book, *Transformed Temperaments*.

Similarly, Roldan (1968) has drawn on the Sheldon body types (i.e., endomorph, mesomorph, and ectomorph), which overlap the above typology to some degree (and other personality types) to illustrate a "hagiotype" (literally, saint type, or most advanced representative of a type). While LaHaye and Roldan are not writing for educators directly, their work is relevant, especially for those who believe in the possibility of style modification. Questions of values and the sources of such modification arise that we shall not attempt to discuss here, of course. Many more investigators in managerial style (such as Blake & Mouton, 1978), leadership, and communication could be cited as relevant too, but this monograph would never end.

V. TEACHING STYLE

Introduction

Teaching style is an area that has received far less research, to date, than cognitive or learning style. While "training style" has not emerged as a focus in the literature, most of what is said of teaching style is relevant. Why has there been so little attention to teaching style? It may be partly due to a measurement problem in that we do not know how separate or close the personal cognitive/learning style of an instructor is to his or her personal teaching style. This may not seem important at first glance, but in fact it is very important. The following example shows why.

Let's say we have Instructor Smith, a "lumper," who personally learns best by noting relationships, grasping the big picture, and interacting with others in small discussion groups. However, one cannot assume that he instructs in this same fashion. When Instructor Smith went to college, his own instructors were "splitters," as is often the case in advanced schooling. They were his role models. In imitation of that role, he treats subjects abstractly and he lectures; he does not think to divide his students up into small discussion groups. If Smith has difficulty in performing according to this model, he may experiment with technique and develop his own style as he gains experience. The *role demand* of his position may, however, affect the limits to which he can develop his personal style; if it is made clear that he is expected to teach in a certain way—in a lecture hall, for instance—he may do so despite his personal inclination. There are other factors, as well; if Smith attempts to teach according to his pupils' styles, matters may be further complicated.

We find that researchers of learning style have separated instructional from personal cognitive or learning style. Of those researchers whose work we have reviewed, several (Canfield, Hill, and Ramirez & Castañeda) have developed frameworks for making an independent assessment of teaching style. Let us briefly review these procedures.

Teaching Style Inventories

Ramirez and Castañeda

As in the case of the younger learners for whom their Child Rating Form was designed, Ramirez and Castañeda's (1974) "Teaching Strategies Observation Instrument" is a direct observation measuring device that looks at both field-independent and field-sensitive behaviors. We might be able to consider these approaches as "formal" or "concrete." The sub-scales of behaviors checked off on a 1-to-5 frequency, ranging from "not true" to "almost always true," are these:

FIELD INDEPENDENT

1. *Personal Behaviors*

- a. Maintains formal relationship with students
- b. Centers attention on instructional objectives; gives social atmosphere secondary importance

2. *Instructional Behaviors*

- a. Encourages independent student achievement
- b. Encourages competition between students
- c. Adopts a consultant role
- d. Encourages trial-and-error learning
- e. Encourages task orientation

3. *Curriculum-related Behaviors*

- a. Focuses on details of curriculum materials
- b. Focuses on facts and principles; encourages using novel approaches to problem solving
- c. Relies on graphs, charts, and formulas

FIELD SENSITIVE

1. *Personal Behaviors*

- a. Displays physical and verbal expressions of approval and warmth
- b. Uses personalized rewards that strengthen the relationship with students

2. *Instructional Behaviors*

- a. Expresses confidence in child's ability to succeed
- b. Gives guidance to students; makes purpose and main principles of lesson obvious to students
- c. Encourages learning through modeling; asks students to imitate
- d. Encourages cooperation and development of group feeling
- e. Holds internal class discussions relating concepts to students' experiences

3. *Curriculum-related Behaviors*

- a. Emphasizes global aspects of concepts; clearly explains performance objectives
- b. Personalizes curriculum
- c. Humanizes curriculum
- d. Uses teaching materials to elicit expression of feelings from students

(Ramírez and Castañeda, 1974, pp. 177-178)

The instrument can be used to assess overall teaching style, or merely to evaluate the style used in a particular lesson or situation. Ramírez and Castañeda make it clear that the ratings reflect frequency, not ability; therefore, if a teacher gets a low frequency rating, it does not necessarily mean a need for specific training. Yet this practitioner team's interest does lie with encouraging teachers to teach bicognitively, so of course they regard the information as helpful when used as baseline data. They believe the instrument is most helpful in teacher training when used to evaluate a particular lesson or situation that is purposely delivered in either the field-independent or the field-sensitive mode. Eventually the instructor could use the instruments much as the students could use their own learning maps; that is, as guides for further strategies.

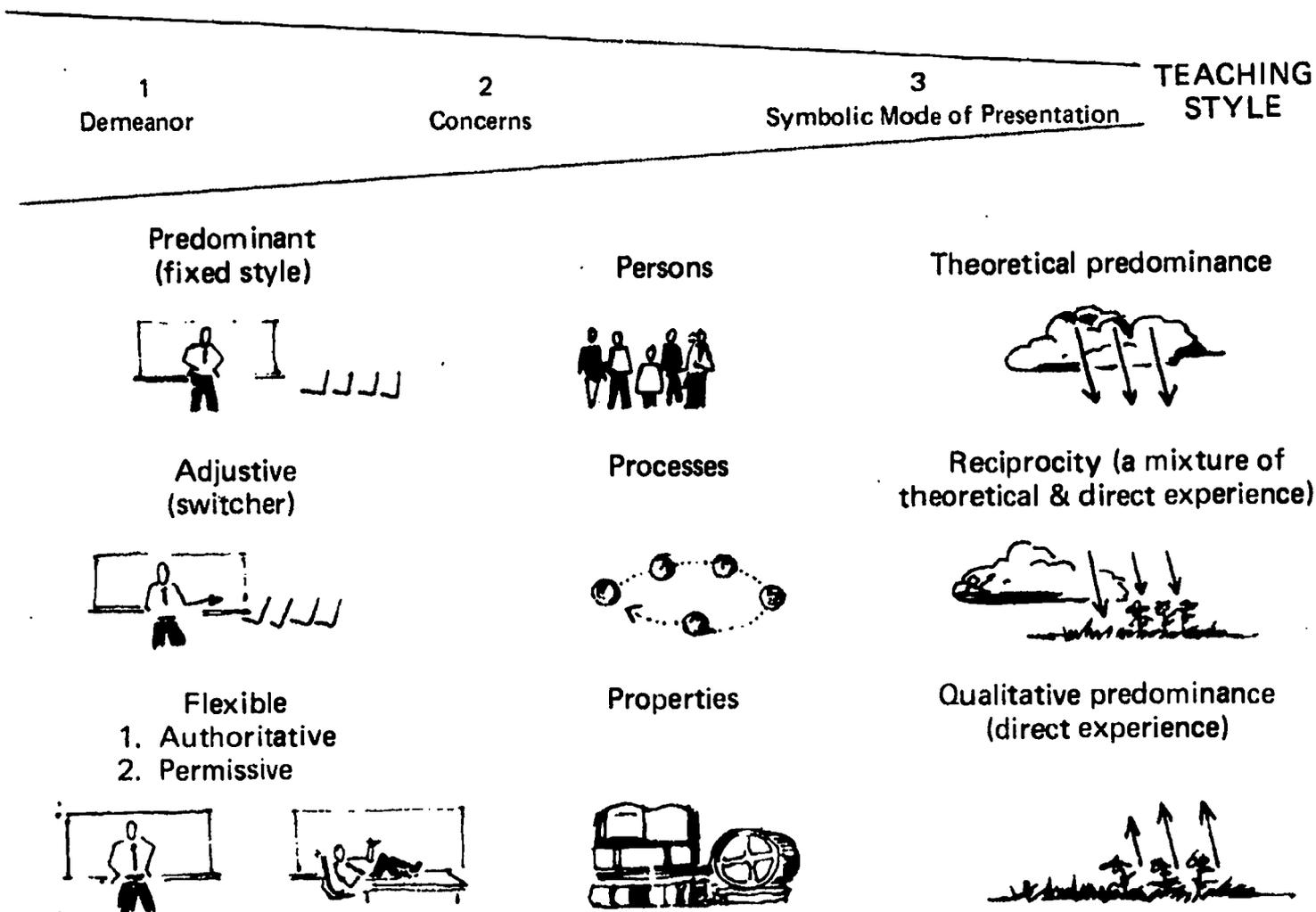
Ramírez (in a personal discussion) confesses to having found some resistance among teachers to changing their behavior, despite the objective nature of the instruments. His team found video-taping even more objective and therefore, more helpful, since teachers can see for themselves during playback whether they did or did not teach in a certain way. Perhaps part of the problem for the teachers in accepting feedback is that although objective, these observation instruments do not specify exactly what the terms mean.

Canfield

Canfield (also in personal discussion) reports that instructors seemed to be threatened by feedback when he was conducting his own research, despite the more specific categories on his Instructional Styles Inventory. However, this inventory used "need for power" as one of the elements and, as Canfield remarked, teachers may not appreciate being told that they feel a need for power. The Instructional Styles Inventory is less well validated than the Learning Styles Inventory (Payton, in a personal discussion), but it has much face validity.

Hill

Hill devised but did not implement a framework for teaching style (illustrated below). He viewed it as he had basic educational cognitive style, inasmuch as he considered teaching style a "Cartesian set," or more of a pattern than the sum of its parts.



Let us see how we can use these descriptors of Hill's teaching style in our earlier example of Dr. Jones and Sam in order to characterize Dr. Jones.

A. Demeanor: If Dr. Jones teaches by formal lecture, not writing on the board, despite the possibility that his students may need visual content, and continues to do so all the time, Jones would be called "predominant" or "fixed" in his approach.

If Dr. Jones had made some adjustments to take in Sam's visualization needs as a point of departure, and had also moved Sam in some ways to help him accommodate to his own teaching style, then Dr. Jones would be "adjustive" (or a switcher) in his approach. It is this sort of approach that Wyett (1967) found most successful with students.

Finally, if Dr. Jones changed to a style that seemed best to meet Sam's visual learning needs, he would be "flexible."

B. Concerns: Some instructors—probably not Dr. Jones as we have described him—emphasize the *persons* involved in the learning experience: the class as a whole, individuals as individuals, or themselves as instructors. Others emphasize the *process*, or what is going on during a learning situation (e.g., "Stop; let's look at what's happening in this discussion"). Still others emphasize the learning itself and the materials used to convey it (*properties*). These are the instructors who want to get the subject matter across at almost any cost.

C. Symbolic mode of presentation: This subset of instructors' styles might be summed up in the question, "Is this teacher down to earth (concrete) or up in the sky (formal)?"; in other words, is he or she "qualitative" or "theoretical"? Dr. Jones tends to be theoretical, teaching formally and through lecture. He expects his students to be familiar with theories and be able to work independently with diagrams and abstract concepts. Down the hall is another instructor who has her students involved in much qualitative "hands-on learning," and takes them on field trips so they can see things for themselves. Around the corner is a third instructor who mixes both approaches, or uses "reciprocity."

Using Hill's framework, Wyett (1967) found highly individualistic teaching styles among those instructors he studied, and used these findings to suggest a need to make teaching more flexible, in order to get it to the learners. He did, however, find it possible to classify teachers in regard to whether they were primarily "theoretical" or "qualitative."

Fischer and Fischer (1979)

Some of Hill's teaching style categories overlap the Fischers' breakdown, also constructed without an accompanying instrument:

- a. The *task-oriented* — prescribe materials to be learned; demand specific performance by student.
- b. The *cooperative planner* — guide the learning process, but encourage student input to help plan instruction.
- c. The *youth centered* — provide a structure for students to pursue the subject as they desire.
- d. The *subject centered* — focus on organized content to the near exclusion of the learner.
- e. The *learning centered* — have equal concern for students and for the subject to be covered.
- f. The *emotionally exciting* and its counterpart — show intense emotional interest in teaching (exciting); or subdue their emotional tone (counterpart).

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- a. The *task-oriented* — prescribe materials to be learned; demand specific performance by student.
- b. The *cooperative planner* — guide the learning process, but encourage student input to help plan instruction.
- c. The *youth centered* — provide a structure for students to pursue the subject as they desire.
- d. The *subject centered* — focus on organized content to the near exclusion of the learner.
- e. The *learning centered* — have equal concern for students and for the subject to be covered.
- f. The *emotionally exciting* and its counterpart — show intense emotional interest in teaching (exciting); or subdue their emotional tone (counterpart).

Learning Materials Style

A problem we find in looking at teaching style—namely, its possible confusion with personal style—is not a problem in making a style profile for educational materials such as textbooks, films, videotapes, cassette tapes, etc. However, in these instances we do find interactions among the particular subject matter, the tasks required, the types of presentation used, and the technical formats. Some efforts are being made toward such mapping (cf. Brose, 1974; Hand, 1972). The methods used are worth noting.

Materials can be mapped by direct observation by raters familiar with cognitive, learning, and teaching styles. Several raters check off categories on a survey for a given material; the results are then tallied to measure the interrater agreement. Finally, the resulting teaching style profile map of the materials can be reviewed, along with the profiles of the learners, to find the extant or desired degree of match.

There are some difficulties in using this type of mapping, however, and they center around how fine a line should be drawn around the teaching style of such materials. The problem would not surface to any great extent for most "major" elements in, let us say, a film, as all films have a "visual" element. When the raters go beyond these obvious elements to "minor" elements, however, there may be less need to worry about inclusion because the match between learners and materials may be better predicted only on the "major" elements (Brose, 1974).

In mapping learning materials, it is important to consider the time that learners using the materials will have in which to complete the task required. The importance of the style of the materials, especially when matched with that of learners, gets "washed out" if learners are allowed to use the materials for an indefinite period of time (i.e., until they master the subject matter therein). Almost anyone can learn almost anything, if given enough time (Brose, 1974).

The mapping of the instructional style of learning materials will become more important as instructors or trainers use more pre-packaged or even teacher-made materials. The present state of the art in understanding how style elements of teacher, learning materials used, and learner relate, leave much to be desired. We need to keep this in mind as we return to the larger question of transfer skill acquisition, which is the object of this monograph.

As we understand the interactions of teachers' personal cognitive or learning style with teaching style on the one hand, and of instructional style of teacher and materials on the other hand, we gain more control over skill acquisition. Leaving less to chance, both teachers and learners will be able to take a more active role in the acquisition process. Let us turn now to some concrete ways in which we may apply use of style toward transfer skill acquisition.

VI. IMPLICATIONS OF STYLE(S) FOR TRANSFER SKILL ACQUISITION

Suggestions for Applications

What can be done with all this information on cognitive, learning, and teaching styles? How can it be of concrete use in learners' needs for transfer skill acquisition? Here are some suggestions every teacher or trainer can use, even if "only" to foster transfer skills along with course content.

1. Decide what needs to be done with cognitive/learning style measures in the specific situation. For instance, would it be best to match training or learning to the style of individuals or a group? Should the measurements be used as a gauge of transfer skills present—or absent—in order to build transfer skill training around those skills that need strengthening?

2. Decide which of the various style measures will give the needed information, remembering that cognitive style (except for Hill's educational cognitive style) provides more basic, polar variables, while learning style provides a variety of variables, very much dependent on the particular measure selected.

Figure 12 presents a comparison chart of some learning style instrumentation. This should be helpful in selecting a learning style approach. The basic information regarding cognitive style measures (pp. 52-54) should provide a reference base for making distinctions among the cognitive styles left incomplete in the figure.

Instructors might consider a combination of instruments, perhaps one for cognitive style and one for a learning style approach. Much depends on what the instructor and the learners need to understand and do with the style information. While learning style instruments should provide more detailed information, a simple cognitive style measurement may provide enough information for basic uses, such as for transfer skill acquisition or style augmentation. This broad approach might be of greater use when many skills or styles are going to be considered, to avoid limiting the study by a specific learning style or educational cognitive style instrument.

3. Decide on any special cutoff points for interpretation (such as "match" and "mismatch" points) between styles of teacher and the person(s) being measured.

4. Apply the measures to all applicable:

- a. Learners, trainees, counselees, or supervisees;
- b. Teachers, trainers, supervisors, etc.;
- c. Format (media) or mode of presentation;
- d. Task or subject matter.

5. Analyze the results, considering the developmental or life stages of the person(s) measured in making interpretations.

	Type of Measurement	Map or Profile Available	Commercial Form Available	Approximate Time To Complete	General Age/Ability Expected	Ease of Administration	Methodological Back-up
<i>Canfield & Lafferty Learning Style Inventory</i>	Ranking; self-report	Yes	Yes	15 minutes	Junior high to adult	Easy for rater and ratee	A good amount
<i>Price, Dunn, & Dunn Learning Styles Inventory</i>	True-false; self-report	Yes	Yes	25 minutes	Early grades through adult	Easy for rates; computer scores form	Much
<i>French</i>	Direct observation	No	No	Varies with reflection time of instructor	(Done by instructor)	Easy for rater; but involves careful reflection (older ratee can rate self)	?
<i>Hagberg & Leider Excursion Styles Inventory</i>	Semantic choice; self-report	Can be duplicated from book	Can be duplicated from book	10 minutes	Junior high to adult	Very easy for rater and ratee (ratee can usually be rater too if given instructions to read)	Face validity only
<i>Hill —OCC Battery</i>	Direct observation & paper-and-pencil	Yes	For parts of the battery only	Several hours	Young adult	Average for ratee; demanding for rater	Much on commercial sections; some on the other
<i>—Cognitive Styles Interest Inventory</i>	Ranking; self-report	Yes	Not commercial but available from school	50 minutes	Young adult (and many junior high)	Easy questions but form can be tricky for ratee; rater can score by hand if knowledgeable and careful or send for computer score	Construct validity
<i>Kolb Learning Styles Inventory</i>	Semantic choice; self-report	Yes	Yes	5 to 10 minutes	Young adults who can discriminate one-word abstract descriptors	Very easy for rater and ratee (who can rate self)	Much
<i>Ramirez & Castañeda Child Rating Form (Field-Sensitive and Field-Independent Observable Behaviors)</i>	Direct observation yielding frequency of behavior scales	No	Can be duplicated from book	Varies	(Done by instructor)	Easy for rater but involves careful reflection (older ratee can rate self)	?

FIGURE 12. Comparison of selected learning style instruments.

Reported Use Other Than How to Teach the Ratee	Supportive Literature Citations	Other Supporting Material	No. of Main Scales	No. of Subscales	Source for Further Information
Materials development; career analysis or guidance	A few	An "Instruction Styles Inventory" is also available	6	0	Inventory forms: Humanics Medie (Liberty Drawer), Detroit, MI, 1970
Materials development	A few	Very complete book with many suggestions for how to teach youngsters of each style; could be used selec- tively on more adult level. A "Productive Styles Inventory" is now being developed.	24	0	Inventory packet: Price Systems, Box 32711, Lawrence, Kansas Book: <i>Teaching Students Through Their Individual Learning Styles</i> (Reston, VA: Reston Publ. Co., 1978)
?	?	?	2	12	Article: "Teaching Strategies and Learning Processes," <i>Educational Considerations, III</i> (Fall, 1975), 27-28
Career and life planning; training	?	Very complete book for persons seeking to know themselves in regard to career/life planning	4	0	Book: <i>The Inventurers</i> (Reading, MA: Addison- Wesley Publ. Co., 1978)
Materials development; match/mismatch to a variety of learning formats; career and life planning; augmentation and survival techniques	Much in disserta- tions; good amount in popular educa- tional journals	Book forthcoming—many developmental papers now available. Overarching "educational sciences;" links Hill's theory and methodology.	3	Approx. 27 (may be up- dated from time to time	Oakland Community College
As above	As above	As above, plus a number of community colleges use CSII as special coun- seling tool. A junior high version is also available.	As above	As above	As above. Inventory forms available for those who know how to use them. Information about training available for others.
Training; career and life planning	Fair amount	A battery in four parts is available for use along with LSI. An "Adaptive Styles Inventory" is now being developed.	4	0	Battery: McBer & Co., Boston
Materials development; style flexing; cultural understanding	Some	Very complete book and other printed material, linking learner's style to cultural background. A self-report "Bicognitive Orientation in Life" (ranking scales) was sent by Ramirez as a more adult version; while Castañeda with Lynn and Woltz have a similar self-report (also ranking scales)	4	11	Book: <i>Cultural Democracy, Bicognitive Development, and Education</i> (New York: Academic Press, 1974) Ramirez: University of California, Santa Cruz

6. Analyze the results, considering the developmental or life stages of the person(s) measured, attempting to reach mutual agreement on interpretations.

Of course, less cognitively developed or less mature persons may not be able to use the results to the extent that others can, but they should be given as much as they can assimilate. In style measure use, "everyone wins," because everybody has a major cognitive or learning style. The challenge lies in finding out what that style is and using it as a *guide map*, not a permanent label.

Learners often display increased interest in and attention to course goals when their style-type information is shared with them, especially when this information is presented as a tool for better self-understanding. The information is individualized, non-threatening, and should be presented on the basis of their own frames of reference—implying that the instructor understands and *cares* "where they're coming from." This in turn improves morale, since most learners appreciate being given this information, and have positive attitudes toward the instructor or organization that has provided it.

7. Discuss implications for:

- a. Learning for simple content mastery;
- b. Augmenting cognitive or learning style (building transfer skills) —
 - (1) At the same time as learning for content mastery; or
 - (2) In separate skill training;
- c. Vocational choices, if relevant.

8. Set performance goals for skill building.

9. Share information (to the extent possible) about one's own cognitive or learning style. Doing this can help create an even greater climate of openness, in which there is mutual understanding and acceptance. It is remarkable how many potential interpersonal difficulties can be avoided by mutual understanding and acceptance of style. Here is a real-life example, generated in a community college that distributes Hill's style instrumentation to students and staff alike:

"Dean So-and-so came in not long ago with this assignment for me," a secretary relates. "He said, 'Now what I want you to do is thus-and-so. It is like the assignment I gave you last month. . . . ' and then he proceeded to tell me how it was indeed like that other assignment, on and on. I couldn't care less about that sort of thing. Finally, when my frustration got to be too much, I said, 'Dean So-and-so, I really don't care how this assignment is like the others. You know from our style inventories that YOU are a major R [Relational, emphasizing how things are similar], but I am a major M [Magnitude, emphasizing the sequence of steps to take, 1-2-3]. So please just tell me what you want me to do and DON'T WASTE TIME TELLING ME HOW IT'S LIKE SOMETHING ELSE!'"

This emphasis on *style* difference, as opposed to *persona!* difference, allowed the matter to be resolved through humor instead of by suppressing unresolved tension. Tactful use of style reference might allow similar candor in a classroom or training lab—and possibly even in a work setting. Speaking in terms of each other's style (rather than in terms of each other's personality) allows for a lighter atmosphere and little fear that a person will appear stupid if he or she reveals specific areas of difficulty.

An Algorithm for Using Matches or Mismatches for Transfer Skill Acquisition

A closer look at the roles of cognitive or learning style in transfer skill acquisition will be useful here. As mentioned earlier, Messick and Associates (1976) suggest the use of match and mismatch in varying combinations for different effects. Transfer skill acquisition would be well served by using this work as a guideline. Figure 13, based on Messick et al.'s work, illustrates the pertinent match and mismatch information, and provides a guideline describing each type of match or mismatch. Figure 14, which immediately follows it, offers an algorithm (or job aid) to help in selection of the match or mismatch that seems called for in a given situation.

Capitalization Matches

If there are serious time constraints in regard to instruction, training, or work production, style augmentation (or transfer skill acquisition) cannot be considered to any great degree *at that point*. It could, however, be built into future schedules so that the choice does not *have* to be made between transfer skill acquisition and acquisition of those skills already scheduled for development.

In this situation, one should match style elements to the requirements of the task, format, and personal or teaching/training/counseling/supervising style as much as possible. When one finds mismatch (at the cutoff points decided upon before giving the measurement of style), one must consider how to make more of a match.

If a person's lack of skills are so great as to impede progress in the situation, one may have to deal with that problem before the learner continues. In this case, the best course of action might be to begin remedial work outside the situation.

If time is frequently a problem in the schedule, you may find it best to have several ready-made formats available (as at Oakland Community College), so all that needs to be done is to give the person the format with which he or she is most likely to succeed. The ready-made format will let the person use those skills or style elements that are strongest and ignore the others.

Although there is no full-fledged transfer skill acquisition in this type of work—in the sense of augmenting those style elements that are negligible or used only to a minor degree—there can still be a basic sort of acquisition if the instructor helps the person understand his or her own cognitive/learning style and how it is used in best match to this situation. That in itself is no mean accomplishment. If time permits, an instructor can also help the person understand how to look for matches in other situations, or can inform the person where to get that sort of information and counseling.

Compensatory Matches

If the time constraint is less serious, but still an important consideration, compensatory matches may prove the best course. Many instructors or trainers already use one or another type of these without being aware of the term. Such methods help the person survive in the situation despite the fact that his or her skills (style elements) are not quite adequate for the type of task, format, or style basically used. Much ingenuity may be called for. Here again, although there may not be more variegated transfer skill acquisition or style augmentation available in this situation, finding the right combination of things to help the person through is a valuable achievement. This is all the more true if the learner is personally involved in finding some of those compensations.

CAPITALIZATION
 ("Preferential")

To exploit learners'/
 trainees' strengths,
 playing up their
 "strong suit."

*We find well-developed
 or preferred general
 personality character-
 istics or cognitive/
 learning style abilities.*

COMPENSATORY

To offset deficiencies
 by providing things the
 learners/trainees have
 trouble providing for
 themselves.

*We find something that
 can't be overcome easily
 and the fact that over-
 coming is not a current
 objective.*

CORRECTIVE
 ("Remedial")

To rectify deficiencies
 in critical skills or
 knowledges blocking
 further learning
 progress.

*We find a trainable
 task—and the fact
 that specific capabilities
 are important for later
 cumulative learning/
 training.*

COMBINATION

To combine as desired
 from first three columns.

- Ignore learner/
 trainee deficiencies
- No correction
- No compensation

- Try to circumvent
 debilitating effects
 of learner/trainee
 deficiencies or
 disturbances by:
 - Mediators
 - Modalities
 - Organizing
 structures
 - Neutralizers
 against motiva-
 tional disturb-
 ances (such as
 anxiety or
 defensiveness)

- Expose to more
 of the same
 instruction/
 training that was
 ineffective at
 first
- Probably keep
 the original
 method of
 presentation,
 but:
 - More slowly
 - More repeti-
 tively
 - More specifi-
 cally

- Capitalize on
 strengths, but
 compensate for
 weakness; or
- Capitalize on
 strengths, but
 correct weakness;
 or
- Compensate for
 weakness as well
 as correct it



FIGURE 13. Guideline of style matches and mismatches.

CHALLENGE
("Mismatch")

To mismatch deliberately.

Especially important where:
(1) There are multiple educational objectives of content and process; (2) systematic, continuous matching maximizes content or process while it limits the other.

- Create conflict between treatment and learner/trainee characteristics to challenge the person to:
 - Become more flexible
 - Increase variety of strategies
 - Increase modes of functioning

SUBSTITUTIVE
To replace preferred but dead-end strategies with more effective ones, even less congenial ones.

STIMULATIVE
To foster development, curiosity, or creativity

- Shape environment to stimulate conceptualization, esp. with graded discrepancies or incongruities.

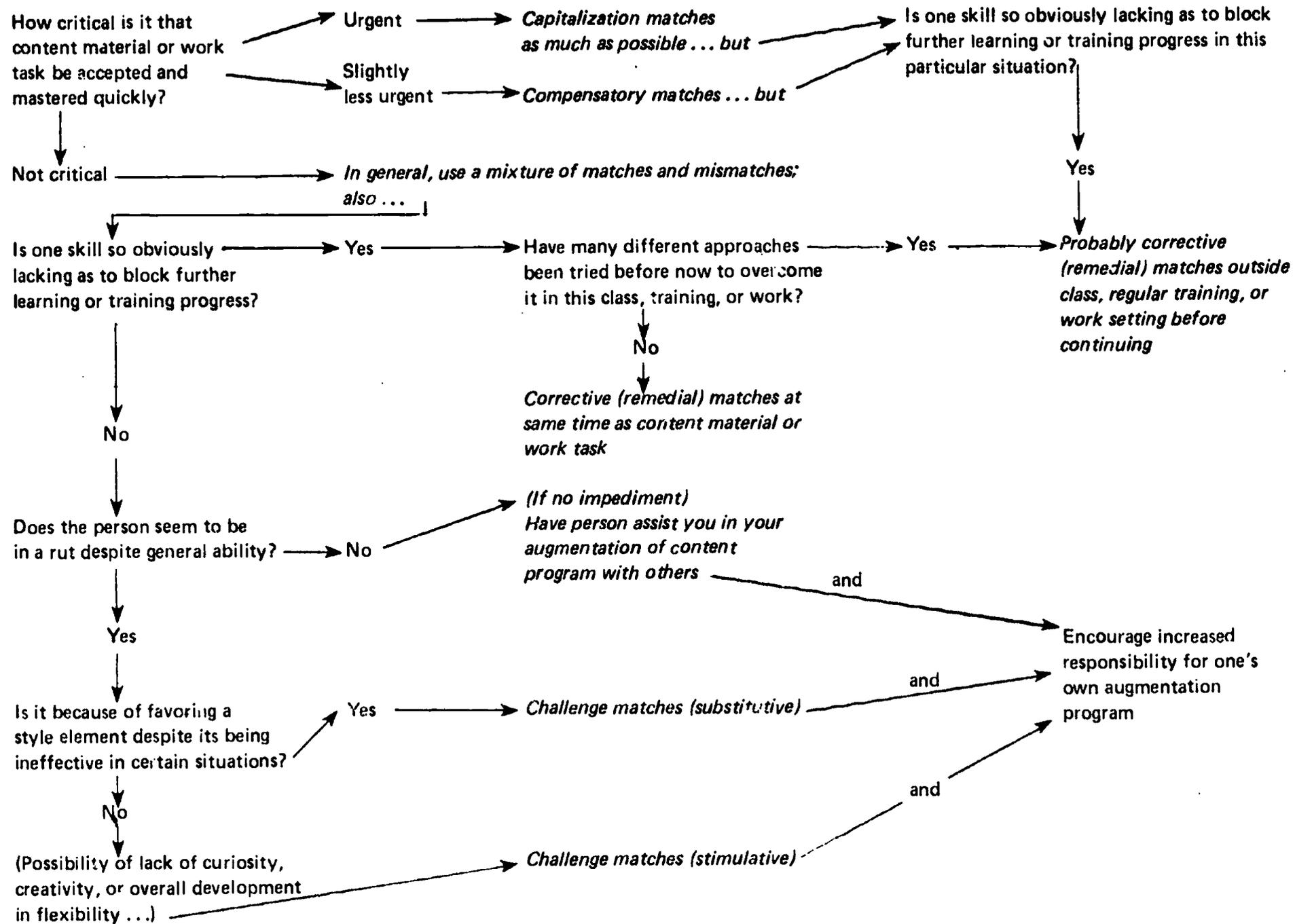
MIXTURES OF MATCHES AND MISMATCHES

To achieve fixed or common goals through different intellectual processes or operations. These are widespread, often by default, but can be used to good advantage.

- SUPPLEMENTAL** *Either match or mismatch is used most of the time to teach the same subject matter, in the same session or sequence.*
But it is supported by the other in the same session or sequence.
- SPORADIC** *Either match or mismatch is used most of the time to teach the same subject matter, in different sessions.*
But occasional sessions are based on the other.
- SEQUENTIAL** *Match and mismatch are used more or less equally in all subject areas.*
But systematic switching from one to the other is done.
- SPLIT** *Match and mismatch are used at the same time in the same session.*
But different treatment components are matched and mismatched.
- STRATIFIED** *Match is used to support and optimize the most important learning/training objectives.*
Mismatch is used sometimes and in other areas to offset any rigidity of functioning.
- STUDENT** *Match and mismatch are used*
 - in the same session; or
 - with the same treatment components; or
 - in the same subject matter.*But different learners/trainees are matched/mismatched.*

IN EXISTING CLASS TRAINING OR WORK FOR TRANSFER SKILL ACQUISITION THROUGH STYLE AUGMENTATION (FLEXING)

FIGURE 14. An algorithm for using Messick and Associates' (1976) style matches/mismatches in style augmentation efforts.



Recall Sam, our visual learner, who found he could at least ask the instructor for *word* pictures to compensate for his need for graphic material that the instructor did not present. If Sam were put in a work setting after learning how to get word pictures in the absence of more graphic material, he should be equipped to help himself through that situation. "Give me an analogy," he might ask.

Harmon and King (1979) found that the cognitive style, field independence/dependence (or sensitivity), which is very similar to Piaget's formal versus concrete operations, show the following differences for each kind of learner (see Figure 15). From this understanding, the instructor can design compensatory matches more easily.

	CONCRETE OPERATIONS	FORMAL OPERATIONS
Relevant to Model Building	Must use models whose components are real things.	Can use models that have abstract or symbol components.
	Cannot use explanations that involve two or more independent variables or that depend on the control of one variable while another is being examined.	Can use explanations that involve two or more independent variables and/or that depend on control variables as part of the analysis.
	Cannot expect student to generate hypotheses, or think in terms of abstract patterns.	Can expect the student to generate hypotheses and to think in terms of abstract patterns.
	Cannot expect student to be aware of his/her own reasoning, inconsistencies among various statements he makes, or contradictions with other known facts.	Student is aware and critical of his own reasoning and actively seeks checks on the validity of conclusions by appealing to other known information.
Relevant to Exercise Construction	Needs reference to familiar objects, actions, and observable properties.	Can reason with concepts, relationships, abstract properties, axioms and theories; uses symbols to express ideas.
	Need step-by-step instructions for complex procedures; should use successive approximations and emphasize practice.	Emphasize theory and/or overview.

FIGURE 15. A comparison of concrete and formal operations (Harmon & King, 1979, p. 17).

When one is faced with concrete learners or trainees, but has rather high-level, abstract material to present, one must bear in mind that such learners need some way of breaking down and "solidifying" (even "personalizing") the material in order to have any chance of comprehending it. In the absence of a Piagetian measurement for judging whether learners are concrete or formal, one can use the Witkin (1975) or Ramirez and Castañeda (1974) measurements as guides.

The instructor can also make "job aids." Sam's instructor, for instance, could make one or two charts with symbols to represent the ideas for the most difficult tasks. They reduce task difficulty in presenting the steps simply and directly, as an algorithm does. (The process of deciding when to

use what kind of match in itself employs an algorithm. . .) Algorithms can be used when decisions are fairly clear yes/no, either/or situations. They also increase a person's retention of a specific task procedure because the person can rely on the job aid rather than having to memorize the complex task in its entirety—all the more desirable if there is a lot of material to keep in mind (Harmon & King, 1979). It is true that job aids by themselves do not aid as much in long-term transfer as the opportunity to learn on one's own (as the developmentalists would point out). But if the learners were asked to keep *thinking about* the material each time they used the job aid, they might begin to comprehend how it might be used in other ways.

Job aids as a concept, given to the learner or trainee or worker, are invaluable because they will help him or her recognize and access pertinent information and options much more clearly. For example, people who make flow charts for computer work know how important they are to their clear conceptualizing of the problem, but people outside the computer field often do not know about this sort of aid. In conjunction with understanding one's own cognitive style, being able to make job aids for oneself is a very powerful tool in life. Making job aids takes advantage of the clarifying principle teachers or trainers have already found for themselves; that is, in having to put jumbled information into a form so that someone else can better understand, one gains a better grasp of the material. The job aid should be viewed as something that will clarify the problem to an outside observer.

Role plays are an excellent way to make material understandable for learners. More basic still, scenarios, which may or may not be role-played "live" or which may be shown visually (film, pictures, etc.) as well as in print, may help convey material that would otherwise be too abstract and formal. The linkage of a performance device (the job aid, for instance) to a developmental stage is one of the major ways that behavioral and developmental insights can be of mutual help.

One should avoid putting these sorts of devices on the level of "tools" for compensatory matches, however, especially for those who have not developed to a more cognitively advanced stage. Even field independents (or formal operators) need concrete devices—there is always a danger of getting too far away from down-to-earth, concrete ways. Field independents may consider pictures or other visual aides as being too simplistic, or "Mickey Mouse," but their concerns can be allayed by pointing out that (a) not only do people have varying cognitive/learning styles, but (b) it's good to have variety. Then everyone can relax, secure that the people running the show know what they're doing, and enjoy a new format because it is clear that it will not be the only one used. Dick Baker, a trainer who frequently uses different formats in his presentations, has found this discussion helpful, particularly when he wants to use role plays. His more field-independent trainees often balk at them without this sort of discussion but they usually profit when the material is correctly presented.

It may thus be true that compensatory matches are most often useful for those who cannot recognize important information in complex contexts (field dependents or sensitives, concrete operators). However, one must not underestimate the need of field independents for concrete material as a compensatory match of their own, especially if they turn out to be very visual or relating best to the written word. It may not be obvious that they have a need for more direct, sense-oriented formats—but it may be true all the same.

Corrective (Remedial) Matches

If a skill—a style element—is lacking to the point where it seems further progress will be blocked, consider corrective (remedial) matches. The work of Ramirez and Castañeda (1974), while reported on younger children, can be adapted to older workers or trainees as an attempt to mix matches and mismatches consistently for developing less familiar styles. For example, they suggest having learners who are field-independent first learn independently and be rewarded for what they do on their own, while field-sensitives could learn at first in groups. In general, then, use a mixture of matches and mismatches in everything for which you teach or train.

Perhaps many different approaches to augment less familiar skills have been tried before in your class, training, or work. In this case, it is probably wise to consider corrective or remedial matches *outside* this context. It may be better to augment with very specialized, professional help. Of course, the problem may come up: "Just where can I turn to get such help?" We need to build up far more expertise than we now have to offer this sort of help. Giammatteo and others in the clinical field have made a start at augmenting skills that are specifically diagnosed in terms of cognitive style. However, there have been attempts in skill building that go under names other than style augmentation, transfer skill building, or even under a more specific generic name; for example, if you want to build a "synthesis" skill, you can perhaps find training under "imagery building," "metaphor making," or "analogy making."

Even instructional or training organizations (like Washington International College) that use a taxonomy of cognitive skills in their programs need to have a scheme such as the algorithm we are now using to help facilitators decide what to do when confronted with learners who need corrective or remedial work in one or more skills. Otherwise, even an attempt to evaluate the transfer skills alongside regular content matter will not actually develop the skills. It would end up as a sort of "formal learning" (in Hall's sense), with concern registered only when the skill did not actually manifest itself as expected.

Combination Matches

In general, this is using a mixture of matches and mismatches in everything you train or teach for. Use this on skill or style elements. It would be helpful to choose several programs—such as Giammatteo's *Beyond Relevancy* (1971) problem-solving skill builder—for use within classroom, training sites, or work sites in order to help learners rehearse alternative modes of arriving at solutions.

What if someone is not in need of augmentation? Occasionally, a facilitator may encounter an individual who is highly versatile, and seems to have no real problem with one or another skill or style element. If this person seems to be functioning well in a variety of styles and displays general ability, this is the sort of person to include in the augmentation program itself. We have seen the advantages in the upsurge of the use of student proctors, tutors, and so forth. In a training or work setting, these may be "master performers" who could help instruct or orient other persons, such as newcomers, in specific skills. This suggests a possible variation of the apprenticeship program set in a transfer skill context.

Challenge Matches

If a person does seem to be in a rut despite general ability, there is good reason to arrange challenge matches, particularly when the learner is a younger person. It would hinder flexibility to allow a person to "lock in" on one cognitive or learning style by allowing him or her to use even an advantageous one all the time, and neglect development of curiosity or creativity. The goal should be to expose the young person to as many chances as possible to develop style.*

If the problem is one of a person's favoring a style element that has succeeded in some situations—but that cannot keep succeeding simply because the law of averages will eventually present situations in which it will not prove adequate—a "substitutive" challenge match is called for. The instructor could arrange for the person to be rewarded for doing something a new way. Perhaps one could have all the persons having one style, or favoring one style element, get together and think of reasons why their way would or would not work in various situations, then allow them to act out new strategies in role plays. Such plays offer an excellent chance for people to experiment with styles and strategies in a safe atmosphere, a protected one in which they are not yet held accountable to the "outside world." The principle is similar to one that Moore (1969) encouraged in his "transfer room," where he fostered an environment in which learners could apply what they had learned to do (as in his example, the production of a group newspaper to utilize newly-acquired reading and writing skills) with successful results. Trainer Judy Springer has devised a workshop, presented at the 1979 annual conference of the National Society for Performance and Instruction, to allow participants to "try out" different consultant roles, based on various cognitive styles, on each other. This workshop showed great promise for style augmentation in all settings by using role play.

Sam, our example of a visual learner, is a good depiction of a person who is ready for this sort of challenge match. This would be all the more true if he had succeeded at "surviving" by learning to meet his visual needs through compensatory matches, in which he always relies on a crutch, as it were. This is not necessarily a bad thing, but he could be much more self-reliant if he could learn not merely how to survive but how to thrive in an aural environment. An instructor might ask him, "What would happen if you were the only person available to listen to very important instructions on tape that would self-destruct after one repetition?" Thus Sam would have to consider what would happen. He would be impressed with the importance of being able to get meaning from what only he would hear, and perhaps he would begin to understand aural input as a vital component in learning.

There are a number of "listening kits" available on the market to develop or improve aural skills, especially for use in the work world. It is doubtful that they all build toward good listening in a true sequence of taxonomic steps, but they must prove successful, at least in part, since sales levels are consistent. It is to be hoped that a complete list of such transfer skill-building tools as "listening kits," "deduction," and "difference-detection" will someday be compiled.

What of the person whose problem seems to be that he or she is not very curious or creative? This person could be a good worker, student, or trainee, able to do exactly what is required—but not able to function as one of McKenney and Keen's (1974) "intuitive" problem-solvers (i.e., using the right side of the brain). Here, too, a challenge match is needed, especially if the person has a somewhat misplaced notion about his or her style strengths (as McKenney and Keen point out, a number of "systematic" problem solvers in managerial roles may be smug vis-à-vis their intuitive colleagues).

* This of course is a major critique of the developmentalists in regard to the use of style testing (Wachs, in a personal interview); an approach such as the Dunns' (1978), wherein the main aim is to arrange capitalization matches as prime strategy, does in fact limit the "challenge" match.

What if the reward structure is changed so that the intuitive approach is what is valued? Such a reward structure should go beyond the level of "brainstorming sessions," in which coming up with new and creative alternatives are rewarded in the training or in the on-the-job session itself, but not put into actual practice. The instructor should provide examples of persons who achieve their objectives through an intuitive, creative approach, suggesting that this behavior, too, is worthy of emulation.

In a subject such as natural science, there are some materials on the market (the Suchman Inquiry Development Program kit, for instance) that turn out to be much more complex or different (from usual materials of that content) than as first meets the eye. The difference is so intriguing that the persons confronted with the materials can hardly refrain from asking all sorts of questions. This, as it happens, is the real reason for the materials: to encourage curiosity that can develop a real-life ability to formulate valid hypotheses.

This sort of challenge fulfills another of Harmon and King's (1979) concerns for approaches in addition to "successive approximation" (the process of incremental approach toward mastery through a series of small steps guaranteed to bring success, like programmed learning or other behavioristic approaches). They would like to see transfer skill acquisition reached through contradiction, as well, so that a person comes to realize that what he or she needs to do may be beyond what seemed to be the right way up to now. This is also the classic strategy of the developmentalists. In Furth and Wachs' (1974) "Schools for Thinking" and in work they have done with adults, cognitive advancement occurs after the person is confronted with a task not too far beyond present ability to do or solve, yet far enough from it that the person must *think out*—using the entire body—a solution based on notions or skills already held but not entirely sufficient to the task.

Acquiring the Ultimate Transfer Skill

We have mentioned at several junctions the important skill of *knowing and being able to work with one's own style*. In effect, skill and style are aspects of behavior. Performance technologist Thomas Gilbert proposes that behavior has six components, and if we wish to increase any particular competency, we should look at each of these six components in order to find out where work is needed to stimulate increased skill in that behavior. Table 2, Gilbert's behavior engineering model (Gilbert, 1978, p. 88), shows the relationships of the six components in a matrix. Cognitive and learning styles appear in the lower left box of the matrix.

The question might be asked: If people believe that knowing about their cognitive or learning style will help them, or if they know that they have been carefully matched to the learning task or format, etc., is it not a "self-fulfilling prophecy" when they improve as predicted? Future research in cognitive/learning style and transfer skill acquisition might address this question. Of course, having faith and achievable goals can provide major motivation in an individual's life. It is necessary to have something "out there on the horizon" for which to reach. Cognitive/learning style research has not yet detected any sign of a "Hawthorne effect" (in which persons respond positively to attention paid to them and their needs) in improvement of performance due to increased ability to use style information advantageously in itself.

Feedback—sharing style information—will probably make people expect more from learning or training or work situations. This may be very helpful in the case of adults, who usually appreciate a collaborative role with the instructor. On this note, it is especially important to begin research on (a) how transfer skill acquisition or style augmentation may best be accomplished at the various life stages as well as in the Piagetian developmental stages, and on (b) how cognitive/learning style is used at these stages. It may be that in stages associated with crisis or renewal, knowledge and application of style information on the part of the learner, worker, or trainee will be of great significance.

Table 2. The Behavior Engineering Model (Gilbert, 1978)

	<i>S^D</i> <i>Information</i>	<i>R</i> <i>Instrumentation</i>	<i>S_r</i> <i>Motivation</i>
<i>E</i> <i>Environmental supports</i>	Data 1. Relevant and frequent feedback about the adequacy of performance 2. Descriptions of what is expected of performance 3. Clear and relevant guides to adequate performance	Instruments 1. Tools and materials of work designed scientifically to match human factors	Incentives 1. Adequate financial incentives made contingent upon performance 2. Nonmonetary incentives made available 3. Career-development opportunities
<i>P</i> <i>Person's repertory of behavior</i>	Knowledge 1. Scientifically designed training that matches the requirements of exemplary performance 2. Placement	Capacity 1. Flexible scheduling of performance to match peak capacity 2. Prosthesis 3. Physical shaping 4. Adaptation 5. Selection	Motives 1. Assessment of people's motives to work 2. Recruitment of people to match the realities of the situation

BIBLIOGRAPHY

- Altman, J.W. *Transferability of vocational skills*. Columbus: The Ohio State University, National Center for Research in Vocational Education, 1976.
- Ashby, N. Kind kids are nice to know. *Parade*, October 21, 1979, p. 14.
- Baird, R.R., & Bee, H.L. Modification of conceptual style preferences by differential reinforcement. *Child Development*, 1969, 40, 903-910.
- Bass, R.K. *An exploratory study of procedures for measuring and mapping qualitative symbolic orientations*. Unpublished doctoral dissertation, Michigan State University, 1972.
- Berke, G.B. *Employing educational cognitive style as a teaching aid for educationally disadvantaged college students*. Unpublished doctoral dissertation, The Catholic University of America, 1976.
- Bieri, J., et al. *Clinical and social judgment: The discrimination of behavioral information*. New York: Wiley, 1966.
- Blake, R.R., & Mouton, J.S. *The new managerial grid*. Houston: Gulf Publishing Company, 1978.
- Bloom, B., et al. *A taxonomy of educational objectives: The classification of educational goals, handbook I: Cognitive domain*. New York: Longmans-Green Publishers, 1956.
- Brain-Mind Bulletin*. Los Angeles: Interface Press, 1977. (Excerpt.)
- Brose, W.P. *Analysis of student interaction with an instructional videotape package in terms of cognitive style*. Unpublished doctoral dissertation, The University of Florida, 1974.
- Broverman, D.M., et al. The automatization cognitive style and physical development. *Child Development*, 1964, 35, 1343-1359.
- Bruner, J. *The process of education*. Cambridge, MA: Harvard University Press, 1960.
- Bruner, J. *Toward a theory of instruction*. Cambridge, MA: Harvard University Press, 1966.
- Bruner, J.S.; Olver, R.R.; & Greenfield, P.M. *Studies in cognitive growth*. New York: Wiley, 1966.
- Bruner, J., & Tajfel, H. Cognitive risks and environmental change. *Journal of Abnormal Psychology*, 1961, 52, 231-241.
- Buzan, T. *Use both sides of your brain*. New York: E. P. Dutton, 1974.
- Canfield, A.A., & Lafferty, J.C. *Learning styles inventory*. Detroit, MI: Humanics Media (Liberty Drawer), 1970.

- Chickering, A.W. *Education and identity*. San Francisco, CA: Jossey-Bass, 1969.
- Clar, P.N. *The relationship of psychological differentiation to client behavior in vocational choice counseling*. Unpublished doctoral dissertation, University of Michigan, 1971.
- Claxton, C.S., & Ralston, Y. *Learning styles: Their impact on teaching and administration* (AAHE-ERIC/Higher Education Research Report No. 10). Washington, DC: American Association for Higher Education, 1978.
- Cohen, R.A. *Primary group structure, conceptual styles and school achievement*. Unpublished doctoral dissertation, University of Pittsburgh, 1967.
- Coop, R.H., & Brown, L.D. Effects of cognitive style and teaching methods on categories of achievement. *Journal of Educational Psychology*, 1970, 61, 400-405.
- Covello, L.V. *Embodiment of feeling: An exploratory study in the transformation of cognition to selected forms of affect through cognitive style*. Unpublished doctoral dissertation, The American University, 1975.
- Cronbach, L.J. Intelligence? Creativity? A parsimonious reinterpretation of the Wallach-Kogan data. *American Education Research Journal*, 1968, 5, 491-511.
- Cross, P.K. *Accent on learning*. San Francisco: Jossey-Bass Publishers, 1976.
- Curwin, R.L., & Fuhrmann, B. *Discovering your teaching style: Humanistic approaches to effective teaching*. Englewood Cliffs, NJ: Prentice-Hall, 1975.
- DeBono, E. *The mechanism of mind*. New York: Simon & Schuster, 1969.
- DeLoach, J.F. *An analysis of cognitive style disparity as an antecedent of cognitive dissonance in instructional evaluation: An exploratory study in the educational sciences*. Unpublished doctoral dissertation, Wayne State University, 1969.
- Della-Dora, D., & Blanchard, L.J. (Eds.). *Moving toward self-directed learning: Highlights of relevant research and promising practice*. Alexandria, VA: Association for Supervision and Curricular Development, 1979.
- Dunn, R., & Dunn, K. *Teaching students through their individual learning styles: A practical approach*. Reston, VA: Reston Publishing Company, Inc., 1978.
- Edwards, B. *Drawing on the right side of the brain*. Los Angeles: J.P. Tarcher, Inc., 1979.
- Esprit, L.G. *A comparison of cognitive styles: An exploratory investigation*. Unpublished doctoral dissertation, Oklahoma State University, 1972.
- Ewing, D.W. Discovering your problem-solving style. *Psychology Today*, 1977, 73, 69-70.
- Faddis, C.R. *The worker as Proteus: Understanding occupational adaptability*. Columbus: The Ohio State University, National Center for Research in Vocational Education, 1979.

- Fischer, B.B., & Fischer, L. Styles in teaching and learning. *Educational Leadership*, 1979, 245-254.
- Flesch, R. *The art of clear thinking*. New York: Barnes & Noble Books, 1973.
- Frederick, W.C. *Information processing and concept learning at grades six, eight, and ten as a function of cognitive styles* (Technical Report No. 44). Madison: Wisconsin Research and Development Center for Cognitive Learning, 1968.
- French, R.L. Teaching strategies and learning processes. *Educational Considerations*, 1975, 3, 27-28.
- Froyen, L.A. *Mastery learning as a function of learner cognitive style, teacher diagnostic intervention, and time on an independent learning task*. Unpublished doctoral dissertation, Indiana University, 1970.
- Furth, H., & Wachs, H. *Thinking goes to school: Piaget's theory in practice*. New York: Oxford University Press, 1974.
- Gardner, R.W. Cognitive style: A study of individual systematization in cognitive behavior. *Psychological Issues* 1, 1959.
- Gardner, R.W.; Lohrenz, L.S.; & Schoen, R.A. Cognitive control of differentiation in the perception of persons and objects. *Perceptual and Motor Skills*, 1968, 26, 311-330.
- Gatewood, M.M. *Cognitive style and academic performance*. Unpublished doctoral dissertation, Case Western Reserve University, 1971.
- Getzels, J.W., & Jackson, P.W. *Creativity and intelligence: Explorations with gifted children*. New York: Wiley, 1962.
- Giammatteo, M. *Overload—Diagnostic tool*. Vancouver, WA: Sylvan Institute of Mental Health & Family Services, 1966.
- Giammatteo, M. Helping professionals for inner city education. *Seminar on exploration of content and experiences in the preparation of teachers for urban centers*. Portland, OR: Northwest Regional Educational Laboratory, 1967a.
- Giammatteo, M. *Some research rationale notations for parent-child services* (Field paper No. 10). Portland, OR: Northwest Regional Educational Laboratory, 1967b.
- Giammatteo, M. *Cultural stress*. Portland, OR: Northwest Regional Education Laboratory, June 1971.
- Gilbert, T.F. *Human competence: Engineering worthy performance*. New York: McGraw-Hill Book Company, 1978.
- Goleman, D. Special abilities of the sexes: Do they begin in the brain? *Psychology Today*, 1978, 12, 44.
- Goodenough, D.R., & Eagle, C.J. A modification of the embedded figure test for use with young children. *Journal of Genetic Psychology*, 1963, 103, 67-74.

- Gregorc, A. A new definition for individual. *NASSP Bulletin*, 1977, 20-26.
- Guilford, J.P. *The nature of human intelligence*. New York: McGraw-Hill, 1967.
- Hagberg, J.O., & Leider, R.J. *The inventurers: Excursions in life and career renewal*. Reading, MA: Addison-Wesley Publishing Company, 1978.
- Hall, E.T. *The silent language*. Greenwich, CT: Fawcett Publications, Inc., 1959.
- Hand, J.D. *Matching programmed instruction packages and an instructional setting to students in terms of cognitive style: An exploratory study*. Unpublished doctoral dissertation, Michigan State University, 1972.
- Harmon, N.P., & King, D.R. Operant learning, cognitive development, and job aids. *Improving Human Performance Quarterly*, 1979, 8, 1-28.
- Harvey, O.J.; Hunt, D.E.; & Schroder, H.M. *Conceptual systems and personality organization*. New York: John Wiley and Sons, 1961.
- Hester, F.M., & Tagatz, G.E. The effects of cognitive style and instructional strategy on concept attainment. *Journal of Genetic Psychology*, 1971, 85, 299-337.
- Hill, J.E. *Cognitive style as an educational science*. Oakland Community College, Bloomfield Hills, Michigan. (Unpublished manuscript in preparation)
- Holzman, P.S., & Klein, G.S. Cognitive system principals of leveling and sharpening: Individual differences in assimilation effects in visual time-errors. *Journal of Psychology*, 1954, 37, 105-122.
- Hunt, D.E., & Sullivan, E.V. *Between psychology and education*. Hinsdale, IL: The Dryden Press, 1974.
- Isaakson, M., & Moore, J.W. *The effects of training of analysis upon the responding style of impulsive children*. Paper presented at the annual meeting of the American Educational Research Association, 1972.
- Instructor's manual for Talent training materials*. Alexandria, VA: The Allington Corp., 1977.
- Joyce, B.R., & Harootunian, B. *The structure of teaching*. Chicago: Science Research Associates, Inc., 1967.
- Kagan, J.S. Reflective impulsivity and reading ability in primary grade children. *Child Development*, 1965, 336, 609-28.
- Kagan, J.S.; Moss, H.A.; & Sigel, I.E. Psychological significance of styles of conceptualization. In J.C. Wright and J.S. Kagan (Eds.), *Basic cognitive processes in children*. Monographs of the Society for Research in Child Development, 1963, 28, 73-112.
- Kagan, J.S., et al. Information processing in the child: Significance of analytic and reflective attitudes. *Psychological Monographs: General & Applied*, 1964, 73, (1, No. 57b).
- Kelly, G.A. *A psychology of person constructs I*. New York: W.W. Norton and Company, Inc., 1955.
- Klein, G.S. Need and regulation. In M.P. Jones (Ed.), *Nebraska symposium on motivation*. Lincoln: University of Nebraska Press, 1954.

- Klein, G.S.; Gardner, R.W.; & Schlesinger, H.J. Tolerance for unrealistic experience: A study of the generality of cognitive control. *British Journal of Psychology*, 1962, 54, 41-55.
- Klemp, G.O., Jr. *Three factors of success in the world of work: Implications for curriculum in higher education*. Paper presented at the National Conference on Higher Education, American Association for Higher Education, March 1977.
- Klemp, G.O., Jr. Identifying, measuring, and integrating competence. *New Directions for Experiential Learning*, 1979, 3, 51-52.
- Kogan, N., & Wallach, M.A. *Risk taking: A study in cognition and personality*. New York: Holt, Reinhart, and Winston, 1964.
- Kolb, D.A. *Learning style inventory: A self-description of preferred learning modes*. Boston: McBer & Company, 1977.
- Koskela, R.N. *Theoretical and empirical relationship between cognitive styles and cognitive structures*. Unpublished doctoral dissertation, University of Wisconsin, 1973.
- LaHaye, T. *Transformed temperaments*. Wheaton, IL: Tyndale House Publishers, 1977.
- Lange, C.M. *A study of the effects on learning of matching the cognitive styles of students and instructors in nursing education*. Unpublished doctoral dissertation, Michigan State University, 1972.
- Mann, H.; Siegler, M.; & Osmond, H. Four types of perception and our ways of perceiving time. *Psychology Today*, 1972, 19, 77-84.
- Martens, K.J. *Project Priority, 1974-1975; An ESEA funded project. Final report*. Albany: State University of New York, Bureau of Two-Year College Programs, 1975.
- McAdam, G.F. *Personalizing instruction through the educational science of cognitive style and teaching style*. Unpublished doctoral dissertation, Wayne State University, 1971.
- McKenney, J.L., & Keen, P.G.W. How managers' minds work. *Harvard Business Review*, 1974, 79-98.
- Messick, S., & Associates. *Individuality in learning*. San Francisco: Jossey-Bass, 1976.
- Messick, S., & Kogan, N. Differentiation and compartmentalization in object sorting measures of categorizing style. *Perceptual and Motor Skills*, 1963, 16, 47-51.
- Moore, O.K., & Anderson, A.R. Some principles for the design of clarifying educational environments. In D.A. Goslin (Ed.), *Handbook of socialization: Theory and research*. Chicago: Rand McNally & Co., 1969.
- Nelson, B.A. *Effects of the analytical-global and reflectivity-impulsivity cognitive styles on the acquisition of geometry concepts presented through emphasis or no emphasis and discovery of expository lessons*. Unpublished doctoral dissertation, University of Wisconsin, 1970.

- Nelson, K.H. *Cognitive style implementation: Project Priority, 1975-1976*. Paper prepared for private circulation, July 1976.
- Niles, T.R. *A comparison of cognitive styles between the most successful Michigan directors of community education and other Michigan directors of community education*. Unpublished doctoral dissertation, Western Michigan University, 1974.
- Ohnmacht, F.W. Effects of field independence and dogmatism on reversal and non-reversal shifts in concept formation. *Perceptual and Motor Skills*, 1966, 22, 491-497.
- Payton, O.; Hueter, A.E.; & McDonald, M.E. Learning style preferences: physical therapy students in the United States. *Physical Therapy*, 1979, 59, 147-152.
- Pettigrew, T.F. The measurement and correlates of category width as a cognitive variable. *Journal of Personality*, 1958, 26, 532-544.
- Price, G.E.; Dunn, R.; & Dunn, K. *Learning style inventory research report*. Lawrence, KS: Price Systems, 1977.
- Ramírez, III, M., & Castañeda, A. *Cultural democracy, bicognitive development, and education*. New York: Academic Press, 1974.
- Ramírez, III, M., et al. *Dimensions of biculturalism in Mexican-American college students*. Prepared for the Office of Naval Research, Organizational Effectiveness Research Programs, Arlington, VA, September 1978.
- Ramírez, III, M.; Cox, B.C.; & Castañeda, A. *The psychodynamics of biculturalism*. Paper prepared for the Office of Naval Research, Organizational Effectiveness Research Programs, Arlington, VA, June 1977.
- Raspberry, W. Training for jobs that aren't there? *The Washington Post*, October 22, 1979.
- Reichman, S.W., & Grasha, A.F. A rational approach to developing and assessing the construct validity of a student learning style scales instrument. *The Journal of Psychology*, 1974, 87, 213-223.
- Roldan, A.S.J. *Personality types and holiness*. (G. McCaskey, M.D., Trans.) Staten Island, NY: Alba House, 1968.
- Rotundo, B. *Project Priority: Occupational emphasis, 1975-1976; A VEA funded project. Final report*. Albany: State University of New York, Two-Year College, Student Development Center, 1976.
- Sabatino, D.A., & Hayden, D.L. Variation in information processing behaviors. *Journal of Learning Disabilities*, 1970, 3, 404, 412.
- Samples, R. *The metaphoric mind: A celebration of creative consciousness*. Reading, MA: Addison-Wesley Publishing Company, 1976.
- Schlesinger, H.J. Cognitive attitudes in relation to susceptibility to interference. *Journal of Personality*, 1954, 22, 354-374.

- Schroder, H.M.; Driver, M.J.; & Streufert, S. *Human information processing*. New York: Holt, Rinehart, and Winston, 1967.
- Schroeder, A.V. *A study of the relationship between student and teacher: Cognitive styles in student-derived teacher evaluation*. Unpublished doctoral dissertation, Wayne State University, 1970.
- Schwartz, F.G. *Validation of the generalizing-particularizing dimension of cognitive style and its implications for meaningful learning*. Unpublished doctoral dissertation, City University of New York, 1972.
- Scott, N.C., Jr. Strategy of inquiry and styles of categorization: A three-year exploratory study. *Journal of Research in Science Teaching*, 1970, 7(2), 95-102.
- Scott, N.C., Jr. *Cognitive style and inquiry strategy: A five-year study*. Paper presented at the annual meeting of the American Educational Research Association, 1972.
- Selz, N., & Ashley, W.L. *Teaching for transfer: A perspective*. Columbus, OH: The Ohio State University, The National Center for Research in Vocational Education, 1978.
- Shade, B. A black cognitive style? Royalties support study of that question and others. *Wisconsin Research & Development Center News*, 1979, 3.
- Sheriff, D.E. *A factor analysis study of Hill's cognitive style inventory*. Unpublished doctoral dissertation, Texas A&M University, 1977.
- Shouksmith, G. *Intelligence, creativity, and cognitive style*. New York: Wiley Interscience, 1970.
- Shuntich, M.E., & Kirkhorn, J. *Learning styles inventories and self-instructional modules in dental auxiliary education*. Lexington, KY: University of Kentucky, College of Allied Health Professions, August 1979.
- Sigel, I.E., & Olmstead, P. *Modification of cognitive skills among lower-class Negro children: A follow-up training study* (Report No. 6). Detroit: Merrill-Palmer Institute, Michigan State University, 1968.
- Stump, R.W. Transferable skills and job changes. To be published in *Proceedings* of the annual conference of the American Society of Trainers and Developers, 1979.
- Suchman, J.R. *Inquiry development program in physical science*. Chicago: Science Research Associates, 1965.
- Suchman, J.R. *Developing inquiry*. Chicago: Science Research Associates, 1966.
- Suojanen, W.W. *Star Trek notes: The human central nervous system, organization, and future of management science*. Paper to be presented at the Western Academy of Management, Phoenix, Arizona, March 27-29, 1980.
- Taba, H. *Curriculum development: Theory and practice*. New York: Harcourt, Brace, & World, 1962.

- Thibodeau, J. Adult performance on Piagetian tasks: Implications for education. *Proceedings for the Twentieth Annual Adult Education Research Conference*, Ann Arbor, MI, April 4-6, 1979.
- Tough, A. Major learning efforts: Recent research and future directions. *Adult Education*, 1978, 28,
- Tyler, L.E. *Individuality: Human possibilities and personal choice in the psychological development of men and women*. San Francisco: Jossey-Bass Publishers, 1978.
- Vernon, P.E. Multivariate approaches to the study of cognitive styles. In J. R. Royce (Ed.), *Multivariate analysis and psychological theory*. New York: Academic Press, 1973.
- Wallach, M.A., & Kogan, M. *Modes of thinking in young children*. New York: Holt, Rinehart, and Winston, 1965.
- Wasser, L. *An investigation into cognitive style as a facet of teachers' systems of student appraisal*. Unpublished doctoral dissertation, University of Michigan, 1969.
- Winter, D.G.; Stewart, A.J.; & McClelland, D.C. Grading the effects of a liberal arts education. *Psychology Today*, 1978, 19, 69-75.
- Witkin, H.A. A cognitive style approach to cross-cultural perspective. *International Journal of Psychology*, 1967, 2, 233-250.
- Witkin, H.A. *The role of cognitive style, academic performance, and teacher-student relations*. Research Bulletin 73-11, Princeton, NJ: Educational Testing Services, 1973.
- Witkin, H.A. *Field-dependent and field-independent cognitive styles and their educational implications*. Princeton, NJ: Educational Testing Services, June 1975.
- Witkin, H.A. Cognitive style in academic performance and in teacher-student relations. In Messick, S., & Associates (Eds.), *Individuality in learning*. San Francisco: Jossey-Bass Publishers, 1976.
- Witkin, H.A., et al. *Personality through perception: An experimental and clinical study*. Westport, CT: Greenwood, 1954.
- Witkin, H.A.; Goodenough, D.R.; & Karp, S.A. Stability of cognitive style from childhood to young adulthood. *Journal of Personality and Social Psychology*, 1967, 7, 291-300.
- Woodruff, A.D. Cognitive models of learning and instruction. In L. Siegel (Ed.), *Instruction: Some contemporary viewpoints*. San Francisco: Chandler Publishing Company, 1967.
- Wu, J.J. *Cognitive style and task performance: A study of student teachers*. Unpublished doctoral dissertation, University of Minnesota, 1967.
- Wyett, J.L. *A pilot study to analyze cognitive style and teaching style with reference to selected strata of the defined educational sciences*. Unpublished doctoral dissertation, Wayne State University, 1967.

Yando, R.M., & Kagan, J.S. The effect of teacher tempo on the child. *Child Development*, 1968, 39, 27-34.

Yeatts, P.O., & Strag, G.A. Flexibility of cognitive style and its relation to academic achievement in fourth and sixth grades. *Journal of Educational Research*, 1971, 64, 345-346.

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