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ABSTRACT

This monograph reviews several approaches for describing learning styles and the instructional implications of an emphasis on learning styles for teachers. Several reasons for the importance of understanding individual learning styles are provided; such understanding leads to: (1) reduction of teacher and student frustration; (2) higher student achievement and an improved self-concept; (3) accommodation of a variety of learners in a classroom; (4) the versatility that is crucial to learning; and (5) improved communication with administrators, parents, counselors, and other staff. Cognitive, affective, and physiological learning styles are considered. Approaches for describing cognitive styles include brain theories, conceptual tempo, field dependence/field independence, mind styles, modalities and multiple intelligences. Approaches for describing affective styles include conceptual systems theory and psychological types. Finally, approaches for describing physiological styles revolve around elements of learning styles which have been classified into four kinds of stimuli: environmental, emotional, sociological, and physical. Six approaches for incorporating instruction that takes learning styles into account in the classroom are provided. They are: (1) pedagogical intelligence; (2) Carol Hall's Living Classroom; (3) whole language; (4) Foxfire activities; (5) the 4MAT System; and (6) the DICSIE (Describe, Interact, Control, Select, Instruct, Evaluate) Model. It is concluded that teachers pass through several stages in their understanding of children's learning styles, and it is emphasized that administrative support, staff development, peer coaching, parent education, and personal determination and commitment are crucial in a positive learning styles classroom. A bibliography of 172 references is appended. (GLR)

What Research Says to the Teacher

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Learning Styles

by Judith C. Reiff

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INTRODUCTION

Have you ever had a student who moaned, "I don't understand," or exclaimed, "I'm finished," before you've handed out all the papers? Have you ever wondered why the same assignment doesn't work for everyone? Or why you seem unable to reach certain students? Researchers have been arguing for decades over what method or text is the "best" one. Of course, teacher personality and teaching competence are crucial variables, but the child is the key to learning. The more we can know and understand the complex child, the more effective and efficient will be the teaching and learning process. We know people think and act differently, yet that fact becomes lost in the education process. We may not understand precisely how or in what way individuals differ. This monograph will review several approaches for describing learning styles and the instructional implications for teachers. Learning about style is important for several reasons.

Reducing Frustration for Students and Teachers

A better understanding of self can help teachers reduce frustration for themselves and their students (32, 59*). We all have unique fingerprints and tongue prints; we all sign our names in different ways. We don't expect people with high blood pressure to take the same medicine. Neither should we expect all students to learn the same way or all teachers to teach the same way. To better understand the individual differences of children, teachers first need to "understand their own learning styles." With personal insight, teachers are apt to be more tolerant of different learners.

What type of learner are you? Have you ever felt stupid or silly sitting in a classroom? Did you feel different or wonder, "Why can't I learn that?" Many children are sitting in classrooms with the same feelings of stress and frustration because they don't understand what is being taught. These students are labeled "at risk" or "attention deficit" because well-meaning teachers perceive learning deficiencies here. Teachers seem to understand and even favor students whose styles are similar to their own. If the learning styles of teachers and students are extremely different, then mislabeling of children as hyperactive or slow may occur when their styles are just different (155).

Teachers can help children become aware of individual learning differences and their own learning styles; then students can appreciate their uniqueness with a positive attitude. They need to feel their styles are accepted rather than feeling weird. Even successful graduate students have confessed that all through their school years they felt strange and different. They wondered,

*Numbers in parentheses appearing in the text refer to the Bibliography beginning on page 34.

"What's wrong with me?" Their ways of thinking were not the same as those of the teacher or their peers. As you read this monograph, consider how you relate to the different styles that are presented. Consider how your own style affects your teaching and your expectations of your students.

Improving Self-Concept and Achievement

Do you have students who seem unmotivated, apathetic with low self-esteem? These factors will contribute to low achievement or becoming an at-risk student. Unmotivated students lack persistence in meeting their goals; this leads to missed opportunities resulting in deficiencies. When low achievement occurs, apathy is used as a shield to protect the student's low self-esteem or lack of skill. Schools too often force children into seeing themselves as "successful achievers or apathetic non-doers"; the apathy becomes a coverup to protect self-worth (131). When individual differences are considered, many researchers contend children will have higher achievement, a more positive attitude, and an improved self-concept (29, 41, 58, 84, 134, 166). When students are more motivated, their learning becomes a meaningful experience in all content areas (34).

Planning and Managing

The teacher with learning style knowledge can plan more appropriate lessons to accommodate a variety of learners in a classroom. If the teacher does not consciously plan to accommodate different learners, then the same strategies, which could negatively affect certain children, may be used repeatedly. Planning appropriate and varied lessons will improve both instruction and management (13, 94, 172). Thus, providing for individual differences is an efficient and organized approach to teaching. Realistically, a teacher cannot be expected to have a different lesson for every child in the classroom; however, lessons can reflect an understanding of individual differences by appropriately incorporating strategies for a variety of styles. Understanding theories of style can help teachers become better planners to meet the learning needs of their students (34, 111).

Increasing Variability and Flexibility

Even though students and teachers have preferred styles, they should be able to adapt and change styles; but individuals differ in their ability to be flexible (70). "Teachers who rigidly adhere to a given style will almost never reach a majority of their students, because they are too locked into what works for them. The same could be said about administrators who work with teachers. Students will also differ in their flexibility" (155, p.369). Therefore, versatility is crucial in the classroom if learning is to occur. Effective teachers demon-

strate flexibility by using a variety of instructional techniques in the classroom (52, 141). This overview of learning style research and terminology will provide a theoretical basis for versatile teaching (137).

Improving Communication

Teachers need to share learning style information with administrators, parents, counselors, special education teachers, and other staff. A cooperative team effort is always more effective in working with students. Learning style understanding provides teachers with a powerful vehicle for communication.

BACKGROUND

Accounting for individual differences is not a new phenomenon. As early as 334 B.C., Aristotle said that "each child possessed specific talents and skills and discussed the concept of individual differences in young children" (123, p. 8). In the early 1900s, several personality theories and classifications for individual differences were advanced; these focused especially on the relationship between memory and visual or oral instructional methods (1, 71, 84, 89, 103, 169). The research in learning styles then declined due to the emphasis on the student's I.Q. and academic achievement. An additional problem was the lack of communication between psychologists and educators. Now in the late 1900s there is a renewed interest in learning styles research and many educators are attempting to apply the results within the classroom (39, 59).

OVERVIEW

Learning styles can be defined, classified, and identified in many different ways (47, 87). Generally, they are overall patterns that provide direction to learning and teaching (32). Learning style can also be described as a set of factors, behaviors, and attitudes that facilitate learning for an individual in a given situation (17). There is no one right way to learn or to teach, but there are certain styles that are more appropriate for a given situation. Thus, when an individual learns, the style may be unique to the task or it may duplicate a previous experience.

Styles influence how students learn, how teachers teach, and how they

interact. Each person is born with certain tendencies toward particular styles, but these biological or inherited characteristics are influenced by culture, personal experiences, maturation, and development (32). Style can be considered a "contextual" variable or construct because what the learner brings to the learning experience is as much a part of the context as are the more salient features of the experience itself (124, 125).

Some researchers believe a useful approach for understanding and describing learning styles is to consider three areas: cognitive, affective, and physiological (32, 59, 83, 84, 85, 86, 136). Teachers realize the difficulty in compartmentalizing concepts into neat categories because there is overlap of terms and meaning. Yet, the reader may find the classification helpful in understanding the complexity and comprehensiveness of learning styles. These terms are not meant to add another label to a child but rather to enhance understanding of individual differences. (See Table 1.)

Cognitive style is defined by Messick (114) as the way a person perceives, remembers, thinks, and solves problems. Messick distinguishes cognitive style from general cognitive abilities for the following reasons: style focuses on "*how* I learn" and abilities focus on "*what* I learn"; style is bipolar or on a continuum, i.e., sequential to global; abilities are unipolar or measured with a single score such as a percentile. Ability scores have a judgment placed on them whether they are excellent, average, or poor; style scores or style characteristics are not right or wrong.

How do you process experiences and knowledge? How do you organize and retain information? Are you analytical or global? Do you work quickly or deliberately? Do you need to visualize the task before starting? Do you approach learning and teaching sequentially or randomly? These are examples of cognitive style characteristics.

Affective components of learning styles include personality and emotional characteristics related to areas such as persistence, locus of control, responsibility, motivation, and peer interaction (42, 95, 119). Do you prefer working by yourself or with peers? Are you more competitive or cooperative? How do you respond to verbal or token reinforcement?

The *physiological* component is biologically based and relates to sex differences, nutrition, and reaction to physical environment (42, 83). Are you a morning, afternoon, or night person? Do you need frequent breaks? Does background music or a snack help you to concentrate while studying or does it distract you? Are you bothered by a room that is too cool or too warm?

As you read this monograph, ask similar questions about yourself and your students. "In education, the time has come to vary the track conditions so that more runners can finish strong" (33).

Table 1
Learning Style Profile

Cognitive

Brain Dominance
- ☐ Analytical
- ☐ Global
- ☐ Integrated

Conceptual Tempo
- ☐ Impulsive
- ☐ Reflective

Mindstyles
- ☐ Concrete sequential
- ☐ Abstract random
- ☐ Abstract sequential
- ☐ Concrete random

Modality
- ☐ Visual
- ☐ Auditory
- ☐ Tactile
- ☐ Kinesthetic
- ☐ Integrated

Multiple Intelligences
- ☐ Bodily Kinesthetic
- ☐ Linguistic
- ☐ Musical
- ☐ Spatial
- ☐ Intrapersonal
- ☐ Interpersonal

Psychological Differentiation
- ☐ Field dependence
- ☐ Field independence

Affective

Conceptual Level
- ☐ High
- ☐ Low

Psychological Types
- ☐ Thinker
- ☐ Sensor
- ☐ Feeler
- ☐ Intuitor

Physiological

Elements
- ☐ Environmental
  sound, light, temperature, design
- ☐ Emotional
  motivation, persistence, responsibility, structure
- ☐ Sociological
  self, pair, peers, team, adult, varied
- ☐ Physical
  perceptual, intake, time, mobility

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COGNITIVE STYLES

Brain Theories

The brain has been compared to a radio, a telephone network, or a computer but actually it is much more complex. The brain weighs only a pound at birth, it will gain a second pound during the child's first year and another pound by age 16. However, we use only a small portion of the brain's capabilities (54, 55).

Brain theory can be traced to early Greek philosophers. They believed the mind was in the heart because an injury there was fatal. They also thought the mind was in the liver, which excreted bile influencing an individual's moods. Too much bile produced anger. Too much phlegm made someone passive or phlegmatic. We are still trying to understand how the mind influences personality. In the late 1700s Franz Gall, a German scientist, equated certain bumps on the head with particular talents and characteristics, which has come to be known as phrenology. This theory has been refuted along with physiognomy, the association of physical traits and intelligence—i.e., a high forehead means high intelligence (55).

Paul Broca in the mid-1800s proposed the classic hemispheric dominance theory that particular characteristics were associated with each side of the brain. Initially, researchers believed the left side of the brain had the higher faculties and was more dominant. By the late 1800s John Jackson was questioning the left brain dominant theory. He considered the right brain to be the "neglected hemisphere" (153). During the early 1900s Wilder Penfield pioneered the use of direct electrical stimulation on certain areas of the brain during surgery. Jun Wada further supported the theory that brain functions could be localized across hemispheres by anesthetizing one hemisphere at a time (138, 153).

Brain theory research made tremendous strides during the 1950s when Roger Sperry at the California Institute of Technology was able to sever the corpus callosum, the nerve fibers between the two cerebral hemispheres, and study each of the hemispheres in isolation. He initially worked with animals to demonstrate that their habits remained the same, but when trained they had two independent minds with recognition, memory, and decision systems. Additional work with epileptic patients had similar results.

Sperry's split-brain theory or cerebral specialization research has established that the two hemispheres of the brain process information differently. Individuals do not learn with only one hemisphere, but there may be a preference for one or the other processing strategies (99). Both hemispheres are equally important and need to be considered to reach optimum potential. Characteristics of the left hemisphere include verbal, sequential, and analytical abilities. Dominant functions of the right hemisphere are global, holistic, and visual-spatial. Other characteristics have been associated with each side but

these are controversial. In 1981 Sperry received the Nobel Prize for his research (55, 138, 153).

Since the 1970s more sophisticated brain research techniques have been used to determine individual differences by computer, analyzing the brain's electrical patterns. The possibilities for understanding the complex questions about human development and uniqueness are linked to brain theory (28, 158). As educators, we need to be mindful of this research and its implications for instruction. Each hemisphere contributes its specialized functions to all cognitive activities. Teaching needs to be a balanced or integrated use of hemispheres. In other words, the brain processes information in different ways other than analytical and verbal; thus, instruction should be varied (138).

Activities primarily associated with the right hemisphere benefit all children (55, 109, 142). Curriculum integration meets the needs of all learners. Music, art, and creative activities will motivate and stimulate a holistic or laterally balanced approach to learning (54, 162).

The October 1990 issue of *Educational Leadership* was devoted to "Learning Styles and the Brain." Testimonies from teachers, curriculum coordinators, and researchers support the growing impact throughout the country of recognizing learning style differences. Caine and Caine (19) state "Although we all have the same set of systems, including our senses and basic emotions, they are integrated differently in each and every brain" (69). These researchers maintain that understanding how the brain functions and recognizing the diversity of individuals is not an isolated or separate movement in education; rather, "it is an approach from which all education will ultimately benefit" (p. 70).

Conceptual Tempo

Teachers can easily observe extremely impulsive or reflective students. Conceptual tempo refers to an individual's consistent tendency to approach problem situations either rapidly or cautiously with accuracy or inaccuracy. It also relates to the behavior exhibited in the classroom. Research by Kagan, Kogan and others established its primary characteristics (79, 90, 91, 98).

The most common instrument for assessing conceptual tempo is the Matching Familiar Figures Test (78) in which a student is shown six similar pictures and a primary picture to match. The respondent's task is to select the picture exactly like the primary picture. Two scores result from the instrument: the time in seconds it takes the student to begin to respond, or the latency score, and the error score or number of errors the student makes before choosing the correct picture.

Impulsive children are quick to respond, risk takers, easily bored, curious, easily frustrated, distractible, and less able to concentrate. Impulsive children work fast to get an answer; reflective children work to avoid errors. Reflective learners do not want to be wrong, or humiliated. They are able to concentrate, analyze, prefer working on solitary tasks, and are emotionally controlled.

One-third of preschool and elementary students seem to be impulsive (82, 150). Children tend to become more reflective with age but extreme tendencies will continue (77).

Impulsive behavior is often negatively viewed and considered counterproductive to learning in the classroom. These learners may cause more frustration and teacher burnout than any other type, especially if there is an extreme mismatch between the conceptual tempo of the instruction and the learners. Frequently, impulsive children are labeled behavior disordered or hyperactive because they have more externalized behavior problems. Although reflective and impulsive children can have above-average intelligence, boys retained in first grade frequently are more impulsive than classmates with similar IQs (77, 113).

Reflectivity was found to be an effective predictor of academic achievement in first grade, especially in the areas of vocabulary, total auditory, and total reading. Listening comprehension and total mathematics results were not any different for impulsives or reflectives (106). Reflectives were better than impulsives in arithmetic skills, set language, and problem solving (129).

Impulsiveness is not the sole cause of learning difficulties but it can interfere with learning. Teachers need to know that impulsives (1) fail to adequately attend to tasks; (2) have difficulty considering quick decisions and alternatives to problems; (3) are less systematic in their information search (96); (4) produce and test fewer hypotheses; (5) underestimate time intervals, which leads to inefficient problem solving; and (6) are impatient and want immediate gratification (36). The teacher must model and help impulsives practice strategies to solve problems (105, 112, 160).

Research indicates neither impulsivity nor reflectivity is superior for all learning tasks (128). However, reflective children use specific strategies effectively for particular tasks. For instance, reflective children were more successful at detailed visual scanning such as recalling details of a story. They also had more understanding of multiple meanings. But when the impulsive child was prompted and aided by the test administrator, the differences decreased (16). Reflective children were more successful at inductive reasoning (specific to general). Interestingly, reflective students also have more systematic eye movement and analyze by units (140). Impulsive children seem to be better at responding to global questions, but both impulsives and reflectives can respond analytically or globally with reinforcement (102, 96). Reflectives use teacher feedback for self-analyzing and problem solving (20).

See Table 2 for suggested strategies to use with reflective and impulsive learners.

Table 2
Strategies for Reflective and Impulsive Learners

Reflective Learners

1. Allow time for thorough examination of material.
2. Organize proofing of work.
3. Model risk taking as a teacher to show error is human.
4. Include cooperative learning to reduce anxiety.
5. Reduce test-taking anxiety by simulating test-taking procedures in the first month of school and continuing throughout the year.

Impulsive Learners

1. Structure time into small segments.
2. Break material into smaller components.
3. Provide a nondistractible environment.
4. Provide explicit guidelines and directions.
5. Have students create a situation from comic strips.
6. Model thinking modification techniques.
7. Reward students with concrete tokens for delayed behavior.
8. Use role play and simulations.
9. Use bodily kinesthetic activities.

As with each learning style construct, awareness of and appreciation for all learners are crucial. The teacher must also decide whether the instructional conceptual tempo is too slow or too fast for particular students. If there is an extreme mismatch, then both teacher and child will experience frustration. The teacher's attitude and expectations in dealing with these learners will determine the classroom atmosphere, student achievement, and student attitude.

Field Dependence/Field Independence

The dimension of field dependence/field independence continues to be one of the most researched learning style areas; it concerns how people learn and memorize when faced with complex material or situations. Four paper/pencil tests of geometric shapes can be administered to determine field independence/field dependence: (1) the adult Embedded Figures Test (171); (2) a preschool version (31); (3) the children's version (ages 5–10) (81); and (4) the Group Embedded Figures test (122).

Subjects are shown a simple shape and a complex design within which the simple shape is hidden; they must isolate the simple figure from the complex design (50). For example:

Can you find this shape in this design?

Herman Witkin, the father of field dependence/field independence determined that an extremely *field dependent* individual is dominated by the field or the surrounding area of the complex figure, has difficulty isolating the hidden figure, and is more global. An extremely *field independent* person is not distracted by irrelevant background material, can distinguish parts of the whole, is more analytical, and can separate the hidden or embedded figure (166, 167, 170).

The Embedded Figures Test is nonverbal, which makes it appropriate to use across cultures. Different societies, especially technical ones, seem to promote certain learning styles (132). The traditional American school is clearly oriented around the more analytic field independent cognitive style. Anderson (3) and Jones (72) maintain a mismatch can occur if the multiethnic culture is more holistic, affective, and field dependent. Janice Hale-Benson (61) discusses the issue of learning style from the Black perspective. How culture relates to style is a controversial but significant question (132).

Even though field dependence/field independence initially focused on research with visual perception, this construct is now associated with personality and social factors (101, 145, 167, 168). Field independent students are less dependent on social cues and interpersonal skills. Garner and Cole (51) found that nonachieving seventh graders of lower socioeconomic status, when compared to achieving students from the same background, had characteristics of field dependence: they were externally controlled, not analytical, and more sensitive to social cues.

Field dependent and field independent students have the same intellectual capacity. However, it is in their ability to use the information and the way they process material that differences emerge (147). Field independent students have more cognitive flexibility than field dependent students (60, 116, 145, 167). They are more flexible in their problem-solving approaches and the way they attack new materials. Field independents are more task oriented and able to focus attention on the relevant aspects of a task (11).

Field independent students seem to favor math and science; whereas field dependents respond more positively to the humanities and the social studies area (146). These characteristics enable field independents to attain higher success in mathematics based on standardized tests of math achievement (148, 156, 161, 170). Field independents also had more positive attitudes toward math (104). Clements (30) found that field independence related to computer competence, especially the higher-order skills of logo processing. In the area of reading, the field dependent students seem to be more dominated by the surface meaning and not as capable of obtaining and using word knowledge, which affected comprehension skills (133).

It is important that teachers realize the difficulties field dependent students have with particular subjects and instructional methods. Again, these students

are just as capable as their peers, but they need different teaching strategies. For example, they respond well to group activities, discussion, cooperative learning, and peer teaching (146). Worksheets should be reviewed to determine if they contain an excessive amount of information or the material is crowded. Word searches or letter finds are fun activities if the teacher realizes some children might be frustrated or pressured, especially if time is a factor. Color-cueing in vocabulary development, map skills, and other content areas would be a beneficial aid (93).

To help the field dependent student organize material, the teacher could provide outlines and summaries for new information. In addition, instruction on how to organize and analyze various topics would be helpful. Modeling by the teacher is another strategy that could prove especially useful to field dependent students.

Guild and Garger (59) have applied information about field dependence/field independence to supervisors and administrators. Field independent teachers have certain expectations from administrators and supervisors to allow independence and flexibility, focus on tasks, provide information directly, and to maintain a professional atmosphere. Field dependent teachers would prefer supportive administrators who provide an open atmosphere by seeking their opinions and being interested in them personally. They want supervisors to emphasize the affective domain in the classroom rather than the content; a written report with verbal feedback is preferred rather than a list of standard criteria.

Guild and Garger (59) compare individual differences to the pearl oyster. "Irritations get into the oyster's shell, and the oyster doesn't like them. But when it accepts their reality, it settles down to make one of the most beautiful things in the world—a pearl" (p. 97).

The following is a summary of the characteristics of field dependent and field independent students:

Field dependent students—

1. are global.
2. have more difficulty isolating a shape from a surrounding area.
3. benefit from cooperative learning.
4. need strategies to help organize and comprehend material (analogies, outlines, color-cues).
5. need teacher to model how to organize information.
6. have problems with crowded/busy worksheets.

Field independent students—

1. are analytical.
2. can isolate a shape from a surrounding area.
3. are more internally motivated.
4. have more cognitive flexibility.
5. like internally independent projects.

Mindstyles

Gregorc (56, 58) maintains that individuals think either abstractly or concretely and their thoughts are organized either sequentially or randomly. He outlines four distinct patterns of thinking styles: (1) Concrete Sequential, (2) Concrete Random, (3) Abstract Sequential, and (4) Abstract Random. Everyone exhibits all four patterns to a degree, but most people are stronger in one or two. The Gregorc Adult Transaction Ability Inventory (57) consists of 40 words in 10 sets of 4 words each. The individual ranks each set of 4 words from the word that best represents self to the one that is least descriptive. Again, there are no right or wrong answers. The following is a summary of the characteristics and strategies for each type of learner (18, 56, 58). The descriptions of these learners provide guidelines for teacher instruction. The inclusion of a variety of methods will meet the needs of all learners.

Concrete sequential learners derive information through direct, hands-on experience, or "seeing is believing." They appreciate order and logical sequence. They prefer touchable, concrete materials and a quiet atmosphere. Ordered, step-by-step presentations help these learners. Workbooks, computer-assisted instruction, and/or assembly kits would be appropriate strategies for this type of learner. An assessment of the concrete sequential learner could include time lines, diorama, or graphs.

Concrete random learners are characterized by divergent experimental attitudes or seeing what "makes things tick." They are thought to have unconventional thinking because they use trial-and-error and a risk-taking approach while exploring unstructured problem-solving situations. They need guidance but not domination. They like games and simulations, independent study projects, brainstorming, and optional reading assignments. A product for assessment might include constructing an invention or creating an experiment.

Abstract sequential learners are characterized by excellent decoding abilities with written, verbal, and imagery symbols. They possess and like to use reading, listening, and visual skills. They like sequential and logical presentations such as slides and lectures. They appreciate extensive reading assignments, lectures, and analytical "thinking sessions." These students would excel in organizing and analyzing research and debating ideas.

Abstract random learners are emotional and imaginative. They learn holistically and prefer unstructured learning experiences such as group discussions and webbing. They would enjoy peer teaching. They like a busy environment and prefer freedom from rules and guidelines. This type of learner organizes material through reflection. Appropriate assessment products for them would be journals, illustrations, and interpretations.

Gregorc believes if the style of teacher and student are *matched* for a time, then a comfortable "path of least resistance" will occur. However, too much matching can change the path into a rut and lead to boredom. A short period of *mismatching* can result in new or varied experiences and an appreciation for

how the "other half" lives. On the other hand, extreme mismatching can lead to frustration, anger, avoidance behaviors, and procrastination. Long-term mismatching can result in major mental, emotional, and physical problems if the mismatch is not recognized and handled appropriately (56, 58).

Modalities

Learning modalities are the sensory channels or pathways through which individuals give, receive, and store information. Perception, memory, and sensation comprise the concept of modality (6, 7, 8). The modalities or senses include visual, auditory, tactile (haptic), kinesthetic, smell (olfactory), and taste. Barbe and Milone (6) conclude that in a classroom the students would be approximately 25–30 percent visual, 25–30 percent auditory, 15 percent tactile/kinesthetic, and 25–30 percent with mixed modalities. In other words, only 30 percent of the students will remember most of what is said in a classroom and another 30 percent will remember primarily what is seen (38).

Visual learners are those who learn by seeing. Auditory learners must hear what they are learning to really understand it. Tactile or tactual learners need to feel and touch to learn. Kinesthetic learners learn better if movement is involved. The terms *tactile* and *kinesthetic* are often used interchangeably.

Most students learn with all their modalities; however, some students may have unusual strengths and weaknesses in particular modalities. For example, students strong in the visual modality will be frustrated or confused with just verbal explanations. Students relying primarily on listening and hearing the sounds have an auditory modality strength (127).

Many students who are not doing well in school are tactile or kinesthetic learners (41). Instruction geared to the auditory learner can be a hindrance to tactile/kinesthetic learners, causing them to fall behind. Once this happens, students begin to lose confidence in themselves and resent school because of repeated failure. One of the key reasons at-risk children have trouble with school is that they tend to be tactile/kinesthetic learners (27). Bottroff-Hawes (15) maintains that one-third of students do not process auditorially and are educationally deaf. Teaching and learning strategies that include visual and kinesthetic experiences need to be provided for these individuals. Students with a tactile strength learn with manipulatives such as electroboards, circle games, and task cards. They must use their sense of touch. Role-playing, creative dramatics, and physical activities would enable kinesthetic learners to use their strengths (21, 40, 43). "Hard to reach and hard to teach students" are more successful when taught with different modality strategies.

An effective means to reach all learners is modality-based instruction; this consists of organizing around the different modalities to accommodate the needs of the learner (8). Teaching through modality strengths capitalizes on individual differences by providing for each type of modality learner. Generally speaking, with comparatively minor curriculum modifications, most

lessons can be adapted in such a way that visual, auditory, tactile, and kinesthetic learners can benefit. Modality-based instruction consists of using a variety of motivating introductory techniques and then providing alternative strategies when a student fails to grasp the skill or concept. If a learner does not initially understand the lesson, then the teacher needs to intervene, personalize instruction, and teach the lesson a different way. Barbe and Swassing (8) call this the "point of intervention."

Modalities and Other Factors

Age. Barbe and Swassing (8) found that modality strengths do vary and change with age. However, the research is conflicting about which modality is dominant at which age. In preschool children the modalities function relatively independent of one another. As the child develops, maturation and experience integrate the modalities. Consequently, more adults than children have mixed modality strengths (7).

Achievement. A significant relationship was found between the ability to use all learning modalities and achievement. This indicates that the ability to use all learning modalities may significantly affect the acquisition of academic skills. Although integrated modality learners are no more intelligent than those students with a single modality, they can process information effectively in whatever modality it is presented (7, 117). Individuals at any age with mixed modality strengths will have an easier time because they can process information in two or three modalities with equal efficiency.

Race. Modality strengths and race were not related. Culture will influence aspects of an individual's approach to learning, but generalizations cannot be made about modalities and race (61).

Handedness. Handedness and modality strengths were not related. No significant differences were found in the modality strengths of right- or left-handed children or adults (8). This suggests that modality strengths are not related to hemispheric dominance and that the opportunity to practice within each modality is the same for right- and left-handed students (7).

Gender. Gender has no bearing on modality characteristics among children or adults. There is no relationship between the dominant learning modality and gender, or between gender and the ability to function using each modality (7, 117, 134).

For more than 20 years, research on learning styles seems to indicate that the way teachers present information determines whether learning happens (110). However, controversy continues as to whether diagnosing and teaching to the modalities of students is ineffective (73, 80, 154) or effective (8, 24, 27, 40). Researchers have identified several problems that could affect the outcome of modality studies, specifically, and learning style studies, generally (12, 22, 32, 134). Some of these problems include the following:

1. The reliability and validity of the instruments used to assess learners should be questioned and researched. More sophisticated measures and instrument comparisons are needed. More than one type of assessment should be used to provide a learner style profile. Many informal pencil/paper modality inventories are on the market. However, the Swassing-Barbe Modality Index (9) is a kit with manipulatives to assess all modality areas for preschool children through adults.
2. The emphasis given to a particular modality within a selected basal textbook series (i.e., phonics) should be considered.
3. Isolating a modality is a problem because teachers routinely instruct in more than one modality at a time.
4. Even with a structured lesson, teachers will vary according to their particular teaching styles.
5. Children have different learning styles and respond to different teaching styles.
6. The length of the treatment varies considerably from one study to another.
7. Inappropriate pre- and post-assessment techniques for determining modality strengths may be used. The matching of the modality strength with the post-assessment has been shown to increase recall and recognition (88).

More consistency is needed regarding instrumentation, implementation, and assessment to determine the effects of the modality approach used. The research studies using stricter classification standards indicated more statistical significance between the modality strengths of the students and teaching to the same modality. In other words, analyzing children with an extreme or a dominant modality strength increased the possibility of significant findings. Evidence indicates that only a few students in a classroom have strong modality preferences and those individuals, particularly, would respond more to teaching strategies matched to their modality strengths (22, 38, 40).

Further investigations about modalities and learning style are necessary for understanding what factors will increase achievement and promote a positive attitude. If extreme modality characteristics are identified, then more studies are needed on how to accommodate these individual differences as well as the effect of matching styles and strategies (14, 33, 35). Ethnographic research or in-depth case studies should be conducted on students with specific modality characteristics. Other consistent learning style traits or behaviors may be found that interrelate to influence attitude and achievement.

Based on the inadequacies of some studies and the significant results of other research, the literature neither supports nor refutes absolutely the belief that the presentation of new material through the modality strength of the

learner produces more significant results than those presentations not considering the modality strength of the learner. The literature does support the use of multiple teaching strategies and using a variety of approaches to meet all modality strengths. Variability or flexibility on the part of the teacher seems to be the key to consistently improving achievement and attitude. According to Suydam (157), even though students learn math through different modalities, the use of tactile/kinesthetic materials was effective with students at all achievement levels. High achievers as well as low achievers profited from the use of materials usually associated with tactile/kinesthetic learners. This research supports the use of all modalities when teaching all students. Variability or flexibility on the part of the teacher seems to be the key to consistently improving achievement and attitude.

Multiple Intelligences

What is intelligence? Intelligence is a difficult concept to define or describe. A traditional response would probably be IQ = MA/CA X 100 as measured on a standardized intelligence test. However, in an interview in *Instructor*, Howard Gardner defines intelligence not as something that can be measured on a paper and pencil test but the ability to create products or solve problems that are valued in one or more cultural settings (149).

Gardner's "theory of multiple intelligences" (49) is considered one of the most exciting works currently being done in the field of learning. He maintains that society and schools reinforce certain types of intelligences by labeling a child, based on limited criteria, as gifted, learning disabled, or at risk. A broader definition of intelligence is needed—one that is not culture bound.

As a Harvard psychologist and co-director of Project Zero/Spectrum, Gardner has identified at least seven abilities/intelligences innate in everyone and developed depending on heredity and environment. According to Armstrong (4), this work supports the theory of multiple intelligences with "solid evidence from brain research, psychological testings, experiments with animals, developmental work with young children, descriptive accounts of exceptional ability, and cross-cultural studies. Multiple intelligences provides a solid foundation upon which to identify and develop a broad spectrum of abilities within every child" (p.15).

Bodily-Kinesthetic Intelligence

The mime exemplifies bodily-kinesthetic intelligence because an object, person, or action is presented through exaggerated movements to symbolize a thought, idea, or event. The body is used in skilled ways, with or without objects, involving fine and gross motor movement (49). Our society's emphasis on other intelligences may alienate many gifted bodily-kinesthetic students from school. For example, an inappropriate label is that a child is hyperactive. A variety of mobile activities would recognize the bodily-

kinesthetic intelligence. Role-playing, simulations, or pantomime could be used to introduce or reinforce a concepts. The student should be able to act out a verb rather than circling it on a piece of paper. Outside the classroom the bodily-kinesthetic person may excel as an athlete. But he or she should also be able to find success in the academic arena.

Linguistic Intelligence

These students are the communicators, poets, and journalists in the classroom. Linguistically gifted children had early language development and now think in words. They learn best by verbalizing, hearing, and seeing words. These learners have knowledge of word meaning or semantics; they are sensitive to word structure systems; and they are aware of the sound of words or phonology (48, 49). Writing limericks or Haiku, choral reading, and discussions are examples of activities where linguistic learners would excel.

Logical Mathematical Intelligence

Logical reasoning was highly regarded by the Greeks and is now a valued and necessary ability in this society. Piaget uses logical-mathematical intelligence as the focus of his developmental theory. Mathematical concepts must be introduced through a variety of approaches to meet the needs of all learners (157). The mathematically intelligent child loves puzzles, experiments, and discovering logical patterns. However, many educators maintain that logical reasoning has become more rote and prescribed rather than a problem-solving approach.

Musical Intelligence

The main components of music are pitch, melody, and rhythm. Oriental societies derive word meaning from pitch or the intonation of particular syllables. Complex rhythms are significant in many African cultures. Other societies stress different musical characteristics (49, 130). The child with musical intelligence needs to have musical activities planned outside the "music room" to bloom as much as the child gifted in language. To integrate music into the curriculum, the musical child would enjoy writing a ballad or rhyming song about a story, singing the names of the planets, or chanting spelling words to a beat.

Spatial Intelligence

These learners are more visual or think in pictures and images. Individuals with this intelligence are capable of mental imagery. They can imagine a scene without being there or without the help of visual stimuli (49). Reading maps, drawing graphs, doing puzzles and mazes are activities these students enjoy. However, too often the activities used to develop these skills are fill-in-the blank worksheets. Students need a number of spatial experiences with a

variety of materials—for example, folding and cutting paper, using clay and fingerpainting, or drawing a picture of how the story ended.

Interpersonal Intelligence

Students with interpersonal intelligence have many friends and are identified as the social butterflies at school. They are sensitive and caring about others. They can be "street smart" (4). They learn best in a social context, appropriate for the strategies of cooperative learning, simulations, and role play. They benefit from discussion and feedback from peers. Negative outcomes for this type of intelligence would produce bullies, gang leaders, and manipulators. The school day should allow ample time for the development of interpersonal intelligence.

Intrapersonal Intelligence

Intrapersonal intelligence can be defined as "access to one's own feeling of life" (49). Students with this type of intelligence are self-reliant, self-confident, and reflective. They need time to daydream and space to be alone. They have dominant personalities and respond to their intuition. Journal writing and independent projects are appropriate activities for these learners.

Current assessment procedures in the schools are not satisfactory for determining multiple intelligences (64). Assessment should be drawn from different sources with a variety of methods (159). The result would be a composite profile describing the student's multiple intelligences.

AFFECTIVE STYLES

Conceptual Systems Theory

The Conceptual-Systems Theory (68) considers primarily how individuals impose structure on the environment. People at the low conceptual level view society from a narrow perspective. Those at the high conceptual level relate to the environment from multiple dimensions (75). Harvey, Hunt, and Schroeder (63) maintain that individuals at the lowest conceptual level or stage 1 are more biased, rigid, and evaluative. The most complex individuals at the high conceptual level or stage 4 will be flexible, independent, and tolerant.

The Conceptual Level Inventory was devised by Hunt and associates (69) to measure how people think (middle grades through adult) or cognitive complexity. The individual is asked to respond within a time limit to each of six incomplete sentences. The six topics were chosen to determine how the subject handles conflict (criticism, uncertainty, disagreement) and authority (rules, parents, orders). Scoring is based on a definition of conceptual level, focusing on how one relates to self, others, and the environment.

Certain teacher behaviors have been associated with various conceptual levels. For instance, teachers with high conceptual complexity (1) are more helpful to students in evaluating information; (2) create more diverse learning settings; and (3) look at a problem from multiple viewpoints. Teacher behaviors consistently associated with high conceptual level scores are described as flexible, responsive, and adaptable, more capable of using alternative solutions, and more tolerant of stress (68, 70, 118).

In the classroom, students at the low conceptual level regard the environment as more fixed and rigid; they are not able to look at alternative solutions to problems. They need more structure and direction because they are not too independent or adaptive. Appropriate teaching strategies for these students would include programmed or sequenced learning, direct instruction, and computer-assisted instruction.

Students at the high conceptual level are more independent, needing less structure. The discovery approach, individual projects, problem solving, and choices of assignments would motivate and challenge them. Hunt maintains that teachers should aim for an *optimal mismatch* between the student's stage and the environment or strategy in order to "pull" the learner toward a higher conceptual level without overstressing (75). The strategies chosen should help accomplish this purpose (67).

Characteristics of individuals at the four conceptual levels or stages can be summarized as follows:

Stage 1. Rejects information not in own belief system; has fixed patterns of responses

Stage 2. Has difficulty seeing viewpoints of others; is breaking away from rigid rules and beliefs; has difficulty with interpersonal relations

Stage 3. Is beginning to take viewpoints of others; is developing more interpersonal skills

Stage 4. Has balanced perspective of task and interpersonal skills; can build new belief systems

Psychological Types

From his clinical observations, Jung (76) identified four different psychological types that influence how individuals learn, how they interact with other people, and how personality characteristics influence their behavior. He classified these types into how the individual makes decisions (thinking or feeling). The four processes are common to everyone, but individuals differ in how well and how much they use each one. Lawrence (95) has summarized and applied Jung's psychological types based on how people perceive reality and how they make decisions.

Perceiving

Sensing types relate best to the real world and concrete experiences. Their senses are particularly important to them in interpreting events. They have a strong awareness of reality and the present. Each previous experience is systematically linked to what is currently happening. The sensors prefer memorizing to finding reasons and are more interested in facts. They like to know the right way to solve problems and want an established routine. These individuals are more observant than imaginative. They are patient and able to attend to details.

Other individuals perceive and relate to the world more through *intuition* and their own interpretations of the world based on body language, imagination, and speculations. Intuitive students are more global and more apt to dislike detailed work. They like to use their imagination and may seem impulsive in solving problems. Understanding symbols and ideas comes easily to them.

The following characteristics summarize the differences in the ways sensing and intuitive types perceive the world:

Sensing Types	*Intuitive Types*
Realistic	Imaginative
Present-oriented	Like new events
Factual	Inventors of ideas
Like to memorize	Like problem solving
Sequential	Global
Patient with details	Impatient with routines

Decision Making

Some individuals are more *thinking* or objective in their decision making. These people tend to be logical, fair, and impersonal. The seem to favor ideas more than people. Their beliefs may seem dogmatic, their actions abrupt, and their responses tactless, though honest.

Feeling people make decisions based more on their emotions and insight than reason. They value personal relationships and harmony, and they are more externally motivated. Emotions govern their decision making, which may seem to fluctuate because of their wanting to agree with others.

The following characteristics summarize the differences in the ways thinking and feeling types make decisions:

Thinking Types	*Feeling Type*
Logical, objective	Subjective
More interested in ideas	More interested in ideas
Businesslike	Influenced by emotions
Value honesty over tact	Value harmony

These four functions—sensing, intuition, thinking, and feeling—will communicate differently depending on whether the individual is an extrovert or an introvert. Extremely extroverted persons wear their emotions on their sleeves and are more open, whereas introverts are more reflective and reserved. Jung believes that most people are both introverted and extroverted at various times but seem to have consistent particular personality characteristics in dealing with certain situations and people (95).

The Myers-Briggs Type inventory (119) is the most popular instrument to determine the combination of types a person might be. Application of the Jungian theory has been effective in all areas involving communication and human relations. "Learning styles are important because they are education-relevant expressions of the uniqueness of personalities"(75, p. 35).

PHYSIOLOGICAL STYLES

Learning Style Elements

A popular approach for viewing style was developed by Rita and Kenneth Dunn (41). The Learning Style Elements are classified into the following areas: environmental stimuli (sound, light, temperature, design); emotional stimuli (motivation, persistence, responsibility, structure); sociological stimuli (peers, self, pair, team, adult, varied); and physical stimuli (perception, intake, time, and mobility). Another category has been added but it is not part of the test: psychological (global/analytical, hemisphericity, impulsive/reflective). These researchers have conducted and synthesized learning style studies for more than a decade. Their findings support increased achievement and an improved attitude when students' learning styles are matched to teaching methods (37, 40, 41).

Communication about learning style research and its application to the classroom have been facilitated through the Learning Style Center at St. John's University and Learning Styles Network Newsletter established by the Dunns (97). The newsletter highlights research and teaching practices related to learning styles. An extensive bibliography is also available.

Self-reporting instruments are available for children in grades 3–5, grades 6–12, and for adults. The responses are computer-scored. A printout is available for each student, along with a summary sheet for the total class (45, 46). An adaptation of these popular, widely used instruments resulted in the Picture Primary Inventory developed by Perrin (126) for children in kindergarten, grades 1 and 2. Questions are read while the pictures are shown to each child. Santora and Perrin (144) also wrote the *Elephant Story*, which introduces the children to individual differences through two elephants as playmates. Carbo adapted the Learning Style Elements to the area of reading (26). She developed a computerized Reading Style Inventory for students—first grade through adult (25). A printout summarizes the various environmental conditions most preferred by the student for reading as well as specific reading strengths. The computer printout also summarizes particular reading strategies that may or may not be appropriate. For instance, a student with poor auditory strengths would have as a recommendation "limit listening activities that focus on decoding" and a student with a strong kinesthetic preference would have the suggestion to "combine reading with making, building, doing, using floor games." Carbo stresses that phonics should be one of many methods to teach reading. Not all children can learn by this method and alternative approaches should be tried (22, 23, 37, 40).

Carbo and the Dunns have written extensively on techniques for modifying the environment with practical suggestions for incorporating manipulatives into the classroom (21, 26, 42, 43, 44). The Multisensory Instructional

Packages (MIP) are self-contained teaching units that focus on a single topic or skill. Multisensory activities are used to meet the needs of different learners, and feedback and evaluation are included as part of the activities. The Programmed Learning Sequence (PSL) is a step-by-step approach to learning that exposes children to material that progresses from easy to difficult with immediate feedback a necessary component. The Contract Activity Packages (CAP) focus on a single concept with alternative activities for the children to choose. Alternative reporting strategies such as brainstorming and team learning are also encouraged (26, 42). The use of these resources would be appropriate in any classroom to promote flexibility and variability.

APPLICATION

Pedagogical Intelligence

Rubin (143) defines pedagogical intelligence as the teacher knowing when to make the right decision about instruction based on cues from students. An understanding about individual differences and learning styles will provide teachers with the theory and knowledge upon which to base decisions. If teachers can determine why a student responds in a certain way, then they can make more intelligent decisions.

For instance, a teacher may recognize the need to enrich or modify the curriculum and use different resources to enhance lessons. Pedagogical intelligence can be improved in several ways (143). Beginning teachers, teachers new to a school system or grade level, should be provided with mentors for support and feedback. Colleges and universities must take a more active role in the monitoring process. Extended supervision would help remove the "ivory tower" stigma of professors in education. Teachers should be involved in cooperative planning and peer coaching (74, 111). Too often teachers believe they are performing in isolation to an audience of 25 students. Because teachers are professionals, charged with the awesome responsibility of guiding, directing, and instructing children, they need guidance, positive reinforcement, and direction. Feedback from peers is effective in improving and changing behaviors (5). Peers can provide teachers with a sounding board, as well as help in monitoring their progress and/or problems without involving their principals or others who might be more intimidating (121).

By planning together, videotaping, or studying different case studies, teachers can be better prepared to work with a variety of students and be more familiar with children's individual characteristics (13, 111, 143, 172). Videotaping enables teachers and others to analyze particular strengths and weaknesses for modification or change.

Other approaches to assisting teachers with decision making would be faculty/staff development sessions focusing on individual differences. Through staff development, teachers should be given training in observation techniques that would allow them some quick, easy, and effective ways to assess students' learning styles. Butler (18) offers these suggestions for incorporating a learning style philosophy into the classroom: observe the students; build on strengths; help students to be flexible; have students think about their own thinking; offer choices; and examine the curriculum. Additional approaches are discussed in the following pages.

Living Classroom

Many teachers unconsciously make pedagogical decisions reflective of a learning styles classroom. However, a conscious effort will make a difference. For example, with assistance from a Southern Bell grant, Carol Hall created the "Living Classroom" for her third graders, which addressed the different learning styles of all the children by linking learning to real life experiences. Content was integrated into student-focused activities; interest areas provided opportunities for students to practice, extend concepts or to generate new ones. Achievement scores and attitude were significantly improved (62).

Whole Language

The Whole Language approach addresses the different learning styles of children by teaching reading and writing through quality children's literature and using this literature to integrate the other curriculum areas. Every child's learning style need not be identified or specified, but through the variety of instructional options within this approach, all children can be successful (2, 53). Hayward (65) provides an excellent overview of the environment and +activities appropriate in a whole language classroom for making intelligent pedagogical decisions.

Foxfire Activities

The use of Foxfire activities developed by Eliot Wigginton (164) is another excellent example of how to accommodate various learning styles through a variety of activities related to real-life experiences. Foxfire began as a publication composed by students at all grade levels about community oral history, folklore, and folklife around Rabun County, Georgia. Classes tape and film the material about the mountain culture; then they organize and edit this rich information into articles for their publication. Some of the projects have included regional and ethnic festivals to present traditional arts such as dance, folk songs, and folk crafts. The activities have enriched the lives of both young and old. The Foxfire concept has spread to other areas of the country with particular classroom projects written for publication in one of the current 145 cultural journals (10, 151, 152).

4MAT System

In 1972 Bernice McCarthy developed a comprehensive instructional approach for meeting individual needs (107, 108, 109). She combined research on brain hemispheres, Kolb's learning cycle (92), and other theories to create an instructional model for teachers to use at any age level with any content area. The 4MAT System (107) systematically addresses the needs of the four

types of learners described by Kolb, in addition to right mode and left mode instructional strategies for each quadrant.

Kolb maintains that learning occurs depending on the way people perceive and process information. He further explains these two dimensions in his Experiential Learning Model. This represents a combined learning/problem-solving dimension that consists of four stages of a learning cycle rather than discrete, mutually exclusive types. The concrete experience stage (CE, feeling) emphasizes learning from particular experiences and special awareness of other individuals and feelings. The reflective observation stage (RO, watching and listening) has people looking at different points of view and reflecting before making decisions. At the abstract conceptualization stage (AC, thinking), learners depend on reason and theory to understand the problem. In the active experimentation stage (AE, doing), learners prefer being involved and seeing how things really work.

Learners in McCarthy's Quadrant 1 perceive information concretely and process it reflectively. They are the innovative and imaginative students who learn by listening, sharing ideas, and being personally involved. Step 1 (right mode) is to create an experience and step 2 (left mode) is to analyze the experience. These students ask "Why?" and want a reason for learning.

Quadrant 2 students are the analytical learners who perceive information abstractly and process by observing. School is comfortable for them. They are concerned about the question "What?" Step 3 (left mode) in this quadrant is to integrate the experience with current information; step 4 (right mode) is to acquire the knowledge and develop the skills.

The common sense learners in Quadrant 3 want to know "How does it work?" These learners perceive by thinking abstractly but they process by being active and experimenting. They want to problem solve by trying it out themselves. These students may find school irrelevant because they want to know how something can apply immediately. Step 5 (left mode) emphasizes practice with "defined givens," and Step 6 (right mode) stresses practice with a personal experience added.

Quadrant 4 students are the dynamic learners; they perceive through concrete experiences and they process actively. Their favorite question is "If . . . ?" Step 7 (left mode) is to analyze and synthesize for usefulness. Step 8 (right mode) is the application to more complex experiences.

McCarthy maintains that schools generally emphasize steps 4 and 5, providing information and its application. By exposing children to strategies appropriate for each quadrant, all learning styles will be accommodated. Students need to adapt and to learn flexibility when their styles are not being met. However, with this approach all students will be successful at least part of the time.

Wilkerson and White (165) evaluated the achievement and attitude of 50 third graders toward a unit on simple machines, comparing the 4MAT System

and a textbook approach. The 4MAT students performed higher on the content knowledge, application, and analysis test; there was no difference on the synthesis and evaluation test. The followup testing indicated the 4MAT group had better long-term retention. The students in both groups had similar attitudes toward studying science. However, the 4MAT children were more interested in learning the material, had a more positive attitude toward the lessons, and demonstrated more on-task behavior than the students in the textbook group. The teachers favored the 4MAT system.

This curriculum model is now being adapted for students at all levels of education and for most content areas. An exciting application of the 4MAT System is teaching its use to students for their own presentations and learning (163).

As McCarthy stated:

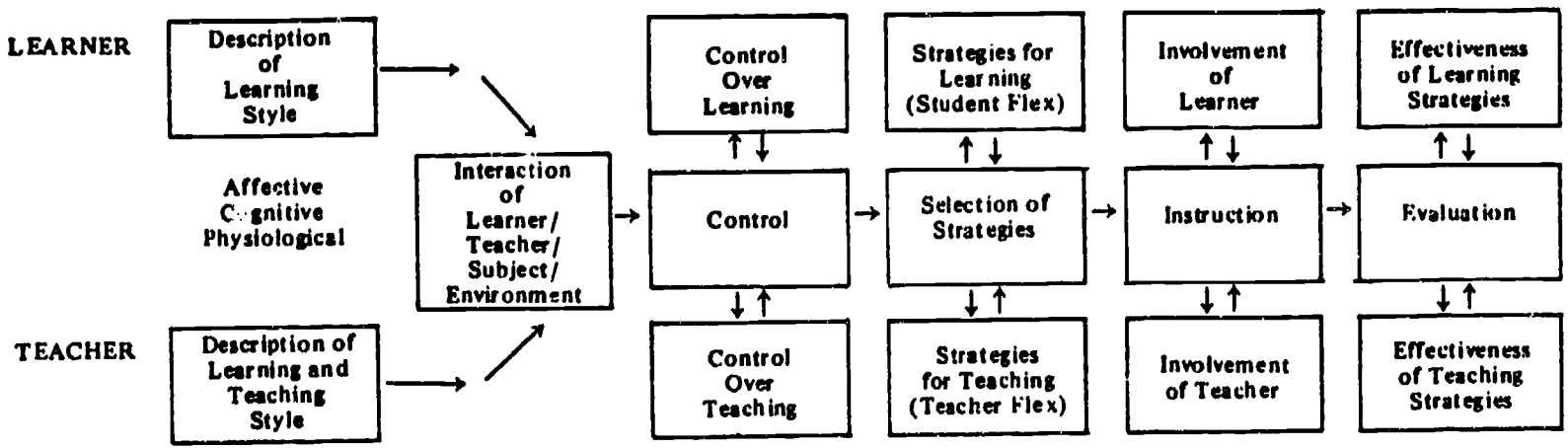
> The development and integration of all four modes of learning and the development and integration of both right and left brain processing skills should be a major goal of education. The more comfortable we are about who we are, the more freely we learn from others.
>
> Students will come to accept their strengths and learn to capitalize on them while developing a healthy respect for the uniqueness of others, and while furthering their ability to learn in alternative modes without the pressure of "being wrong." (107, p. 90)

DICSIE Model

The DICSIE Model is a systematic approach for personalizing instruction and understanding style. It consists of the following components: Describe, Interact, Control, Elect, Instruct, and Evaluate (135). (See Figure 1.) By incorporating the DICSIE model, the teacher is involving students in the learning process. Several alternative ways are needed to *describe* style, such as those mentioned in this monograph. Guild and Garger (59) summarize five techniques to help with describing: (1) informal inventories; (2) standardized measures; (3) student's products; (4) interviews; and (5) teacher observations. Style should not be described on the basis of a single measure.

A complex *interaction* occurs between the style of the teacher and the style of the learner. The environment and content also interact in the learning/teaching process. Students need to be in *control* of their learning by understanding and practicing the methods most effective for them. Teachers should promote student flex or flexible, versatile, and integrated styles of learning. Teachers use teacher flex when *selecting* a variety of appropriate instructional strategies (32). Students need to be involved during *instruction* and be active learners. They should be provided choices, appropriate materials, and activities.

Figure 1
DICSIE Model for Personalizing Instruction



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Evaluation must occur to determine the effectiveness of the teaching and learning process. Alternative evaluation methods will provide the teacher with more complete and accurate information about the capabilities of the students. For instance, student products, students working in pairs, simulated situations, questions on either audiotapes or computers are ways to test material by means other than pencil/paper. Students needing more structure and visual aids would benefit from study guides or study questions. Practice tests would be helpful for the student to become acquainted with the "testing style" of the teacher.

CONCLUSION

Teachers progress through several stages in their understanding of style. Initially, they may be curious; they may be generally aware of individual differences—perhaps the terms: analytical, global, or modalities. As teachers become more knowledgeable about style, excitement and enthusiasm for the teaching/learning options related to style will be evident. However, teachers also express *confusion* about the issues, instrumentation, and terminology; *skepticism* and *apprehension* may occur about how to adapt or modify teaching strategies for the various learning styles in the classroom. Eventually teachers move to the *cautious experimentation* stage where they change the room arrangement, attempt different teaching techniques, and try other procedures to accommodate individual learners. If teachers feel successful, then *confidence* and *acceptance* will follow; if the outcome is negative, however,they will become *discouraged, frustrated,* and *defeated.* Therefore, administrative support, staff development, peer coaching, parent education, along with personal determination and commitment, are crucial in a positive learning styles classroom. A total team effort is needed for teachers to be flexible, accommodating, and successful.

This monograph has summarized research in several learning style areas and provided suggestions for incorporating this approach into the classroom. Whatever stage you are in, we hope that you will return to your students and view them from a different perspective.

INSTRUCTION BEGINS WHEN YOU,
THE TEACHER, LEARN FROM THE LEARNER,
PUT YOURSELF IN HIS PLACE
SO THAT YOU MAY UNDERSTAND
WHAT HE LEARNS AND THE WAY HE UNDERSTANDS IT.
—Kierkegaard

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