Learning Style:

THE CLUE TO YOU

LSCY: Research and Implementation Manual

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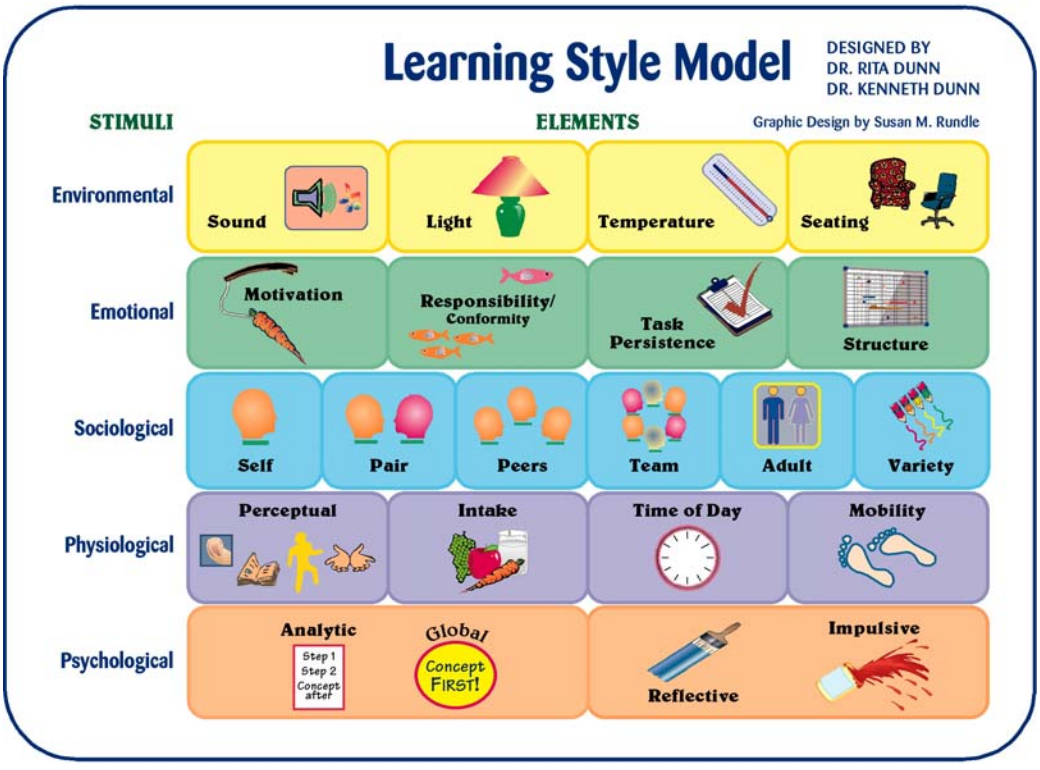
This manual was adapted by permission from the Teacher Manual for the *Global Learning Styles Education Program: Our Wonderful Learning Styles* (Dunn, 1998) by Professor Rita Dunn.

Chapter One

What are Learning Styles?

Learning styles are a combination of many biological and experientially imposed characteristics that contribute to concentration, each in its own way and all together as a unit. Learning style is more than merely whether a student remembers new and difficult information most easily by hearing, seeing, reading, writing, illustrating, verbalizing, or actively experiencing; perceptual strength is only one part of learning style. It is also more than whether a person processes information sequentially or analytically rather than in a holistic, simultaneous, global fashion; information-processing style is just one component of style. It is important to recognize not only individual behaviors, but to explore and examine the whole of each person's inclinations toward learning (Dunn, Thies, & Honigsfeld, 2001).

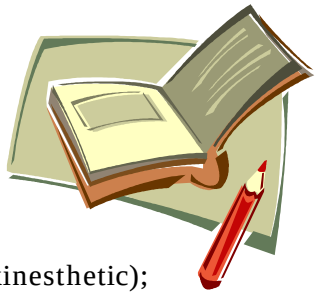


Learning style, as such, is the way in which each learner begins to concentrate on, process, absorb, and retain new and difficult information (Dunn & Dunn, 1992; 1993; 1999). The interaction of these elements occurs differently in everyone. Therefore, it is necessary to determine what is most likely to trigger each student's concentration, how to maintain it, and how to respond to his or her natural processing style to produce long-term memory and retention. To reveal these natural tendencies and styles, it is important to use a comprehensive model of learning style that identifies each individual's strengths and preferences across the full spectrum of physiological, sociological, psychological, emotional, and environmental elements. The Dunn and Dunn Learning-Style Model has spawned several diagnostic instruments to evaluate learning style; the first was introduced in 1976 and *Learning Style: The Clue to You!* (**LS:CY**!) was tested nationally in 1998. Whereas most diagnostic instruments are text-based, the **LS:CY**! assessment was designed specifically for both global and analytical students and incorporates visual stimuli into a didactic instrument (Burke, Guastello, et al., 1998/1999).

Teachers cannot correctly identify all the elements of learning style; some aspects are not observable to the experienced eye (Beaty, 1986. However, a properly administered learning-style identification instrument influences the learning experience positively and significantly increases aptitude and achievement.

How Do Learning Styles Develop?

More than three-fifths of a person's learning style is biologically imposed (Thies, 1979; 2001-2002). While concentrating on new and difficult academic information, an individual's learning style preferences can include:



- Quiet or background noise;
- Bright or low light;
- Formal or casual seating;
- Uninterrupted study or intermittent breaks;
- Perceptual modes (auditory, visual, tactile, and kinesthetic);
- Intake or no intake (snacking, chewing, or drinking);
- Varied periods during the day;
- Passivity or mobility; and
- Global or analytic processing styles (Dunn & Dunn, 1992; 1993).

Even among family members, learning styles vary. Mothers and fathers tend to have diametrically opposite learning styles; children often reflect the partial style of one parent but not the other; siblings learn differently from each other, and offspring do not necessarily reflect either parent's style. Because of the difference between their styles, one sibling may perform well while another may perform inadequately or unevenly in traditional schools that primarily respond to the styles of motivated, conforming, analytic learners. Siblings also relate differently to their parents.

Other elements develop as an outgrowth of students' experiences. Developmental elements of learning styles include:

- Motivation;
- A need for more or less structure;
- Conformity versus nonconformity; and
- Sociological preferences for learning.

Preferences for learning styles change over time (Dunn & Griggs, 1995). However, during a period in which an individual has strong style preferences, that person achieves most easily when taught with strategies and resources that complement those preferences. Although many people can learn basic information through an incompatible style, even accomplished professionals learn most easily through their learning-style strengths (Boyle, 2000; Boyle & Dunn, 1998; Lefkowitz, 1998; Miller & Dunn, 1997). The important thing to remember is that no single style is better or worse than any other. Everyone can learn; we all just learn differently.

The Dunn and Dunn Learning Styles Model

Since 1967, Drs. Rita and Kenneth Dunn have been compiling and scrutinizing educational literature and research concerned with how people learn. They found an abundance of research, dating as far back as 80 years, that repeatedly verified the individual differences among how students each begin to concentrate on, process, absorb, and retain new and difficult information.

- Initially, in 1972, the Dunns identified 12 variables that significantly differentiated among students; three years later, they reported 18 (1975); by 1979 they had incorporated hemispheric preference and global/analytic inclinations into their framework. Over the past two decades, research conducted by the Dunns, colleagues, doctoral students, graduate professors, and researchers internationally have documented that when students are taught according to their identified learning-style preferences, they display statistically increased academic

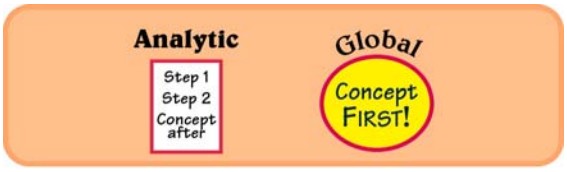
achievement, improved attitudes toward instruction, and better discipline, than when they are taught without attention to their preferred styles (*Research on the Dunn & Dunn Model* ..., 2005).

The current Dunn and Dunn Model includes 20 elements that, when classified, reveal that students are affected by their:

- Environment (sound, light, temperature, seating design);
- Emotionality (motivation, task persistence, responsibility/conformity, structure);
- Sociological preferences (learning alone, in pairs, in a small group of peers, as part of a team, with an adult, with variety or routines);
- Physiological characteristics (perceptual strengths, time of day, need for intake, mobility while learning); and
- Psychological processing inclinations (global/analytic, impulsive/reflective).

Identifying Characteristic Elements of Learning Style

Global versus Analytic Processing

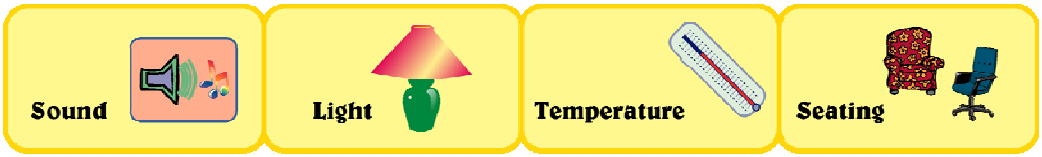


An analytic student can be characterized as one who learns most easily when information is presented step by step in a cumulative, sequential pattern that builds toward conceptual understanding. Global students, on the other hand, learn more easily when they either understand the concept first and can then concentrate on the details, or are introduced to the information through a story or anecdote replete with visual examples. Both types of reasoning, analytic and global, are a reflection of an individual's attempt to optimize the efficient use of neural space-brain capacity. Therefore whether individuals are global or analytic learners, they are capable of mastering the same information or skills if they are taught through instructional techniques that address their respective styles (Dunn, Bruno, Sklar, & Beaudry, 1990; Dunn, Cavanaugh, Eberle, & Zenhausern, 1982; Sagan, 2002).

This type of reasoning, or information-processing style, appears to evolve; the majority of elementary school children have global styles, but as children age and advance in school, some of them become more analytic. Additionally, analytic and global students appear to have different environmental and physiological needs. Analytics tend to prefer learning in quiet, well-lit, formal settings and of-

ten possess a strong emotional need to complete tasks they begin. They rarely feel the need to eat or drink while learning. Global students, on the other hand, prefer subtle distractions while they learn. They often concentrate best with background sound (music or conversation) soft lighting, informal and comfortable seating arrangements, food intake, and breaks while studying. They also prefer to work on several tasks simultaneously.

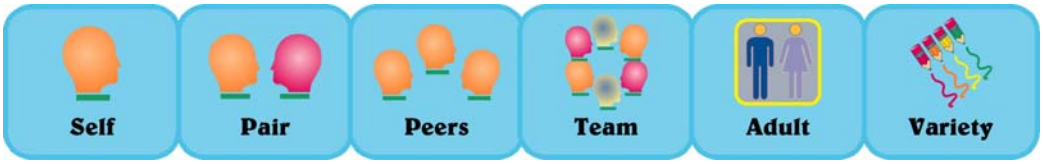
Impact of Environmental Factors on Learning



Students register different responses to a number of environmental factors while learning. Some prefer to study with background music, others prefer quiet; some prefer bright lighting, others prefer dim; some prefer warm environments, others cool; and so on. It is very important to identify and address these environmental preferences, as students have shown higher retention rates, better attitudes, and greater achievement when the instructional environment was suited to their individual preferences. Many studies have supported these findings across all grade levels, including several that demonstrated significant improvement in various curriculum areas (www.learningstyles.net).

For instance, when a person is seated in a hard chair, like the traditional wood or steel school desk, fully 75 percent of total body weight is concentrated on and supported by four square inches of bone (Branton, 1966). The resulting stress causes fatigue, discomfort, and frequent postural change — for which students are scolded daily. More informal or comfortable seating can improve attitudes and increase attention span

Sociological Factors That Influence Learning



Many teachers present new material and instruct their students in a direct, didactic fashion. Students who have difficulty absorbing and retaining the new information are considered inattentive. Few teachers realize that despite the quality of the teaching, some children are incapable of learning from an adult in a conventional classroom situation. These young people are uncomfortable and usually too tense when under pressure to concentrate in teacher-dominated and authoritative situations. For such adolescents, learning either alone or with peers

is a better alternative than working directly with their teachers in either an individual or group session. Four studies have examined the effects of sociological preferences on attitude toward learning and have found statistically higher aptitude-test scores when students were taught in ways that complemented their learning preferences (*Research on the Dunn & Dunn Model ...*, 2005).

Physiological Learning-Style Preferences

Physiological elements that can influence learning include: perceptual elements, food intake, time of day, and degree of mobility. Perceptual strengths or preferences often are not identified or are under-targeted in the learning environment. The four modalities, or types of perceptual preference are: auditory, visual, tactual, and kinesthetic. Considering that most children are not auditory — it is rare for students to remember 75 percent of what is said to them in a typical class period — lectures, discussions, and questioning are the least-effective method of teaching. Few teachers, however, know how to introduce difficult new material in a kinesthetic or tactual manner — but these are the sensory preferences of most underachieving students. It is important to identify students' perceptual preferences, introduce new and difficult material through students' perceptual strengths, and then reinforce the required information using secondary or tertiary modalities. Capitalizing on individual perceptual strengths is crucial to achieving significantly better through the approaches that are illustrated and discussed in more depth in this Manual.

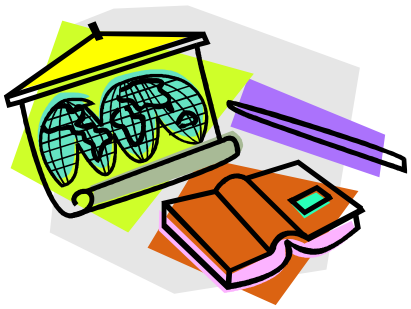
Task efficiency is related to *when* a student is likely to learn best. Several studies have shown that matching elementary students' time preferences with instructional study and testing schedules resulted in significant gains academically. Most students are not alert early in the morning. Most middle-school students experience their strongest energy between 10:00 AM and 2:00 PM — only 28 percent were found to be *morning people*.

Many students who are restless, apparently disinterested and sometimes disruptive often are mislabeled as hyperactive. Most students exhibiting these characteristics are not clinically hyperactive — they are often normal children in need of mobility (Restak, 1979). The less interested the learners are in the material being taught, the more mobility they require. Studies show that approximately 95 percent of these so — called *hyperactive* students are male. When the same characteristics are observed in girls, they are correlated with a high degree of academic achievement. Implementation strategies designed to promote disciplined mobility are discussed in Chapter 3.

Chapter Two

Administering the LS:CY! Online Assessment

Learning style encompasses at least 21 different variables, including each individual's environmental, emotional, sociological, physiological, and cognitive-processing preferences. Consequently, there is a need for a diagnostic instrument that measures all of these elements. Teachers cannot correctly identify all the elements of a student's learning-style pattern through observation. Some elements of style are not observable even to the experienced eye, and the behaviors associated with other elements arc often misinterpreted (Marcus, 1977). It is important to identify learning style with a comprehensive instrument and it is critical to use one that is both valid and reliable. Extensive experimental research on learning styles verifies that students, prompted correctly, can accurately articulate their learning style preferences, but the concept of style should be explained to them clearly before they are tested (see Preparing Students, p.13).



What Does the LS:CY! Assessment Test Do?

Each student's learning style is based on a complex set of reactions to varied stimuli, feelings, and previously established behavioral patterns. Those patterns tend to be repeated when the student concentrates on new or difficult material. The LS:CY instrument was designed to respond to selected characteristics of global learners by including the use of stories, fantasy, holistic writing, imagery, humor, and pictures. The LS:CY includes five stories. Each of the five stories contains three strands of learning-style elements. The stories all contain the theme of mystery and detectives. This theme was chosen because of its high level of interest to middle-school students. Each story is followed by a series of questions that pertain to the students' individual learning style.

In the **LS:CY** assessment, students are asked 69 questions that are used to identify their particular learning-style preferences. The assessment measures the

patterns through which learning occurs in individual students; it summarizes the environmental, emotional, sociological, physiological, and psychological preferences that each student has for learning.

The **LS:CY**! program includes a one-page profile of each student's learning-style preference, as well as a detailed full narrative report that helps interpret the assessment. It provides ideas on how students can use learning style to understand and remember information that is new and difficult, and provides tips on the best environment and resources for each learner.

The **LS:CY**! assesses individual preferences in the following areas:

- Immediate environment: sound, light, temperature, and seating design.
- Emotionality: motivation, persistence, responsibility/conformity and need for internal or external structure.
- Sociological factors: learning alone, with a partner, as part of a small group or team, with peers, with an authoritative or collegial adult, and/or in a combination of ways.
- Physiological factors: auditory, visual, tactual and/or kinesthetic perceptual preferences; food or liquid intake, chronobiological energy levels, and mobility needs.
- Indication of global or analytic processing inclinations and impulsive versus reflective inclinations.

The LS:CY! assessment:

- Permits students to identify how they prefer to learn.
- Provides a computerized graphic summary of each student's preferred learning style, called the *One Page Student Report*.
- Suggests a basis for redesigning the classroom environment to complement many students' needs for sound, quiet, bright or soft light, temperature, or seating design (see Chapter 3).
- Sequences the perceptual strengths through which individuals should begin studying; shows how to reinforce new and difficult information for individuals; shows how each student should do his or her homework.
- Indicates the methods through which students are likely to excel-for example, through Contract Activity Packages (CAPs), Programmed

Learning Sequences (PLSs), or Multisensory Instructional Packages (MIPs), Small Group Strategies, or Tactual or Kinesthetic Resources.

- Extrapolates information concerning which students are conforming or nonconforming and how to work with those who are nonconforming.
- Pinpoints the best time during the day for each student to be involved in required difficult subjects and thus permits grouping students for instruction based on peak energy times.
- Itemizes the types of students for whom snacks while learning may accelerate the learning process.
- Notes the types of students for whom movement while learning may accelerate the learning process.
- Suggests for which students analytic or global approaches to learning new and difficult material are likely to be important.

Preparing Students for Taking the LS:CY! Assessment

Introduce learning styles to students by explaining the different styles that exist in school classrooms, in families, and in varied cultures. Tell students that their mother's style is likely to be different from their father's style and that their styles are probably different from friends' and classmates' styles.

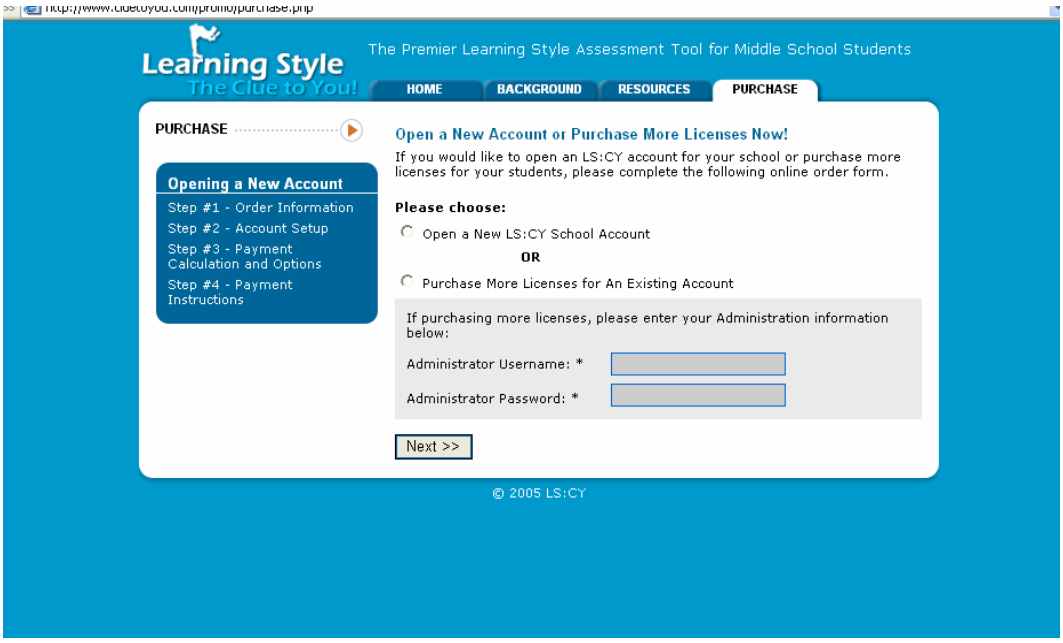
Students need to understand that *everyone* has strengths, but that each person's strengths are different. Explain to them that learning styles are based on complex reactions to many different things in their lives, including feelings, routines, and events. As a result, patterns often develop and repeat whenever anyone concentrates on new and difficult material.

Introduce students to the idea of learning about their strengths by honestly answering a series of questions that will be analyzed, not graded. Explain that only honest answers result in information that makes it easier for them to learn. Discuss different learning styles with the class, regardless of grade level.

Assessing Your Students

Ordering the LS:CY!

Go to www.cluetoyou.com and read more information about Learning Styles and the LSCY, view demonstration videos, and purchase student administrations.



Administering the Test

The **LS:CY!** assessment consists of 69 questions interspersed among five sections. The detective work of the *Whodunnits* is divided into five stories with a series of questions following each:

- The Case of the Shattering Windows
- The Case of the Wrong Directions
- The Case of the Unwelcome Bat
- The Case of the Mummy's Ring
- The Case of the Strange Noise

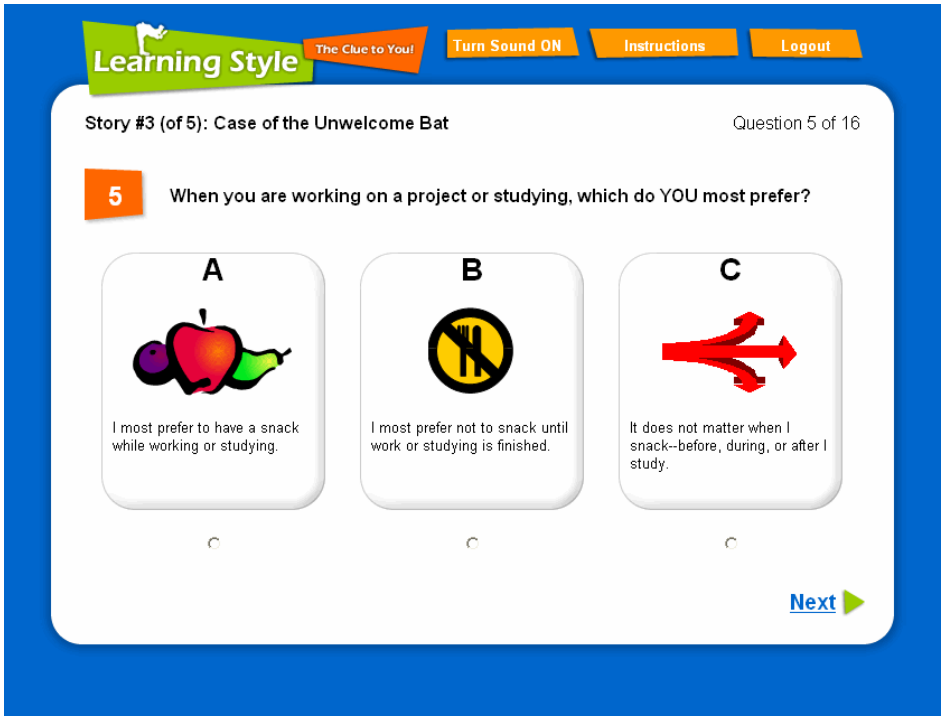
The following readability rates were assessed for the instrument:

- Flesh Reading Ease = 78.7
- Flesh-Kincaid Grade Level = 5.0

The *Flesh Reading Ease* rated text on a 100-point scale under the assumption that the higher the score, the easier it was to understand the document. For most standard documents, it was recommended to aim for a score of approximately 60

to 70. For the purpose of assessment, it was recommended to increase the ease of readability. The *Flesh-Kincaid Grade Level* score rated text on a United States' grade-school level. The fifth-grade reading level was deemed low enough to avoid frustrating middle-school students and still contain vocabulary that would be interesting and challenging.

Each question is repeated three times throughout the test for the purpose of assuring response consistency. Students respond to each question using a multiple-choice answer format. Each possible response includes a picture image that is representative of the answer. The inclusion of both verbal and nonverbal message forms is a major feature of the instrument that allows response options to be processed in the style of the individual's global/analytic preference or through preferred modalities. The inclusion of picture images allows global students to holistically acknowledge the subject matter.



The students can be tested individually, in small groups, in a classroom, at home, or in a computer lab. The stories and questions may be read to students. Although, the test should take no longer than 40 minutes to complete, it is not necessary to finish in one time period. Students may stop after any one of the five stories and log on later to complete the assessment.

Strengthening Students' Understanding of Learning Styles

After examining students' profiles and sharing the information with each student, identify which elements of style affect large clusters of students in the class and select learning-style approaches that best match their needs. Develop one large wall chart that indicates each student's strong preferences and a second chart that shows how best to use those preferences when working on assignments either at home or in the classroom.

Encourage students to predict the styles of their family members by describing behaviors that suggest characteristics representative of learning styles. Direct the students to survey their relatives to see how accurately they guessed, and then have them compare their family's styles with those of their classmates' families. They can use illustrations and write poems or stories about how they feel about the results of their **LS:CY!**

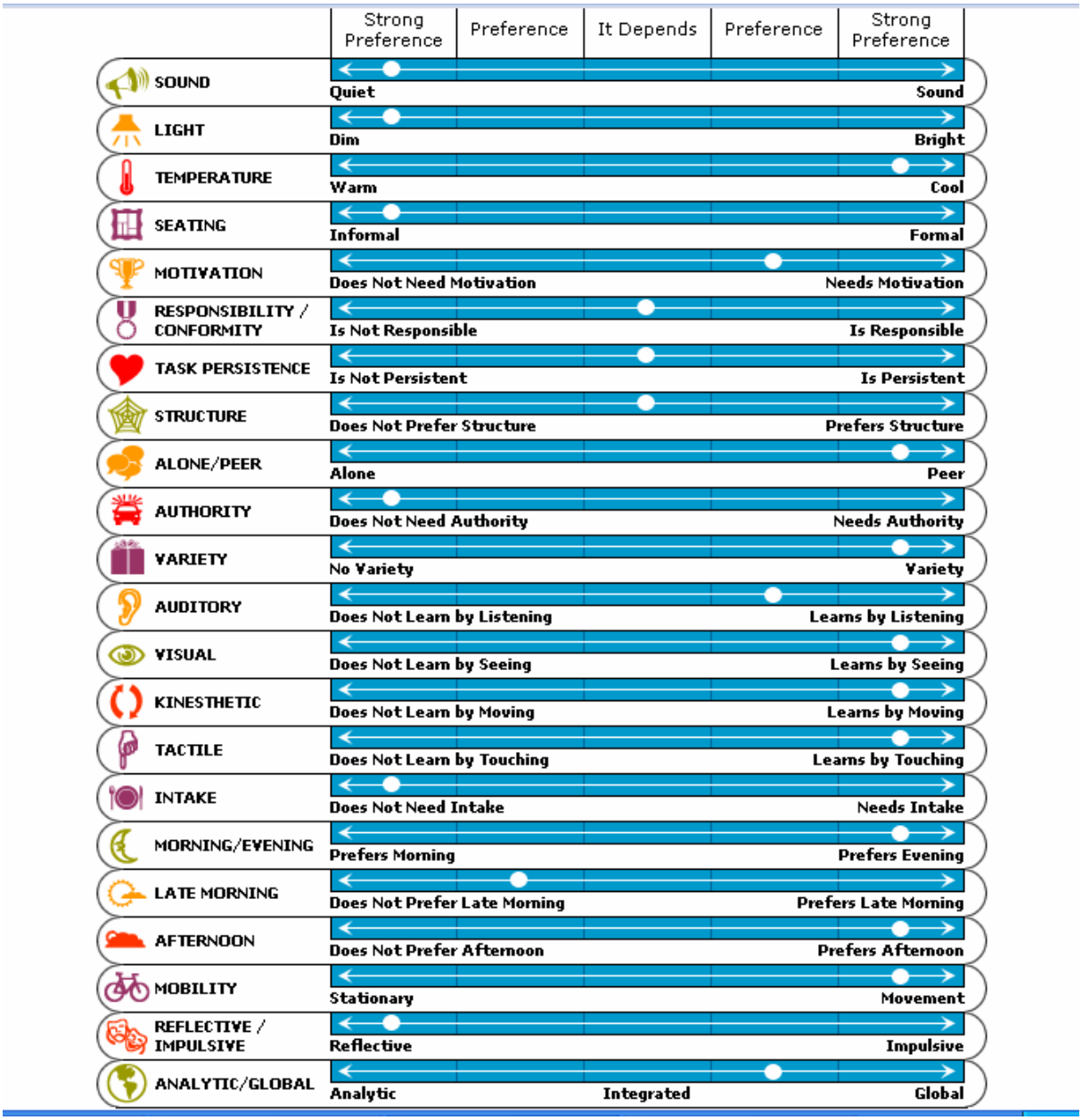
Students may have difficulty using their styles for completing assignments and homework until they learn how to teach themselves using tactual and kinesthetic methods. It may be practical to begin by teaching the students to develop their own Electroboards, Flip Chutes, Pic-A-Holes, Multipart Task Cards, and kinesthetic floor games. Chapter 3 includes descriptions of these instructional strategies that effectively teach tactual learners to absorb difficult information through their perceptual strength. A file containing directions for creating these materials is included on the **LSCY!** Administration Site (See Extras).

Meanwhile, you should share the results of the learning styles assessment with students' parents. Discuss their child's learning style and the learning style shared by the majority or large clusters of the class. Explain to parents and to students what the learning style guidelines mean and how to use them. Ask parents to encourage their children to use their learning styles. A sample of the Parent Letter also is included on the Administration Site (See Extras).

Interpreting the Results

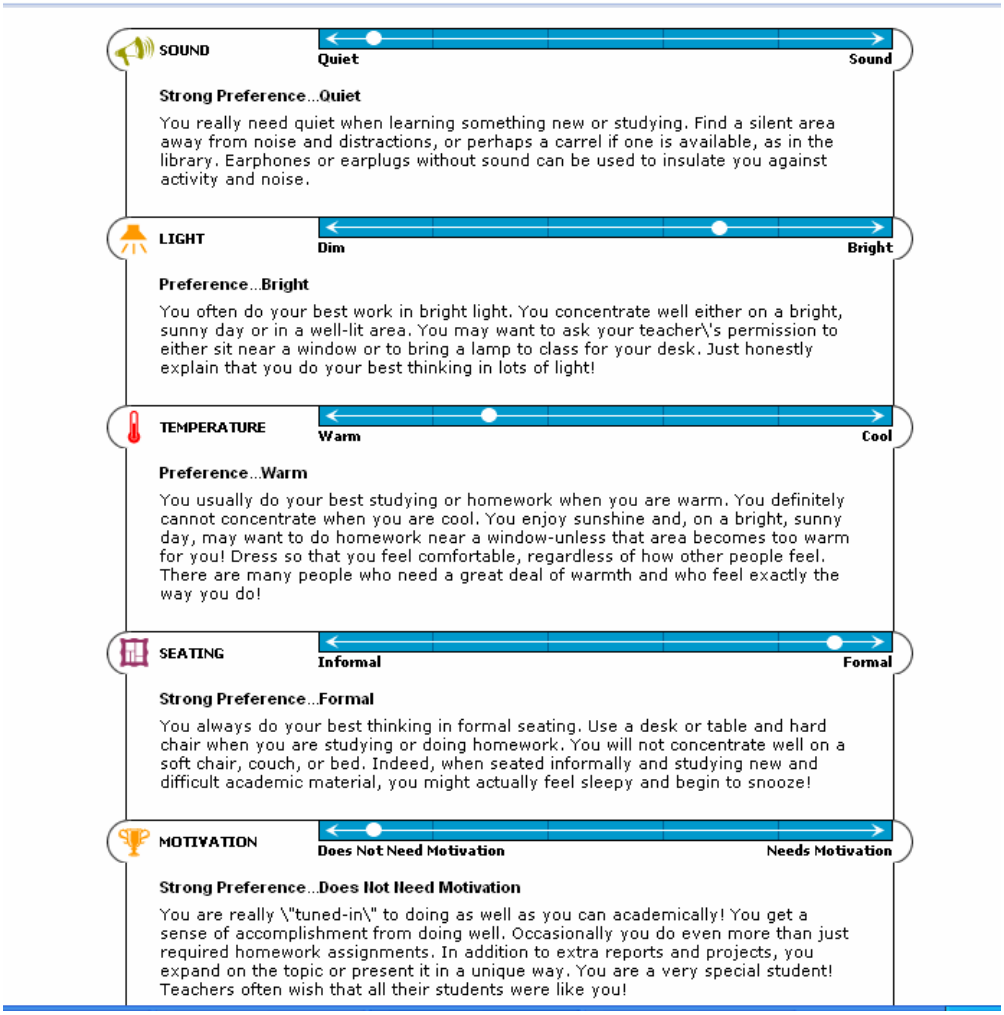
Individual Learning-Styles Profile

The *One Page Student Report* illustrates an individual student's preference or strong preference for each learning-style element.



Individual Full Report

The Full Report is a multi-page narrative that is designed to give students and their parents examples of how to best utilize their identified learning-style strengths.



SOUND — Quiet / Sound

Strong Preference...Quiet

You really need quiet when learning something new or studying. Find a silent area away from noise and distractions, or perhaps a carrel if one is available, as in the library. Earphones or earplugs without sound can be used to insulate you against activity and noise.

LIGHT — Dim / Bright

Preference...Bright

You often do your best work in bright light. You concentrate well either on a bright, sunny day or in a well-lit area. You may want to ask your teacher\'s permission to either sit near a window or to bring a lamp to class for your desk. Just honestly explain that you do your best thinking in lots of light!

TEMPERATURE — Warm / Cool

Preference...Warm

You usually do your best studying or homework when you are warm. You definitely cannot concentrate when you are cool. You enjoy sunshine and, on a bright, sunny day, may want to do homework near a window-unless that area becomes too warm for you! Dress so that you feel comfortable, regardless of how other people feel. There are many people who need a great deal of warmth and who feel exactly the way you do!

SEATING — Informal / Formal

Strong Preference...Formal

You always do your best thinking in formal seating. Use a desk or table and hard chair when you are studying or doing homework. You will not concentrate well on a soft chair, couch, or bed. Indeed, when seated informally and studying new and difficult academic material, you might actually feel sleepy and begin to snooze!

MOTIVATION — Does Not Need Motivation / Needs Motivation

Strong Preference...Does Not Need Motivation

You are really \"tuned-in\" to doing as well as you can academically! You get a sense of accomplishment from doing well. Occasionally you do even more than just required homework assignments. In addition to extra reports and projects, you expand on the topic or present it in a unique way. You are a very special student! Teachers often wish that all their students were like you!

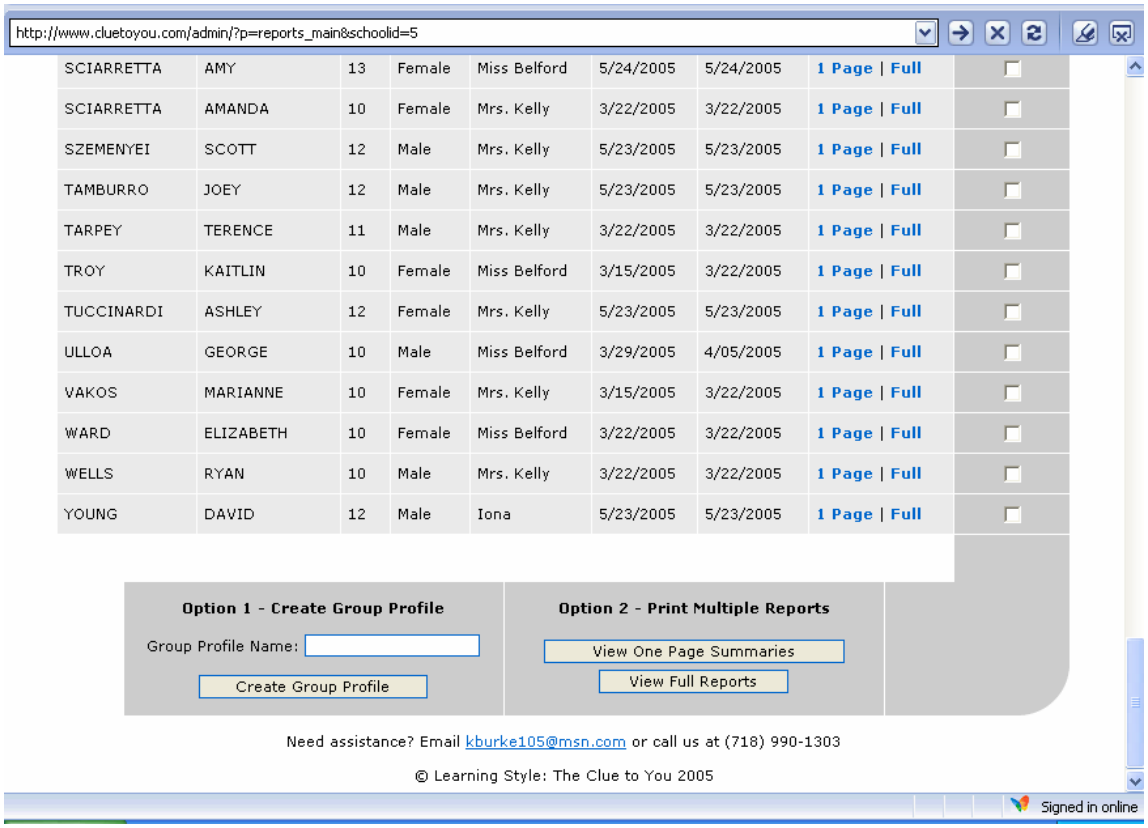
Learning-Style Report for Parents

The Learning-Style *Report for Parents* should include the student's *Individual Learning-Styles Full Report* and a personalized letter to the student's parents (www.cluetoyou.com/admin) that introduces the concept of learning style. The website sample letter provides some background on why the student has been tested and how to interpret the results. It states the objectives of implementing a learning-styles program and gives suggestions on how the parents can help at home.

Interpreting the Results

Group Profile

A Group Profile can be created by the administrator for any particular group — by class, gender, academic achievement, etc. The site administrator has the option of creating group profiles after logging on to www.cluetoyou.com/admin.



Interpreting the Results

Group Profile

The one-page graphic with bar charts indicates the percentage of the group that displays a preference for each of the learning-style elements.

Learning Style — The Clue to You!

Group Profile

Group Profile Name: Belford
Students: 33

Date Created: 05/24/2005

	Strong Preference	Preference	It Depends	Preference	Strong Preference	
SOUND	14 (42%)	4 (12%)	4 (12%)	3 (9%)	8 (24%)	
Quiet						Sound
LIGHT	5 (15%)	1 (3%)	18 (54%)	5 (15%)	4 (12%)	
Dim						Bright
TEMPERATURE	2 (6%)	8 (24%)	16 (48%)	4 (12%)	3 (9%)	
Warm						Cool
SEATING	14 (42%)	2 (6%)	7 (21%)	4 (12%)	6 (18%)	
Informal						Formal
MOTIVATION	3 (9%)	4 (12%)	10 (30%)	11 (33%)	5 (15%)	
Does Not Need Motivation						Needs Motivation
RESPONSIBILITY / CONFORMITY	5 (15%)	2 (6%)	6 (18%)	11 (33%)	9 (27%)	
Is Not Responsible						Is Responsible
TASK PERSISTENCE	8 (24%)	6 (18%)	9 (27%)	2 (6%)	8 (24%)	
Is Not Persistent						Is Persistent
STRUCTURE	4 (12%)	2 (6%)	14 (42%)	8 (24%)	5 (15%)	
Does Not Prefer Structure						Prefers Structure
ALONE/PEER	7 (21%)	6 (18%)	8 (24%)	5 (15%)	7 (21%)	
Alone						Peer
AUTHORITY	4 (12%)	4 (12%)	6 (18%)	8 (24%)	11 (33%)	
Does Not Need Authority						Needs Authority
VARIETY	5 (15%)	6 (18%)	2 (6%)	13 (39%)	7 (21%)	
No Variety						Variety
AUDITORY	(0%)	2 (6%)	11 (33%)	11 (33%)	9 (27%)	
Does Not Learn by Listening						Learns by Listening
VISUAL	1 (3%)	(0%)	9 (27%)	9 (27%)	14 (42%)	
Does Not Learn by Seeing						Learns by Seeing
KINESTHETIC	10 (30%)	6 (18%)	6 (18%)	9 (27%)	2 (6%)	
Does Not Learn by Moving						Learns by Moving
TACTILE	1 (3%)	4 (12%)	13 (39%)	6 (18%)	9 (27%)	
Does Not Learn by Touching						Learns by Touching
INTAKE	5 (15%)	2 (6%)	10 (30%)	5 (15%)	11 (33%)	
Does Not Need Intake						Needs Intake
MORNING/EVENING	(0%)	3 (9%)	13 (39%)	5 (15%)	12 (36%)	
Prefers Morning						Prefers Evening
LATE MORNING	6 (18%)	4 (12%)	15 (45%)	6 (18%)	2 (6%)	
Does Not Prefer Late Morning						Prefers Late Morning

Communicating the Results with Students and Parents

The printed reports that are generated on the **LS:CY**! website are very helpful for describing learning-style preferences to students and their parents. However, left to stand on their own, they quickly lose their usefulness. It is critical to spend time with your students — both alone and in groups — explaining to them what their learning-style preferences mean, how their preferences are different from those of their peers, and how they can best use their preferences to learn more efficiently. Group the students by common preferences (see Chapter 3) and keep the children and their parents involved at every step along the way.

Parents often feel that they are somehow left out of their children's school experiences. Parents are interested in, and often concerned about, the concepts and strategies to which their children are being exposed, especially if the concepts are new. Explain to parents the advantages of capitalizing on each youngster's learning style and describe how the student will be involved in the implementation process (e.g., classroom redesign). Once parents understand why the instructional environment is being altered, they usually are willing to support the effort, at least until sufficient time has elapsed to yield an objective judgment as to the effectiveness of the change.

Chapter Three

Implementation Methods

The more your students are involved in how their learning experience is constructed, the more they are going to be interested in learning. Teach your students to use their learning-style strengths to help them teach themselves.

Redesigning Conventional Classrooms

With a basic understanding of styles and needs, students can redesign the classroom. Teachers should help them compile a list of adjustments that respond to their own and their classmates' learning-style differences. One way to begin classroom redesign is to have the students measure the available furniture, cut out paper representations of the furniture, and move them around on a scaled floor plan of the classroom. They can use cardboard boxes, plants, bricks, yarn, and other readily available materials to make dens, offices, and nooks. Guide students by showing them sample diagrams or illustrations of other learning-style classrooms (Burke & Samide, 2004; Dunn & Dunn, 1992; 1993).

Students usually enjoy rearranging furniture, whether they focus on one area or the whole classroom. When at least one space appeals to each learner, implement the redesign and encourage students to test that floor plan for a week. New designs can be considered after testing the first ideas, compare behavior problems and incomplete assignments with previous occurrences and ask the students about their new environment and their grades both before and after the change. Middle-school students usually love the new environment and rarely permit teachers to return to a conventional classroom design without challenge.

When you decide to experiment with the physical classroom, remember to consider several physiological and sociological aspects of learning. Factors include seating, lighting, sound, temperature, attention spans, and particular group or individual arrangements. If you have several students who require informal seating, begin the transition into style with seating arrangements; if you have a cluster of students who need soft illumination, perhaps consider in lighting.

Seating

Most schools provide a combination of chairs, desks, and tables made of wood, steel, and plastic for each student. Resting on that inflexible surface is about four square inches of bone that supports 75 percent of a student's total body weight. The result — physical discomfort becomes a distraction — squirming, fidgeting, rocking, and eventually, a need to get out of the chair.

Many students learn better when they are allowed to use cushions on either their chairs or the floor, can sit on beanbags or other casual furniture, or can relax in a carpeted, informal section of the room. It is crucial for global students to relax while concentrating. To acquire more comfortable and more suitable seating arrangements, ask parents to donate cushions, beanbag chairs, carpet squares, rugs, outdoor furniture, couches, rocking chairs, or easy chairs.

Lighting

Although fluorescent lights are used in most classrooms, they have negative effects on some students. The fade time of florescent lighting is longer than 50 percent of the cycle time, is worse with old bulbs than with new bulbs, and cycles 60 times a second. That reverse phasing stimulates analytics (who find it difficult to concentrate on demanding academics in low light) and over-stimulates global processors (who tend to react with restlessness and hyperactivity). Reduced illumination results in higher test scores for children who prefer soft lighting.

The positive and negative effects of natural versus artificial light on plants have been reported. The identical exposure is beneficial for some plants and detrimental to others. People also respond differently to lighting. To find the optimum lighting for students, teachers may try one or more of the following experiments for six weeks.

- Use only half of the lights in the classroom. Permit students to sit wherever they feel most comfortable. Perhaps turn the lights off in one corner and encourage poor readers to sit there. Ask colleagues to note differences in behavior and attention spans and to watch for changes in achievement.

- Encourage poor readers to choose a piece of colored acetate (often used on overhead projectors) and place it on each page of their book, moving it from page to page. Look for changes in attention span, focusing, and behavior. Expect improvement in 5 to 10 percent of poor readers.
- Insert colored, fireproof paper between light bulbs and their covers in one or more areas of the classroom.
- Teach in natural light — you may not appreciate the atmosphere, but many of your students will!
- Permit students to wear sun visors, sunglasses, or caps with visors if they ask to or if their **LS:CY**! Learning-Styles Profile indicates that they have a preference for low light. Adults require more light than children, and bright light causes tension among some students.
- Cover large, bright, white surfaces whenever possible.
- Use dark curtains to shade areas for students who need soft illumination, or allow students to partly shade their working areas with transparent, dark-toned fabrics.

Sound

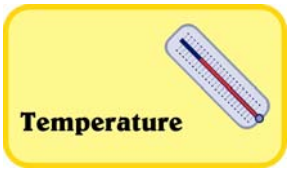
The ability to concentrate on difficult cognitive tasks in either quiet or noise-filled environments varies among individuals. Strongly analytic processors require quiet, whereas strongly global processors often think better in the presence of sound, including music, modified background conversations, ocean waves crashing, or birds singing. For students who strongly prefer background noise (as indicated by the **LS:CY**! Learning Styles Profile), use only music without lyrics, because the mind automatically repeats lyrics with which it is familiar instead of concentrating on tasks.

Experiment with different sound environments and get feedback from students. In addition:

- Encourage students who need quiet to sit away from traffic and activity patterns.
- Allow soft cotton or rubber ear plugs, earmuffs, or nonfunctioning headphones during tests or in study environments.
- Carpet the traffic areas for the 10 to 12 percent of students distracted by sound.
- Provide private classroom spaces for students distracted by noise.

- Offer seats near the hub of activities or near the door for students who require sound.
- Permit music on headphones for students who prefer background sound.

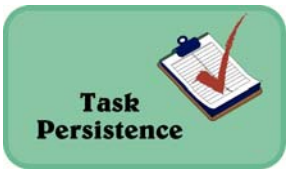
Temperature



In every group of people, some members feel warm and others feel cool while everyone else is comfortable. Temperature preferences are unrelated to either global or analytic processing, but need to be accommodated for learning efficiency. Responding to strong temperature preferences improves achievement. Students who seem devoid of energy or are consistently withdrawn may be experiencing environmental discomfort. The following measures may help some students:

- Use curtains to block out the sun and drafts.
- Turn on a fan and let students choose their seats.
- Supply paper cups and water for drinking and for dabbing on faces and wrists.
- Allow students to keep a sweater in their desks or in a closet.
- Encourage students to layer their clothing so that they can put on or take off items.
- Remember that the warmest part of a room is in the middle, with weather-dependent exceptions near windows and heat sources.

Task Persistence



Some students have a strong emotional need to work on a task until it is done. These youngsters often concentrate for uninterrupted periods and are most often analytic processors. In contrast, global processors tend to begin a task with a burst of energy, work for a short period of time, and then take a break. They dislike working on only one thing at a time and prefer to engage in multiple tasks simultaneously.

Classrooms need to accommodate both global and analytic processors. Help arrange classrooms to permit analytics a section without noise, people, or other distractions, and offer global processors diversified activities, projects, and interactions. Instructional environments need to include both settings to help all students succeed academically. Some possibilities include:

- Arranging desks and chairs in dens, alcoves, and private spaces so other students do not disturb analytic processors.
- Designing seating arrangements that accommodate the differences among students' height, weight, and girth to alleviate distractions caused by discomfort.
- Allowing students to stand or sit casually while concentrating and completing assignments.
- Designating an aisle or section of the room for kinesthetic students to walk in quietly while they read, complete tasks, and think.
- Structuring assignments to permit variety, mobility, breaks, and peer interaction for students who need them. Allow these students to move around the room as they study, to change activities, and to migrate purposefully from one area to another.
- Designating small-group work areas.
- Designating areas where global students can engage in a variety of short, instructional activities and other areas where analytics can work without interruption. Adjust lights, seats, and acoustics in these areas to allow for mobility and social interactions. It is possible to develop these nontraditional spaces without much effort, time, or money.

Sociological Preferences

The social setting in which children learn best is unrelated to global or analytic tendencies. Many children learn best with a mixture of patterns — sometimes alone, and sometimes with a partner, in a small group of peers, in a team, or with either an authoritative or collegial teacher. An individual's sociological patterns may vary with age and achievement. Some people learn consistently in one way, others in varied patterns, and still others have no preference for a particular pattern. However, more global students than analytic students are peer-oriented. These students often learn best with either a single friend or in a small group, in contrast to 13 percent of all students who learn best alone and 28 percent who need a teacher. Let students choose the social setting that best suits them to complete all or most assignments, with the exception of tests, or until they or you determine that the setting is inappropriate.

Rules for Maintaining Learning-Style Privileges

The benefits of experimenting with the physical classroom far outweigh any imagined risks, but you must establish firm ground rules that even the youngest students can understand. List ground rules on a wall chart and illustrate them for

global students. Start with basic rules and add others as they become important. Emphasize that practicing their learning styles includes the use of certain privileges, but that disregarding rules will result in losing those privileges (Dunn, 1996).

The ground rules should change with the privileges being introduced. For example, introducing intake (water and raw vegetables) may require a rule that intake is allowed in your classroom but not necessarily in other teachers' classrooms.

Rules for Maintaining Learning-Style Privileges

- Your learning style must not distract anyone else.
- Your grades must improve.
- Your assignments must be completed.
- Whenever I need your attention, you must give it to me immediately.
- The way you work in class is based on your learning-style assessment and subsequent evaluations.

Redesigning Teaching Strategies

Match teaching strategies with the learning-style profile of each student. No single approach will be effective with all students, but allow students to experiment with several methods to identify which are interesting and to help them understand difficult material most easily. After a few experiences with each method, students should choose the method that most benefits them.

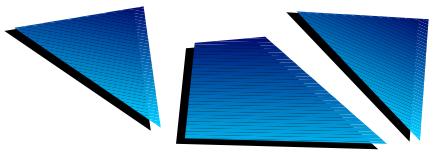
Tactual and Kinesthetic Resources

Students who perform poorly in a conventional school often have tactual or kinesthetic strengths, but are required to learn by listening or by reading. These and other students need to learn how to teach themselves by using Multipart Task Cards, Flip Chutes, Pic-A-Holes, Electroboards, and floor games (Dunn & Dunn, 1992; 1993).

Every time new and difficult material is introduced, students should create new cards for these manipulatives so that they value the resources, learn at least one or two methods for teaching themselves, and have at least one strategy for becoming successful academically.

Task Cards

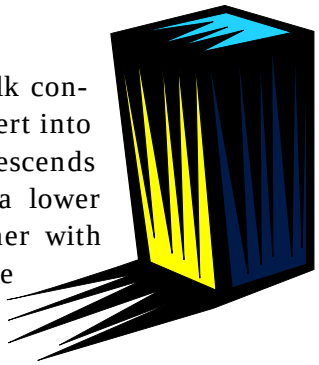
Multipart Task Cards are easy-to-make, self-corrective, tactual, and visual resources that help many students who do not remember easily by listening or by reading. Task Cards are effective in introducing new material and in reinforcing previously learned material.



Students who use Task Cards may work at their desk or anywhere in the classroom, school, or home. Task Cards may be used by individuals, by pairs, or by a small group — provided that everyone follows the rules.

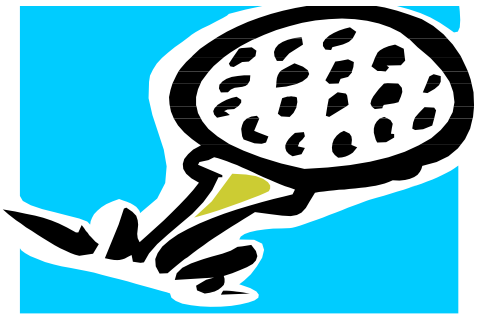
Task Cards present information about a specific topic, concept, or skill that has been translated into questions and answers or sample answers (some true, some false). A student can make Task Cards by, for example, (1) printing the name of each state in the United States on the left side of an index card; (2) printing the name of the state's capitol in the middle; and (3) gluing a picture of the state's outline (or famous product) on the right side of the card. Then the card can be cut into irregularly shaped thirds so that only the correct answers fit together.

Flip Chutes



Make Flip Chutes from half-gallon orange juice or milk containers. Design small question-and-answer cards to insert into the upper face of the container. As each question card descends on an inner slide, it flips over and emerges from a lower opening, displaying the answer. Decorate the container with paint, contact paper, and lettering that relate to the topic.

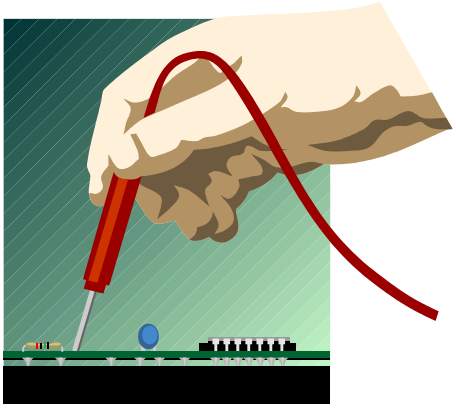
Pic-A-Holes



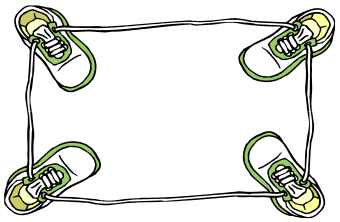
Pic-A-Hole is a holder that includes a series of cards, each with one question and possible answers printed near the bottom. The student inserts a golf tee into the hole directly below the answer chosen. If the question card lifts from the holder with the tee in place, the answer is correct.

Electroboards

Electroboards consistently hold the attention of most students. Immediate visual feedback is provided by a continuity tester bulb that lights up when an answer is correct. Questions are on one side of the Electroboard and the answers are out of sequence on the other. Students use a two-prong continuity tester to choose a question on one side of the front and the answer on the other. The right answer illuminates the bulb. Electroboards and all other tactual resources are particularly inviting if the shapes reflect the subject. For example, make an Electroboard in the shape of a whale.



Floor Games



Buy a large sheet of plastic or use old tablecloths, shower curtains, carpet remnants, or sails which may be glued, drawn, or decorated with a game designed to let students jump, or move around as they are exposed to the major or finer points of the topic through questions or tasks. A popular commercial floor game, Twister, although rudimentary in this context, causes players to stretch across a floor mat (and each other) to reach spots of colors as dictated by the spins of a color wheel.

Small-Group Instruction

Another strategy you can implement is small-group instruction. About 28 percent of students are peer-oriented, although many can learn with one or more classmates at least some of the time. Thus, as a transition from teacher-directed instruction, experiment with Team Learning to introduce difficult new information, Circle of Knowledge to reinforce it, and Brainstorming to develop problem-solving skills. Unlike cooperative learning, which requires teacher-directed learning followed by students learning together, these approaches allow peer-oriented students to teach themselves or each other without your direct involvement (Dunn & Dunn, 1992;1993).

Team Learning

Use the Team Learning approach to permit students to learn the most difficult information in any unit or topic independently, in pairs, or in a small group. Give each topic a name that describes the subject, for example: *Team Learning: Who Do You Think You Are? Digging for Family Roots*. Then, list the names of each student, if they work in a group, and identify the recorder. Provide printed material to teach the students what they need to know to master the objective of the lesson and then follow with three types of questions: factual, higher-level cognitive, and creative.

A factual question might be to explain the meaning of genealogy and to use and spell the word correctly in a sentence. A higher-level cognitive question doesn't have a right or wrong answer, but it requires students to hypothesize and analyze. You may ask students to list five advantages and disadvantages of tracing a family's genealogy. Follow those questions with one that requires the creative application of the information that is being learned. For example, ask students to write a humorous poem that describes what might happen when people trace their family tree. After answering these questions, you should have the students share their answers with the rest of the class (Dunn & Dunn, 1992, 1993).

Circle of Knowledge

Many teachers use Circle of Knowledge to reinforce new and difficult material directly related to the objectives in the Team Learning, introduced a day or two before. As in Team Learning, name the topic and the students participating and identify the recorder. Students may choose to work alone, in pairs, or in groups of three or four. Students who work together should work in a small circle. Pose a single question or objective and have the members of each group work together, developing possible answers. The method for answering is a clockwise rotation of answers, until time is called or until the members have exhausted their ideas. When time is up, the groups share their answers and you write them on the chalkboard. The class analyzes the answers; scores result from a mixture of unique and correct answers and challenges of incorrect answers class (Dunn & Dunn, 1992, 1993).

Contract Activity Packages (CAPs)

Use this strategy to allow motivated students to progress at their own speed and avoid the repetition and interruptions inherent in large-group instruction. CAPs are also effective with nonconforming students who often fail to do what their teachers require in class. Introduce one or two CAPs to the whole class to help

students who are motivated, have auditory or visual preferences, or who are non-conforming. Contract Activity Packages include:

- A simply stated objective;
- Multisensory Resource Alternatives that teach the required information through perceptual preferences;
- Activity Alternatives in which students use the new information to create a Programmed Learning Sequence; a Flip Chute, Multipart Task Cards, Electroboards, Pic-A-Holes, or other tactual resources; floor games or other kinesthetic resources; compositions, poems, plays, scripts, songs, drawings, dances, or pantomimes;
- Reporting Alternatives in which students share their creative Activity Alternatives;
- Opportunity to work in a social group, usually with more than one peer, or independently; and
- A test to assess the student's knowledge of the objective before, during, or after the activity (Dunn & Dunn, 1992;1993).

Programmed Learning Sequences (PLSs)

Use a PLS for students who prefer learning with structure, alone or in pairs, auditorially, visually (print or illustrations), tactually, and in small steps with immediate reinforcement.

A typical Programmed Learning Sequence frame presents only one idea or fact at a time, requires students to be active learners, and provides immediate feedback. Students may not continue to the next frame until they have mastered each previous phase (each phase is sequentially more difficult). After six or seven frames, material is reinforced through tactual resources, and each PLS also has a tape for auditory learners.

Each PLS covers one topic, concept, or skill, and is named appropriately with a humorous subtitle (*Math: Divide and Conquer!*). Important components include specific directions, a global beginning, a story woven through the PLS, step-by-step sequencing and answers, and periodic tactual reinforcements (Dunn & Dunn, 1992;1993).

Multisensory Instructional Packages (MIPs)

Students who do not enjoy school and who resist learning invariably achieve better than before when using MIPs. Although MIPs include a variety of multisensory resources, taped directions sequence the learning according to the

user's learning style. Thus, based on each individual's learning-style strengths, directions indicate which resources should be used to begin, to reinforce, and to review the curriculum. Slow learners find this approach easy to use independently. The directions are personalized and every resource is self-corrective. A tape guides the student through each MIP and the package includes an Electroboard, Flip Chute, Pic-A-Hole, Task Cards, floor game, CAP, and PLS (Dunn & Dunn, 1992;1993).

Chapter Four

TEST RELIABILITY AND VALIDITY DATA

Initial Reliability and Validity Study

Description of the Study

Research was designed to determine the reliability and validity of the *Learning Style: The Clue to You!* (**LS:CY**!) (Burke, 1998; Guastello & Burke, 1998/1999; Burke, Guastello, Griggs, Beasley, Gemake, Sinatra, & Lewthwaite, 1999; Dunn, 1999). Reliability was analyzed with respect to the stability of the test scores over repeated administrations of the same test, as well as in comparison with the test results of the same students on the *Learning Style Inventory* (Dunn, Dunn, & Price, 1996).

To support the types of inferences that may be drawn from this test, it also was necessary to establish the instrument's validity. It was hypothesized that global students would respond to a global-format learning-style assessment more accurately than they did to an analytic-format learning-style assessment. In addition, substantial interest had been manifested concerning the relationships among field dependence/ independence, global/analytic characteristics and other elements of learning style (Dunn, Beaudry, & Klavas, 1992).

Methodology

Subjects for this study included 534 sixth-, seventh-, and eighth-graders from 21 schools. The schools included private, parochial, and public institutions located in urban, suburban, and rural areas of the major geographic regions of the United States. The sample was comprised of 270 females and 264 males from various ethnic populations, including, but not limited to, Hispanic, African American, Caucasian, Asian, and Caribbean middle-school students.

Three instruments were utilized: (a) the *Learning Style Inventory* (LSI) (Dunn, Dunn, & Price, 1996); (b) the *Children's Embedded Figures Test* (CEFT) (Karp &

Konstadt, 1963); and (c) the global-format learning style assessment — *Learning Style: The Clue to YOU!* (**LS:CY!**) (Burke & Dunn, 1998).

In accord with the established criteria (*The Standards for Educational and Psychological Tests and Measures*, 1985), a new instrument, *Learning Style: The Clue to You*, was designed. Its contents were based on the 20 variables described in the Dunn and Dunn Learning-Style Model (1993). Thus, **LS:CY**! reflects the Dunn and Dunn Learning-Style Model and, in addition, includes its psychological elements that the *LSI Manual* references, but does not directly assess other than through a combination of scores among five correlated LS characteristics (Burke, 1998; Dunn, Bruno, Sklar, & Beaudry, 1990; Dunn, Cavanaugh, Eberle, & Zenhausern, 1982, Sagan, 2002).

Results of the Study

Based on the content validation procedures itemized in the *Standards for Educational and Psychological Tests*, a five-member jury examined, reexamined, and then unanimously agreed that the **LS:CY**! (a) paralleled the Dunn and Dunn Learning-Style Model, (b) incorporated 20 elements of that model, (c) conformed to established criteria for the assessment of learning styles, (d) contained appropriate content for middle-school students, and (e) conformed to established criteria describing a global cognitive style Dunn, 1992; 1993; Dunn, Thies, & Honigsfeld, 2001).

LS:CY! Test-Retest Reliability Coefficients

Students who comprised the sample for this investigation were each administered the analytic-format version of the LSI once and the global-format version of the **LS:CY**! twice. A test-retest reliability coefficient for each element of the **LS:CY**! was computed. Test-retest reliability coefficients ranged from a minimum of .727 (visual) to a maximum of .994 (light). The mean value of the coefficients was .937. Therefore, based on the high test-retest reliability, it was concluded that an individual's test results were likely to remain relatively consistent (reliable) over repeated administrations of the **LS:CY**!.

LS:CY! Test-retest Reliability Coefficients

Learning-Style Elements	Reliability Coefficients
Sound	.991
Light	.994
Temperature	.987
Design	.988
Motivation	.976
Persistence	.959
Responsibility	.988
Structure	.984
Alone/peers	.983
Authority	.989
Variety	.991
Auditory	.918
Visual	.727
Tactual	.840
Kinesthetic	.847
Intake	.865
Morning/evening	.982
Late Morning	.983
Afternoon	.970
Mobility	.970
Right/left	.941
Global/analytic	.912
Reflective/impulsive	.777

Internal Coefficients Consistency Reliability

Correlation coefficients among items within each element were used to compute Cronbach's (1951) Alpha as an estimate of internal-consistency reliability. The **LS:CY**! internal consistency reliability coefficients were based on an average of the Cronbach's Alpha for the two administrations. The internal consistency-reliability coefficients for the **LS:CY**! ranged from .76 to .99 with a mean of .94. The internal consistency reliability coefficients for the LSI ranged from .56 to .88 with a mean of .76. These data evidenced that students responded more consistently to the **LS:CY**! than to the LSI.

Internal Consistency Reliability Coefficients

Learning-Style Elements	LS:CY! Test One	LS:CY! Test Two	LS:CY!** Internal Reliability	LSI*** Internal Reliability
Sound	.9912	.9923	.99	.86
Light	.9937	.9967	.99	.80
Temperature	.9810	.9808	.98	.75
Design	.9760	.9760	.97	.75
Motivation	.9582	.9902	.97	.77
Persistence	.9441	.9566	.95	.81
Responsibility	.9780	.9925	.98	.82
Structure	.9727	.9935	.98	.69
Alone/peers	.9808	.9875	.98	.88
Authority	.9823	.9826	.98	.70
Variety	.9889	.9920	.99	.72
Auditory	.9041	.9576	.93	.75
Visual	.7085	.8306	.76	.73
Tactual	.8168	.8661	.84	.77
Kinesthetic	.8293	.8593	.84	.71
Intake	.9222	.9221	.92	.86
Morning/evening	.9779	.9834	.98	.79
Late Morning	.9761	.9718	.97	.56

Afternoon	.9583	.9599	.95	.66
Mobility	.9725	.9687	.97	.88
Right/left	.9597	.9636	.96	NA
Global/analytic	.9194	.9256	.92	NA
Reflective/impulsive	.8374	.8572	.84	NA

** Average reliability coefficients of test one and test two.
***LSI internal reliability coefficients (Price & Dunn, 1997).

Relationship Between Consistency Scores and Global/Analytic Preferences

A correlational analysis was performed on the results of the assessment based on each student's Consistency Score and global/analytic preferences as determined by the **LS:CY!**. Students who responded with an analytic preference on the LSI attained higher Consistency Scores than the global-preferenced students on that same instrument. In contrast, the Consistency Scores on the **LS:CY!** for both global and analytic students revealed no statistical difference between the responses of the analytic and the responses of the global students. These data indicated that the **LS:CY!** enabled global students to respond to questions as consistently as analytic students did. Therefore, in essence, the **LS:CY!** extracted the one-sidedness of a traditional analytic-format instrument.

There were no statistically significant differences among the **LS:CY!** Consistency Scores for several demographic variables. These data indicated that the **LS:CY!**'s Consistency Scores were not dependent on students' gender, school, location, ethnicity, grade, or the order in which the tests were administered (counterbalanced group).

A Consistency Score on the LSI indicates the accuracy with which each respondent answers the 104 questions by calculating the number of response agreements among similar items (Price & Dunn, 1997).

Relationship Between Consistency Scores and Global/Analytic Preference

Consistency Score	Question A Test 1	Question A Test 2	Question B Test 1	Question B Test 2
LS:CY! Test	.0440	.0458	-.0184	.0060
LS:CY! Re-test	.0230	-.0156	-.0141	-.0120
LSI	.2757*	.2337*	.1482*	.1640*

Consistency Score +/- 70	Question A Test 1	Question A Test 2	Question B Test 1	Question B Test 2
LS:CY! Test	.0019	-.0082	-.0167	.0064
LS:CY! Re-test	-.0618	-.0630	-.1218	-.0829
LSI	.3499*	.2939*	.1878*	.1894*

CEFT and the LS:CY! Global/Analytic Elements

A sample of 32 seventh-grade students and 43 eighth-grade students each were administered the CEFT in addition to the LSI and the **LS:CY**!. A correlational analysis was performed between the scores on the CEFT and the global/analytic dimension of learning style as measured by questions on the **LS:CY**!. This analysis was used to establish whether a significant correlation existed between the global/analytic questions of the **LS:CY**! and the total scores on the CEFT — designed to measure the individual difference dimension initially labeled by Witkin as *field dependence-independence* and, more recently, as *psychological differentiation* (Witkin, Dyk, Faterson, Goodenough, & Karp, 1962). These correlations revealed a strong relationship between the global/analytic questions of the **LS:CY**! and the field-dependent/field-independent scores of the CEFT.

CEFT and the LS:CY! Global/Analytic Elements

	Question A Test 1	Question A Test 2	Question B Test 1	Question B Test 2
CEFT Score	.4887*	.4819*	.5479*	.5495*

p=.001

Considerable interest was evidenced concerning the relationships between field dependence/independence and other aspects of learning style. In particular, such relationships were examined with respect to the perceptual element of learning-style. It was hypothesized that a significant relationship existed between processing-style preferences and a strong visual preference. This hypothesis was based on the definition of a visual-preferenced learner as one whose primary perceptual strength was visual and who could recall at least 75% of what had been read or observed during a 40-50 minute lesson (Dunn & Dunn, 1993).

A number of similarities have been noted between field-independent individuals and analytic processors, and between field-dependent individuals and global processors (Witkin, Dyk, Faterson, Goodenough, & Karp, 1974). These data strongly suggest relationships between field dependence/ independence and global/analytic processing ($p \leq .001$).

Further conclusions were drawn concerning students with a strong visual preference and their field dependence/ independence. A subsequent correlational analysis was conducted. A significant relationship ($p \leq .000$) was revealed between the two. The attribute of field dependence/independence appears to be directly related to an individual's learning-style visual preference.

Predictive Validity — CEFT and the LS:CY!
Global/Analytic Elements for
Perceptual Preferenced Students

	Question A Test 1	Question A Test 2	Question B Test 1	Question B Test 2
CEFT Score for Visual Students	.8974*	.8995*	.8583*	.8536*
CEFT Score for Auditory Students	.4364	.4503	.3797	.3760
CEFT Score for Tactual Students	.6350	.6377	.4826	.4866
CEFT Score for Kinesthetic Students	.5830	.5830	.6241	.6106

$p \leq .000$

Attitudinal Analysis

Students were asked to respond to a questionnaire regarding their comparative attitudes toward the LSI and the **LS:CY**! at the completion of the administration of both inventories. More than 88% of the total population of sixth-, seventh-, and eighth-grade students indicated that they more strongly preferred the **LS:CY**! instrument as compared with the LSI; less than 12% of the students preferred the LSI assessment as opposed to the **LS:CY**!. Students who preferred the LSI revealed a negative correlation with global processing. This indicated that the students who preferred the LSI were analytically preferenced.

Relationship Between Attitude Scores and Global/Analytic Preference

	Question A Test 1	Question A Test 2	Question B Test 1	Question B Test 2
Attitude	-.4680*	-.4692*	-.6640*	-.6575*

p<.001

This attitude survey lends further credence to the research concerning the preferences of global/analytic learners. Global learners prefer processing in pictures, symbols, icons, and themes. If educators are to justify their professional decisions concerning instructional strategies for both teaching and assessing learners, it is necessary that they engage in an extreme paradigm shift.

Conclusions

Based on the data that emerged from this research, it was concluded that global students responded more accurately and consistently to a global-format learning-style identification instrument than they did to an analytic-format instrument. Specifically, the **LS:CY**! evidenced strong reliability and validity across gender, geographic description, grade, regional location, and school affiliation. In addition, strong correlations were evidenced among field dependence/ independence, global/analytic, and visual preferences. Furthermore, student's attitudes toward the **LS:CY**! — the global-format instrument — were significantly more positive than they were toward the LSI — the analytic-format instrument. Understandably, students in the sample population who preferred the LSI significantly more than the **LS:CY**!, were strongly analytic.

Research with LS:CY!
Homework Prescriptions for Middle-School Students

Jennifer Lauria Minotti (2005) designed a study to examine the effects of individualized learning-style Homework Prescriptions on the achievement and attitudes of sixth-, seventh-, and eighth-grade middle-school students in a parochial New York City school. Two different treatments were utilized for the Experimental vs. the Control Groups. The treatment assigned to the Experimental Group provided learning-style-how-to-study guidelines based on the LS:CY!. The treatment assigned to the Control Group required distribution to, and adherence of, traditional study guidelines that included participation in class lectures, readings, and subsequent discussions.

Participants were administered a pretest on their knowledge of learning styles and two attitudinal surveys—one identifying the students' attitudes toward learning styles; the other identifying their attitudes toward studying and completing homework assignments. Each of the six classes participating in this study were tested separately in a climate- controlled vacant computer laboratory.

On the second day of this investigation, the Experimental Group was introduced to learning styles via an animated computerized slide show followed by a group discussion. A copy of the slide show was sent home to permit parents to become acquainted with the presentation. The Control Group also viewed an animated computerized slide show—one on traditional study strategies. The Control Groups' parents also received that presentation. Shortly thereafter, the **LS:CY**! (Burke & Dunn, 1998) was administered to the Experimental Group to identify those students' individual learning-style preferences.

The Control Group received a booklet of traditional tips for studying and completing homework assignments. The *Homework Tips* booklet was disseminated among and discussed with the Control Group students in a nearby conference room while the Experimental Group was being administered the **LS:CY**! in the computer lab. The parents of the students in the Control Group also were given a copy of the *Homework Tips* booklet.

Related Homework Prescriptions were computer generated for each of the students in the Experimental Group based on the results of their **LS:CY**! individual data. Students were directed to use the suggestions for studying and doing homework during the next two-week period. Their parents were given a copy of their own child's computer-generated Homework Prescription.

All students were required to report how they actually studied based on the suggestions outlined in either the *Homework Tips* booklet distributed to the Control Group or the learning-style based Homework Prescriptions for the Experimental Group. Each participant was given a study log and pen to record the information each night and was directed to turn in that log with the required assignment each day during the two-week period.

Multivariate analyses of variance (MANOVA) and Pairwise comparisons were employed to examine whether use of homework prescriptions significantly affected the achievement and attitudes of middle-school students when compared with the application of traditional study strategies. Data evidenced statistical differences in achievement between the scores of the Experimental and Control Groups. Findings supported statistically higher gains in knowledge of learning styles, reading, mathematics, science, and social studies achievement, and attitudes-toward homework and attitudes-toward-learning styles resulting from the Experimental treatment condition. Significance was reported at the $p < .001$ level and effect sizes indicated moderate to very strong interactions.

Comparisons of Two Learning-Style Identification Instruments for Middle-School Students

Charlotte S. Ming (2004) compared the computer-generated results of using two different learning-style identification inventories on seventh-grade middle-school students in Bermuda. Based on previous studies, she hypothesized that there would be essential similarities between the learning-style profiles generated on the same students by the *Learning-Styles Inventory* (LSI) (Dunn, Dunn, & Price, 2000) and the **LS:CY**! (Burke & Dunn, 1998).

The LSI consists of 21 elements whereas the **LS:CY**! consists of 23 and the two instruments' questions are worded differently. The last two elements of the LSI and the last three elements of the **LS:CY**! differ, too. Whereas the LSI questions students in a single-focused, True or False questioning format, the **LS:CY**! bases it questions on five mystery stories to capture students' imagination. The **LS:CY**! also includes illustrations related to each question to assist global students in understanding the meanings of both the stories and the questions.

The 20 similar elements of the LSI and LS:CY! were compared using a paired sample t-test. The elements of light, seating design, persistence, auditory, visual, tactual, intake, time-of-day, late morning, and needing mobility were essentially similar at the $p < .05$ level. The remaining elements may have differed somewhat, but not to a significant degree.

Taiwanese Adolescents' Reading and Mathematics Achievement by Age, Gender, Learning Styles

This study examined the differences in learning-style preferences between 704 11- and 12-year-old female and male Taiwanese adolescents and then determined whether their learning styles correlated with their mathematics- or reading-test scores by age, gender, and SES. Learning style was identified with the LS:CY! (Burke & Dunn, 1998). Mathematics- and reading-test score data were obtained from two Taipei Municipal elementary schools; socio-economic status (SES) was determined by Stevens and Cho's *Socio-Economic Index (SEI)*.

T-test results supported Hypothesis 1 that there were significant age differences between the learning-style preferences of 11- and 12-year-old Taiwanese students. They also revealed that Taiwanese students differed significantly in their learning-style preferences for 12 Dunn and Dunn Model elements — sound, temperature, design, motivation, persistent, responsible/confirming, peers/alone, authority, auditory, intake, morning/evening, and mobility.

The results of the second t-test supported Hypothesis 2. Diverse and significant gender variables were revealed through t-tests for five of 23 learning-style variables: (a) female students preferred a more formal environmental design than male students; (b) male students evidenced a greater preference for their kinesthetic modality than female students did; (c) male students preferred intake more than female students; (d) female students tended to be more analytic or sequential than male students; and (e) female students were more reflective than male students.

The results of two multiple regressions and two correlation analyses revealed a significant relationship between a model composed of all predictor variables (learning-style environmental stimulus, emotional stimulus, sociological stimulus, physiological stimulus, and psychological stimulus, age, gender, and SES) and Taiwanese students' achievement scores in mathematics and reading. Results also indicated significant relationships between students' achievement-test scores and their learning-style emotional stimulus, between students' achievement-test scores and their learning-style physiological stimulus, between students' achievement-test scores and gender, and between students' achievement-test scores and SES.

Learning Styles of Biological Siblings and Their Parents

Joann Borchetta's in-progress research was designed to determine the extent to which siblings' learning styles differed from each other and from their parents' styles. She is exploring the following questions.

1. Will there be significant differences and similarities between or among the learning styles of biological siblings?
2. Will there be significant differences and similarities between or among the learning styles of biological siblings based upon age?
3. Will there be significant differences and similarities between or among the learning styles of biological siblings based upon gender differences?
4. Will there be significant differences and similarities between or among the learning styles of biological siblings and their parents?

Previous studies indicated that selected learning-style preferences, such as auditory instruction, are biological and cannot be changed on demand (Restak, 1979; Thies, 1979; Thies, 1999-2000). To identify the learning styles of the students in Grades One through Four, *Our Wonderful Learning Styles* (OWLS) *(*Guastello & Dunn, 1997) will be administered. Students enrolled in Grades Five through Eight will be administered the **LS:CY**! (Burke & Dunn, 2005). *Building Excellence* (BE) (Rundle & Dunn, 2000) will identify the learning styles of the parents in this study.

Data currently are being collected and coded to identify the styles of each sibling and parent within the same family. These data then will be analyzed to determine the extent to which each of the family members' styles are similar to or different from each other by age, gender, and birth order.

Available Translations of the LS:CY! Into Multiple Languages

Persons wishing to identify the learning styles of students in Grades Five though Eight have access to this assessment in several languages—Danish, English, Norwegian, Spanish, Swedish, and Taiwanese. Students need merely click onto www.cluetoyou.com and locate the section that cites the language in which it may be taken. Too, research concerning the learning styles of adolescents in Bermuda, Brazil, Brunei, Germany, Hungary, New Zealand, Russia, Sweden, the Philippines, and the United States is available in Dunn & Griggs (2004).

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