

*Learning Styles Research: Understanding
How Teaching Should be Impacted
By the Way Learners Learn
Part II: Understanding How Learners
Prefer to Receive Information*



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Abstract: Over the years, educators have asked questions about how people learn. This article is the second in a series of three that provide updated information on the impact of learning styles on learners. In addition, learning style assessments for each of the theories will also be discussed.

Introduction

Past studies on learning styles give attention both to how a student learns and to how a student prefers to learn. Learning style research was first documented as an emerging concept during the 1970s. Since that time, researchers have approached the concept of learning styles from differing vantage points. As Rita Dunn, one of the early learning style researchers, wrote, "Learning style is the way in which each person absorbs and retains information and/or skills; regardless of how that process is described, it is dramatically different for each person" (Dunn, 1984, p. 12).

Using learning styles assessment instruments can provide effective assistance to teachers. First, understanding how a student prefers to learn allows the teacher to attempt to match a student's learning style with the way the teacher delivers information. Second, understanding how a student prefers to learn can help the teacher lead the student in developing existing and adapting new individual learning strategies (Smith, 1990).

To organize types of learning style theories, Curry developed a model based on a survey of 21 recognized theories. The Curry Model was initially

organized into a three-layered system that she described as the layers of an onion. The outer layer of the model describes the way the learner interacts with the learning environment and with instructional practices. The middle layer focuses on how information is processed. The center or core of the model focuses on learning behaviors associated with the learner's central personality style (Hickcox, 1995). Curry later updated her research by dividing the outer layer into two layers. The outer layer is now dedicated to instructional preference and classroom environment. The second layer now encompasses theories of how social interaction affects learning (Cassidy, 2004). These two outer layers were presented in the first article in this series, which was published Spring 2006.

Reviewing Curry's Middle Layer

Curry identified numerous researchers in the middle layer of her model. The learning style theories of Biggs; Entwistle and Ramsden; Hunt; Kolb; Reinert; Schmeck, Ribich, and Ramanaiah and Schroeder are included within this layer (Hickcox, 1995). These theories focus on how students process information. The research of Kolb; McCarthy; Entwistle and Ramsden; and Schmeck, Ribich, and Ramanaiah will be the focus of this discussion. These theorists were selected because of the high scores for validity and reliability each received in Curry's assessment.

Kolb Learning Styles

A leading researcher in Curry's middle layer of learning styles is David Kolb who defines learning styles as "one's preferred methods for perceiving and processing information" (Jonassen & Grabowski, 1993, p. 249). At the center of Kolb's theory are two fundamental concepts. The first concept is how learners grasp a new experience or receive new information. The second concept is how learners process or transform the learning experience (Claxton & Murrell, 1987). Using these concepts as his core, Kolb's research has concentrated around a four-stage experiential learning cycle that includes four adaptive modes of learning: concrete experience, reflective observation, abstract conceptualization, and active experimentation. Concrete experience (feeling) and abstract conceptualization (thinking) describe how a learner perceives environments and experiences, and are viewed as opposite ends of the learning continuum. Reflective observation (watching) and active experimentation (doing) describe how information is processed and are also viewed as opposite concepts. Each mode has unique aspects and can be defined separately (Claxton & Murrell, 1987).

Abstract individuals comprehend information conceptually and symbolically. *Concrete* individuals rely on or apprehend by the tangible, felt qualities of immediate experience. *Active* individuals extend the environment by external manipulation. *Reflective* individuals exhibit intention by internal reflection on the external world. (Jonassen & Grabowski, 1993, p. 249)

Kolb's findings support the theory that every individual draws from each of these areas to some extent, although each has a preferred learning style (Willcoxson & Prosser, 1996). Using these two continuums, Kolb determined four learning styles: Divergers, Assimilators, Convergengers, and Accommodators.

Accommodators are best at learning from "hands on" experience (doing and feeling). Divergers excel in using imagination and brainstorming, combining concrete experience and reflective observation (feeling and watching). Convergengers' dominant learning abilities are focused on finding practical uses for ideas and theories (doing and thinking). Assimilators are most adept at logically organizing and analyzing information, building and testing theories, and designing experiments (thinking and watching). (Philbin, Meier, Huffman, & Boverie, 1995, pp. 486–487)

Within each style, learning is described from different perspectives and is determined by how someone relates socially with family and friends and by "heredity, past life experiences, and the demands of the present environment" (Jonassen & Grabowski, 1993, p. 249). Learners within each of the four styles demonstrate preferences that grow naturally from personality characteristics. The personality types measured in the Myers-Briggs Type Indicator show a logical impact and connection to Kolb's learning style preferences (Davis, 1993). The Myers-Briggs Type Indicator is based on the theory that behavioral variations within any individual are actually consistent with the way the individual receives information and makes decisions. This personality instrument is designed around Jung's theory that all individuals use sense or intuition in the perception of life, and thought or feelings in order to make decisions (Claxton & Murrell, 1987).

Characteristics of Kolb's Learning Styles

Kolb's learning theory can be visualized as two perpendicular axes demonstrating the continuum between active experimentation and reflective observation and between concrete experience and abstract conceptualization.

An individual whose learning style is located close to the intersection of the axes will have a more balanced approach to learning and will be more adaptive in learning situations. On the other hand, an individual whose style is located away from the intersection will be more dominated by that style in learning (Pinto, Geiger, & Boyle, 1994).

Divergent learners prefer concrete experience and reflective observation during learning experiences. Divergers tend to depend heavily on feelings, imagination, and intuition. They have the ability to see many perspectives and generate ideas, and the ability to relate well to others. They are open-minded and typically engage in thoughtful understanding. However, weaknesses are found in areas of decision-making, thinking skills, use of theories, and systematic thought processes (Jonassen & Grabowski, 1993).

Researchers have determined that Divergers will excel in learning situations that include individualized learning, open-ended assignments, and sensitivity to feelings. Learning strategies should include evaluating current information, creating examples, using illustrations, and evaluating implications. Divergers tend to struggle in learning situations that emphasize theoretical background or theoretical models (Jonassen & Grabowski, 1993).

Assimilative learners prefer abstract conceptualization and reflective observation. Assimilators depend upon sound logic, accuracy, inductive reasoning, and the ability to assimilate a wide range of ideas. They have the ability to create multiple perspectives in learning, to use a systematic approach, to organize information, and to analyze abstract concepts. Weaknesses within this learning style include the tendency to be less focused on people or feelings, to minimize personal involvement, and to exert little influence on others. Assimilators are not usually action-oriented, artistic, or decisive (Jonassen & Grabowski, 1993).

Researchers have determined that Assimilators will excel in learning situations that include organized information, conceptual models, testing of theories, and analysis of data. Learning strategies should include validating sources, forecasting predictions, and evaluating implications. Assimilators are challenged in learning situations involving simulated situations or applying real-world situations (Jonassen & Grabowski, 1993).

Convergent learners prefer abstract conceptualization and active experimentation. They are strong in the areas of problem-solving and decision-making. Convergers tend to be unemotional, focused, and pragmatic. They have the ability to apply ideas practically, to use a systematic and analytical approach, to influence others, and to get things done. Weaknesses can include having narrow interests and being relatively unemotional, close-minded, and unimaginative. Convergers tend to focus less on people or feelings and more on concrete tasks (Jonassen & Grabowski, 1993). "They perform well in situ-

ations such as conventional intelligence tests, where there is a single correct solution to a problem” (Pinto, et al., 1994, p. 114).

Researchers posit that Convergers will excel in learning opportunities that include creating new ways of thinking and experimenting with new ideas. They enjoy goal setting and decision-making. Learning strategies should include goal-setting, repetition of important information, outlining information, and outcome predicting (Jonassen & Grabowski, 1993).

Accommodative learners prefer concrete experience and active experimentation. Accommodators’ strengths are being action- and results-oriented, seeking new experiences, and being willing to take risks. Accommodators have the ability to carry out plans, to adapt to new situations, to influence and to lead others, and to achieve results. They are often intuitive, artistic, and people-oriented. Weaknesses can include relying on other people for information, lacking confidence in personal analytic ability, disregarding theory, and being perceived as controlling (Jonassen & Grabowski, 1993). Accommodators “perform well in situations where a person must adapt to changing immediate circumstances” (Pinto, et al, 1994, p. 114).

Researchers have found that Accommodators will excel in learning that includes the opportunity to set objectives, seek opportunities, and influence others. They enjoy using concrete examples to apply information and prefer active participation instead of reflective participation (Jonassen & Grabowski, 1993).

Kolb’s Theories on Learning

Based on his findings, Kolb provides perspective on both learning and development. First, he has redefined his initial concept of learning:

Learning is best conceived as a process, rather than in terms of outcomes. Ideas are not fixed and immutable elements of thought, but are formed and re-formed through experience. Learning is described as a process whereby concepts are derived from, and continuously modified by, experience. From the perspective of experiential learning, the tendency to define learning in terms of outcomes can become a definition of nonlearning; the failure to modify ideas and habits as a result of experience is maladaptive. (Jonassen & Grabowski, 1993, p. 254)

Second, Kolb supports Dewey’s concept that learning continues throughout life and is affected by the learner’s experiences. Dewey suggested that every experience is interpreted within the framework of previous experiences and will modify further those experiences yet to come. Third, Kolb

accepts Lewin's theory that emphasizes the importance of a learner's active participation in the learning process. Finally, Kolb supports the Piagetian concept that describes intelligence as a result of a learner's interaction with his environment rather than an innate characteristic within the learner (Claxton & Murrell, 1987).

Kolb links learning with individual development and describes learning as the movement of a learner from simple to complex concepts. The period of the early years of a learner (from birth to age 15) is seen as a period of acquisition or acquiring information and skills upon which all future learning is based. Acquiring language and basic math concepts are included within this period. The next period (from about 16 to 40 years of age) is a period of learning specialization during which a learner's personal preferences directs his or her learning experiences. Within this period, students learn specific information and skills pertaining to a career, such as medical skills, accounting skills, or plumbing skills. The final period (after the age of 40) is a period of learning integration during which an individual attempts to resolve the conflict between the need for specialization and the desire for personal fulfillment. Within this period, emphasis is placed on continuing education as well as developing skills outside of the chosen profession. For example, a doctor is required to stay current in research within the medical field at the same time he can develop skills in music (Claxton & Murrell, 1987).

The Use of Learning Styles in the Classroom

Interestingly, more recent research by Kolb and others has been used to determine what gender differences can be found within these learning styles. Research was based on two concerns. The first concern was conceptions about how women learn have been shaped historically within the framework of a male-dominated culture. Learning characteristics for females, such as intuitiveness and personal knowledge, have often been devalued academically. The second concern was the fact that the male experience in learning has been used as the baseline against which the characteristics of both men and women as learners have been evaluated. Researchers found that the learning style least compatible with how women learn is the Assimilator, a style that is most accurately reflected in the traditional approach to academics. Women were found to do best in learning opportunities in which they could be involved in hands-on, practical experiences that focused on the affective domain (Philbin, et al., 1995).

Jones, Reichard, and Mokhtari (2003) discovered that although students may indicate a preference for a certain learning style, they tend to adapt their learning strategies to the subject matter being studied. For example, when studying science many students said they would prefer to learn through active

experimentation, even if that were not their primary learning style. However, when studying English or social studies, they would not use active experimentation as a learning strategy. “Students’ learning style preferences varied significantly across four different subject-area disciplines: English, math, science, and social studies” (p. 372). The researchers determined that students were able to “style-flex” (p. 371) or use learning strategies other than their primary learning style when the subject matter demanded them to do so.

Kolb’s research has been helpful as education opportunities develop outside the traditional classroom to include online learning and distance education formats. Kolb’s Learning Style Inventory (LSI) has been used to predict whether a student’s enjoyment level of an online course is an indicator of his/her success in the course. Terrell and Dringus (2000) discovered that graduate students classified as Accommodators “dropped from the [Internet-based] program at rates substantially higher than students with other preferred learning styles” (p. 237). Du and Simpson (2002) found that student enjoyment in an online course directly related to learning style. They suggest that instructors structure course design according to the learning styles of their students to increase satisfaction and achievement. Suggestions include providing students instruction and exploration training at the beginning of the course to help enable them to study more independently and more effectively. In addition, the more involved the students were in course participation, the more positive the learning experience was for online students.

Arant, Coleman, and Daniel (2002) recommend that online course instructors vary the instructional techniques and course requirements to suit the needs of their students.

Convergers prefer teaching methods that provide decision-making, problem-solving, and hands-on work. Divergers prefer cooperative groups and brainstorming. Teaching to Assimilators, a professor might assign the creation of a model or theory, or allow students to design projects for credit. In the same vein, Accommodators would prefer assignments that allow the discovery of learning, and activities, and projects, as opposed to reading and lectures. (pp. 11–12)

Reliability of the Learning Style Instrument (LSI)

The strength of the LSI can be seen in the reliability testing of the instrument. According to Hickcox (1995), when reviewing the research field for Kolb’s testing instrument, Curry assigned psychometric ratings of “strong in regard to reliability and fair in terms of validity” (p. 34). Veres, Sims, and Locklear (1991) tested the 1985 version of the LSI and reported, “The increased stability of the modified version argues against dismissal of the LSI as an instrument for the study of learning styles” (p. 143).

However, not all reviews of Kolb's Learning Style Inventory have been favorable. Cassidy (2004) listed five different reviews, dating from 1979 to 1992, that questioned the reliability and validity of the instrument. Henson and Hwang (2002) stated that "continued use of the LSI should be considered questionable at best" (p. 724) after reviewing 110 articles developed from Kolb's LSI. Loo (2004) administered Kolb's Learning Style Inventory to a group of management undergraduates. "Large individual differences in learning preferences within each style and type, and small differences in learning preference mean scores show that, overall, there are weak linkages between learning styles and learning preferences" (p. 99).

Practical Uses of the Learning Style Instrument (LSI)

Proponents who use Kolb's testing instrument cite the ease of developing teaching methodology that targets each identified learning style as support for the instrument and the theory (Garner, 2000). Critics contend, however, that "none of the research used Kolb's work to assign learning styles to students and then try and facilitate those learning styles" (Garner, 2000, p. 347). Students who prefer concrete learning experiences learn best in situations where they are allowed to see, touch, and experience things during the instructional process. Students with preferences for abstract learning enjoy presentations of theoretical information that they can understand before attempting to apply the new information to real situations. Students who are active learners prefer to participate in the learning process through discussion and hands-on learning strategies. Reflective learners prefer to work alone as they think through the information presented (Jonassen & Grabowski, 1993).

Experiential learning involves students in activities both within and outside the classroom. In the classroom, the professor provides information that will be necessary for the student to perform effectively in the field. After an outside learning experience, professors can help students analyze the experience by identifying situations the student could handle as well as those where the student needs additional guidance (Hickcox, 2002).

Outside-of-the-classroom experiences emphasize learning in settings where students eventually are going to live and work. In the classroom, active learning strategies such as the case study method, role-playing and simulations of work and other environments, cooperative learning, and problem-based discussion groups move the faculty members' role from "teaching" to "teaching for learning." (Hickcox, 2002, pp. 127-128)

When professors incorporate experiential learning into their curriculum design, several considerations will need to be made. First, professors might need to modify course content to allow time for experiential activities and the

resulting discussions. Second, professors cannot assume that students will study the course content on their own. In addition to monitoring learning activities, professors will need to hold students accountable for mastering the subject matter. Third, traditional college students (age 18 through mid-20s) may be uncomfortable with this approach to learning. Professors should be willing to explain the importance of experiential learning and the specific learning goals for each activity. For this reason, courses designed for first- and second-year students should focus on acquisition of knowledge. In the final years of study, students will then be better prepared for courses with a significant emphasis on experiential learning activities (Hickcox, 2002).

McCarthy 4MAT System

Researcher Bernice McCarthy used the research of David Kolb as the theoretical basis for 4MAT. For McCarthy, the task was to describe the differences in the way people perceive reality and the way people process information in light of that reality (McCarthy, 1990). McCarthy proposed that a student needed learning experiences in all four of the areas Kolb identified and described this process as a “*natural cycle of learning*” (McCarthy, 1997, p. 46).

McCarthy’s 4MAT System was developed using Kolb’s four groupings of learners: those who learn by (a) feeling, (b) thinking, (c) doing, and (d) reflecting and watching. Within each of these areas, McCarthy suggested activities using the left or analytical mode of the brain and the right or intuitive mode of the brain to help learners progress through the natural cycle of learning (McCarthy, 1997). For those who learn by feeling, McCarthy suggests that the teacher serve as a motivator and witness to students, thereby creating “an accepting climate where the imaginative learner (and all types of learners) can explore ideas without being evaluated too quickly” (McCarthy, 1987, p. 125). For those who learn by thinking, McCarthy perceives the role of teacher as one who provides information and stresses the need to provide information that is organized. For those who learn by doing, McCarthy describes the role of the teacher as a facilitator and a coach who takes a support position through learning activities. For those who learn by reflecting and watching, McCarthy emphasizes the need for the teacher to serve as an evaluator and remediator who creates “a climate where there is freedom to discover by doing” (McCarthy, 1987, p. 125). McCarthy recognizes the challenge presented to teachers from her findings:

The complexity of schooling makes it necessary to understand how the parts and the whole fit together and to plan accordingly. To focus only on instruction (as I believed I would at first) will not work. Learning style issues lead directly to instruction issues, which lead directly to curriculum

issues and their attendant ambiguities about the nature of evaluation. The necessity to integrate curriculum leads to questions about teacher time, time away from students to work together, to construct integrated approaches to content, and to be learning partners to one another. And all of it hinges on outcomes. What are our goals? Do we want our students skilled in multiple forms of conceptualization, or are the present narrow forms of evaluation sufficient for life in contemporary society, where meaning is experienced as multiple and interactive?

I continue to ponder these questions and to experience the complexity of the schooling enterprise as I go. It has become apparent to me that a systems approach is vital. And I become more and more perplexed by—and leery of—people who have easy answers. (McCarthy, 1990, p. 36)

McCarthy aims for a balance in teaching/learning activities. She stresses that “teachers do not need to label learners according to their style; they need to help them work for balance and wholeness” (McCarthy, 1997, p. 50).

Learning is both reflective and active, verbal and nonverbal, concrete and abstract, head and heart. The teacher must use many instructional methods that are personally meaningful to each student. The more students can travel the cycle, the better they can move to higher-order thinking. (McCarthy, 1997, pp. 50–51)

She emphasizes that “all students need to be taught in all four ways in order to be comfortable and successful part of the time while being stretched to develop other learning abilities” (McCarthy, 1985, p. 62).

Employing McCarthy’s 4MAT System is not without difficulties. Scott (1994) documented the challenges teachers expressed when they tried to incorporate 4MAT teaching. Although teachers were convinced of the importance of using the 4MAT System, they required additional training to learn how to plan activities within each of the quadrant areas.

Entwistle and Ramsden Learning Styles

Building upon the research of theorist Gordon Pask, researchers Entwistle and Ramsden approach learning styles from a serialist/holist cognitive basis. Pask studied how students attempt to complete a learning activity that requires understanding and found “two distinctive *styles of learning—holist and serialist*” (Entwistle, 1987, p. 61). A holist learns by focusing on multiple aspects of content, while considering the larger picture. A serialist learns through focusing on small bits of information, while concentrating on step-by-step learning (Jonassen & Grabowski, 1993). “Learners using a deep or

holist approach consciously pursue and reach deep understanding. Those using a surface or serialist approach seek out facts for memorization” (Jonassen & Grabowski, 1993, p. 213).

Entwistle and Ramsden created the Approaches to Studying Inventory (ASI) to test Pask’s concept of “holist and serialist *learning strategies*” as well as “deep and surface *approaches to learning*” as defined by Marton and Saljö (Entwistle & McCune, 2004). The ASI classified students’ approaches to studying into one of four orientations.

The *reproducing orientation* indicated the use of a surface approach, with an emphasis on rote memorizing, and a narrow syllabus-bound attitude, associated with both extrinsic motivation and fear of failure. In contrast, *meaning orientation* indicated an intention to understand for oneself—comprehension learning, relating ideas, and using evidence being all motivated by interest in the ideas presented. The *achieving orientation* involved a strategic approach (being aware of study requirements and making sure they were achieved), linked positively to achievement motivation and negatively to disorganized studying. The final and less well defined orientation—*nonacademic*—indicated negative attitudes to studying and was associated with both of Pask’s learning pathologies—improvidence and globetrotting. (Entwistle & McCune, 2004, p. 329)

In response to continuing research, the original ASI has been restructured several times. Other versions include the Revised Approaches to Studying Inventory (RASI), the Approaches and Study Skills Inventory for Students (ASSIST), and the Approaches to Learning and Studying Inventory (ALSI). Each version of the ASI continues to assess how students approach studying (Entwistle & McCune, 2004).

Entwistle and Ramsden’s Three Approaches to Learning

Learners who use the deep approach “are more likely to actively construct what they learn and give meaning to what they need to remember. . . . Deep learners are also more likely to be self-motivated to learn” (Santrock, 2001, p. 147). Specific characteristics of the deep approach include “intention to understand; vigorous interaction with content; relate new ideas to previous knowledge; relate concepts to everyday experience; relate evidence to conclusions [and] examine the logic of the argument” (Entwistle, 1987, p. 60). Deep approach learners accept responsibility for their own learning and “become actively interested in the course content” (Entwistle, 2001, p. 10).

Learners who use the surface approach “fail to tie what they are learning into a larger conceptual framework. They tend to learn in a passive way, often

rotely memorizing information” (Santrock, 2001, p. 147). Specific characteristics of the surface approach include “intention to complete task requirements; memorise (*sic*) information needed for assessments; treat task as an external imposition; unreflectiveness about purpose or strategies; focus on discrete elements without integration [and] failure to distinguish principles from examples” (Entwistle, 1987, p. 60).

Entwistle identified the strategic approach after determining a third learning option “in which the [students’] intention was to achieve the highest possible grades, while the process depended on cue seeking, well organised [*sic*] study methods, and effective time management” (Entwistle, 1997, p. 19). Specific characteristics of the strategic approach include “intention to obtain highest possible grades; use previous exam papers to predict questions; be alert to cues about making schemes; organise [*sic*] time and distribute effort to greatest effect [and] ensure conditions and materials for studying [are] appropriate” (Entwistle, 1987, p. 60).

Entwistle and Tait (1993) conclude, “Students with contrasting approaches to learning are likely to define ‘good teaching’ in quite different ways” (p. 9). They offer the following description of the challenges in fulfilling students’ expectations of good teaching:

Although some students will rate highly teaching which is intellectually challenging, other students will prefer courses that ‘give them the facts’. Students adopting a surface approach will appreciate teaching that directly supports and assesses a narrowly defined set of educational objectives. Inevitably, some students are reluctant to put the amount of intellectual effort into their studying which the deep approach demands, and therefore appreciate teaching which cuts down their work, rather than increases it by challenging them to think for themselves and carry out further readings. (p. 9)

Moving Students to Deep Learning

In spite of these challenges, Entwistle (2001) provides several recommendations to promote deep learning. First, Entwistle suggests encouraging deep learning through proper curriculum design and teaching methods by using open-ended topics, emphasizing learning aims, stressing topic relevancy, and including definitions of important course content. Second, Entwistle prescribes using tests and assessment techniques that evaluate and demonstrate understanding and suggests assigning grades based on levels of understanding. Finally, Entwistle stresses that using the deep strategic approach allows students to fully take advantage of deep learning opportunities. However, students who are more shallow in their learning approaches tend to

be less prepared and less able to accept available learning help. Suggestions for improving deep learning for students include “provide overarching goals, generative topics, and clear aims; relate teaching directly to prior knowledge; teach so as to clarify meanings and arouse interest; encourage metacognitive alertness and self-regulation in studying; introduce formative assessments designed to develop understanding [rather than multiple-choice tests]; develop marking [grading] criteria to describe levels of understanding; use assessment techniques that encourage and reward conceptual understanding” (Suskie, 2001, p. 17).

In using the ASI, Elias (2005) found that several factors could impact each student’s ability to use deep learning. For example, Elias discovered that women tend to use more deep learning strategies than men do. Nontraditional students also rely on deep learning strategies more than traditional students do. Interestingly, Elias found that freshmen and seniors were more likely to use deep learning strategies than were sophomores and juniors.

Schmeck, Ribich, and Ramanaiah Learning Styles

In 1977, researchers Schmeck, Ribich, and Ramanaiah first published the Inventory of Learning Processes (ILP) to examine the cognitive activities students use while studying (Schmeck & Geisler-Brenstein, 1991). The inventory was used to investigate “the behavioral and conceptual processes which students engage in while attempting to learn new material” (Ribich & Schmeck, 1979, p. 516). The ILP was originally created with 62 true/false statements. The inventory was later revised (ILP-R) by Schmeck and Geisler-Brenstein in 1991 by adding an additional 118 statements. In addition, response options were converted to a 6-point Likert scale. The ILP-R is used to collect student responses to four dimensions of their involvement in studying: Academic Self-Concept (how a student approaches learning from an emotional basis); Reflective Processing (how a student expresses and asserts himself through learning); Agentic Processing (how a student focuses personally on the task of learning); and Methodical Study (what methods a student uses to process information) (Schmeck & Geisler-Brenstein, 1991).

The dimension of Academic Self-Concept is based upon four subscales within the ILP-R. These four subscales are used to measure a student’s intrinsic motivation for learning, the student’s self-efficacy in the learning process, the student’s ability to learn through non-reiterative processing, and the student’s self-esteem. A student’s responses to each of these subscales are used to determine whether a student’s self-concept as a learner is healthy (Schmeck & Geisler-Brenstein, 1991).

The second dimension, Reflective Processing, is based on three subscales within the ILP-R. These are used to measure the student’s ability to use deep

processing of information while learning, the student's ability to use elaborative processing by connecting concepts to past experiences and information already processed, and the ability to use self-expression while learning (Schmeck & Geisler-Brenstein, 1991).

The third dimension, Agentic Processing, is based on three subscales within the ILP-R. These subscales are used to measure the student's desire for authority, order, and adherence to a stated plan, the student's ability to use serial processing by moving from one completed learning task to another, and the student's ability to retain facts. A student who scores high in this dimension is expected to succeed with objective tests (Schmeck & Geisler-Brenstein, 1991).

The final dimension, Methodical Study, has no subscales. The dimension is used to draw information about the student's study skills and habits. A student who scores high in this area tends to study frequently and over-study for tests, although he may not be successful as a student (Schmeck & Geisler-Brenstein, 1991).

Richardson (2000) has voiced several concerns about the ILP and the ILP-R. First, he cites the lack of testing international students and distance education students as detrimental to understanding test results. Second, Richardson suggests that test results of the ILP-R do not demonstrate distinct differences between the scales, and, therefore, he questions the use of the instrument.

Deep-Elaborative or Shallow-Reiterative Cognitive Styles

Schmeck (1988) contends that a student's cognitive style can change or adapt to fit specific learning requirements, although he believes "there is still a stylistic element that is often very resistant to change" (p. xiii). Therefore, he stresses the importance of developing and integrating both global and analytic functions in the learning process.

The predominantly analytic person has the capability to see surface differences whereas the global individual looks deeper into relationships. Nevertheless, analytic skills are still needed to examine, evaluate, and comprehend relationships at a complex level. Therefore, . . . it is the self-actualized individual using both styles who sees deeper and with greater understanding. (Tendy & Geiser, 1997, p. 5)

According to Schmeck (1981), students can usually be classified into two learning groups. Those students who are classified as deep-elaborative "spend more of their study time thinking and less time repeating. They classify, com-

pare, contrast, analyze, and synthesize information from different sources” (pp. 384–385). In contrast, those students who are classified as shallow-reiterative “spend much of their study time repeating and memorizing information in its original form. They prefer to assimilate information as given rather than rewording, restating, or rethinking it” (p. 385). For the teacher, the challenge is to help students move from rote memorization to integration of content and experience.

Schmeck’s and others’ findings underscore the importance of a student’s being able to identify his feelings about learning activity. How the student feels about himself as a learner and about the activities required for learning determines the student’s success. The implication of this finding is that the teacher assumes a mentorship role by helping a student successfully learn using a variety of learning activities. Rather than changing the tasks or the learning process, the teacher has the responsibility of helping a student understand his own strengths and weaknesses so he can adapt to the requirements of learning (Schreiber & Shinn, 2003).

Schmeck (1981) provides several suggestions for teachers. First, Schmeck emphasizes meaning over symbols in the classroom by requiring students to restate concepts using their own words. Second, Schmeck refuses to dictate notes to students, expecting them rather to record the meaning of concepts in their own words. Third, Schmeck supplies examples of concepts and requires students to create their own examples. Fourth, Schmeck relates new concepts to other known information, thereby demonstrating that all learning is connected. Students are then encouraged to make connections between concepts learned in the classroom and real-life experiences.

When designing test instruments, Schmeck (1981) avoids using questions that require memorization of facts or matching his preset expectations. Instead, he tests students’ comprehension of material on a deeper level by calling for them to use their experiences in the process. Further, Schmeck chooses not to use questions with only one acceptable response and gives credit when students demonstrate careful consideration of the material in their answers. Finally, Schmeck uses questions that require students to compare and contrast learned concepts.

Questions and Implications Drawn from Learning Styles Theories for Christian Teaching

As stated in the first article of this series, a review of learning styles raises as many questions as it answers. How should the understanding of learning styles impact the way a teacher teaches? If a teacher accepts the reality of individual learning styles and chooses not to use that information in teaching,

has he fulfilled the task of teaching? Several implications about learning styles can be drawn from this discussion.

First, learning is best understood as a continuing process that combines the act of receiving information with the life experiences of the student. Learning experiences that are outcome based fail to take advantage of learner experiences. As quoted earlier, Jonassen and Grabowski (1993) stressed, "From the perspective of experiential learning, the tendency to define learning in terms of outcomes can become a definition of nonlearning; the failure to modify ideas and habits as a result of experience is maladaptive" (p. 254).

Second, teachers face the difficult task of providing learning activities that are aimed at students' preferred learning styles while not neglecting the responsibility of training students to learn in new ways. If teachers focus too much attention on matching learner preferences with learning methodology, student boredom can ensue. The goal is to help students develop skills that allow them to learn in a variety of ways, even those in which they are not comfortable.

Third, teaching that is aimed at bringing about change in how learners prefer to receive and process information is more difficult to achieve than adapting environmental and social elements (Curry's outside two layers). In many cases, teachers can easily change the physical conditions of the classroom as well as the amount and type of social interaction used within a given teaching session. In contrast, when the teacher wants to ensure that each student has the opportunity to receive and process new information in his preferred cognitive style, she must involve the student's thinking skills (left-brain functions), intuitive skills (right-brain functions), and experiential skills (hands-on application) in the learning process. She must, therefore, establish very specific learning goals and then choose instructional methods that lead the students to those goals. This is a more difficult process to complete. As this series is completed, the challenges associated with the learning style theories in Curry's central layer will be considered.

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