

Personality Spectrum

Rank order the 4 responses to each question by placing a 1, 2, 3, or 4 in each box:
4 = MOST LIKE YOU, 1 = LEAST LIKE YOU

1. I like instructors who

- A. tell me exactly what is expected of me. B. make learning active and exciting. C. maintain a safe and supportive classroom. D. challenge me think at higher levels.

2. I learn best when the material is

- A. well organized. B. something I can do hands-on. C. about understanding and improving the human condition. D. intellectually challenging.

3. A high priority in my life is to

- A. keep my commitments. B. experience as much of life as possible. C. make a difference in the lives of others. D. understand how things work.

4. Other people think of me as

- A. dependable and loyal. B. dynamic and creative. C. caring and honest. D. intelligent and inventive.

5. When I experience stress I would most likely

- A. do something to help me feel more in control of my life. B. do something physical and daring. C. talk with a friend. D. want to be alone and think about it.

6. I would probably NOT be close friends with someone who was

- A. irresponsible. B. unwilling to try new things. C. selfish and unkind to others. D. an illogical thinker.

7. My vacations could be best described as

- A. traditional. B. adventuresome. C. pleasing to others. D. a new learning experience.

8. One word that best describes me is

- A. sensible. B. spontaneous. C. giving. D. analytical.

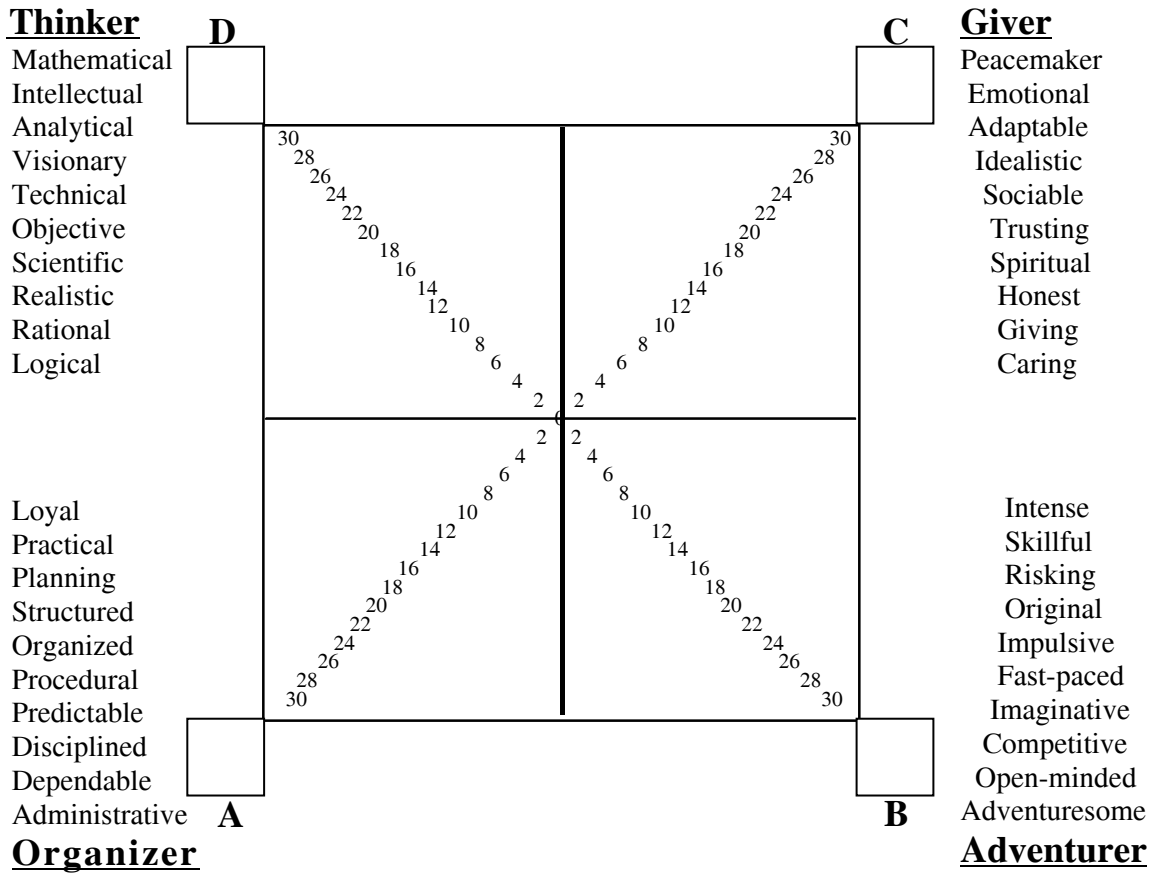
Total Columns

- A. B. C. D.

Plot these totals on the brain diagram on the next page.

Personality Spectrum—Thinking Preferences

Place a dot on the appropriate number line for each of your 4 scores and then connect the dots.



Pathways to Learning

Write your 8 Multiple Intelligences in the table below according to your scores.

Scores 20-24=Highly Developed	Scores 14-19=Moderately Developed	Scores below 14=Underdeveloped

Personality Spectrum Profiles

Thinker - NT

Personal strengths - You enjoy solving problems and love to develop models and systems. You have an abstract and analytical way of thinking. You love to explore ideas. You dislike unfairness and wastefulness. You are global by nature, always seeking universal truth.

Work/school - You work best when assigned projects which require analytical thinking and problem-solving. You are inspired by futuristic ideas and potentials. You need the freedom to go beyond the established rules. You feel appreciate when praised for your ingenuity. You dislike repetitive tasks.

Relationships - You thrive in relationships that recognize your need for independence, and private time to think and read. Stress can come from the fear of appearing foolish. You want others to accept that you feel deeply, even though you may not often express it.

Learning - You like quiet time to reflect on new information. Learning through problems-solving and designing new ways of approaching issues is most interesting to you. You may find it effective to convert material you need to learn into logical charts and graphs.

Organizer - SJ

Personal strengths - You value the traditional family and support social structures. You never take responsibility lightly. You have a strong sense of history, culture, and dignity. You value order and predictability. You dislike disobedience or nonconformity. You value loyalty and obligation.

Work/school - You enjoy work that requires detailed planning and follow-through. You prefer to have tasks defined in clear and concrete terms. You need a well-structured, stable environment, free from abrupt changes. You feel appreciated when you are praised for neatness, organization, and efficiency. You like frequent feedback so you know you are on the right track.

Relationships - You do best in relationships that provide for your need of security, stability, and structure. You appreciate it when dates that are important to you are remembered by others.

Learning - You must have organization to the material and know the overall plan and what will be required of you. Depending on your most developed Multiple Intelligences, organizing the material could include any of the following: highlighting key terms in text, rewriting and organizing notes from class or the text, making flash cards.

Giver - NF

Personal strengths - You value honesty and authenticity above all else. You enjoy close relationships with those you love and there is a strong spirituality in your nature. Making a difference in the world is important to you, and you enjoy cultivating potential in yourself and others.

You are naturally romantic and a peacemaker. You dislike hypocrisy and deception.

Work/school - You function best in a warm, harmonious working environment with the possibility of interacting with openness and honesty. You prefer to avoid conflict and hostility. You thrive when your creative approach to your work is appreciated and praised.

Relationships - You enjoy relationships that include warm, intimate talks. You feel closer to people when they express their feelings and they are open and responsive. You think romance, touch, and appreciation are necessary for survival. You blossom when others express a loving commitment to you and you are able to contribute to the relationship.

Learning - You enjoy studying with others and also helping them learn. Study groups are very effective for you to remember difficult information.

Adventurer - SP

Personal strengths - Adventure is your middle name. A hands-on approach to problems solving is important to you, and you take pride in being highly skilled in a variety of fields. You need variety and hate waiting. You live in the here and now. It is your impulsiveness that drives everything you do. You dislike rigid structure and would prefer to be the person in authority.

Work/school - You function best in a work environment that is action-packed with a hands-on approach. You appreciate the opportunity to be skillful and adventurous, and to use your natural ability as a negotiator. You like freedom on the job so you can perform in nontraditional ways and in your own style. Keeping a good sense of humor and avoiding boredom on the job is important to you. You feel appreciated when your performance and skills are acknowledged.

Relationships - You function best in relationships that recognize your need for freedom. You thrive on spontaneous playfulness and excitement.

Learning - You learn exciting and stimulating information easiest so pick classes and instructors carefully. Study with fun people in a variety of ways and places. Keep on the move. Develop games and puzzles to help memorize terminology.

Pathways to Learning

Rate each statement: rarely = 1, sometimes = 2, often = 3, almost always = 4
Write the number of your response on the line next to the statement and total each set of 6 questions.

<p>1. ____ I enjoy physical activities.</p> <p>2. ____ I am uncomfortable sitting still.</p> <p>3. ____ I prefer to learn through doing rather than listening.</p> <p>4. ____ I tend to move my legs or hands when I'm sitting.</p> <p>5. ____ I enjoy working with my hands.</p> <p>6. ____ I like to pace when I'm thinking or studying.</p> <p style="text-align: center;">____ TOTAL for Bodily-Kinesthetic</p>	<p>25. ____ I listen to music.</p> <p>26. ____ I move my fingers or feet when I hear music.</p> <p>27. ____ I have good rhythm.</p> <p>28. ____ I like to sing along with music.</p> <p>29. ____ People have said I have musical talent.</p> <p>30. ____ I like to express my ideas through music.</p> <p style="text-align: center;">____ TOTAL for Musical</p>
<p>7. ____ I use maps easily.</p> <p>8. ____ I draw pictures or diagrams when explaining ideas.</p> <p>9. ____ I can assemble items easily from diagrams.</p> <p>10. ____ I enjoy drawing or taking photographs.</p> <p>11. ____ I do not like to read long paragraphs.</p> <p>12. ____ I prefer a drawn map over written directions.</p> <p style="text-align: center;">____ TOTAL for Visual-Spatial</p>	<p>31. ____ I like doing a project with other people.</p> <p>32. ____ People come to me to help them settle conflicts.</p> <p>33. ____ I like to spend time with friends.</p> <p>34. ____ I am good at understanding people.</p> <p>35. ____ I am good at making people feel comfortable.</p> <p>36. ____ I enjoy helping others.</p> <p style="text-align: center;">____ TOTAL for Interpersonal</p>
<p>13. ____ I enjoy telling stories.</p> <p>14. ____ I like to write.</p> <p>15. ____ I like to read.</p> <p>16. ____ I express myself clearly.</p> <p>17. ____ I am good at negotiating.</p> <p>18. ____ I like to discuss topics that interest me.</p> <p style="text-align: center;">____ TOTAL for Verbal-Linguistic</p>	<p>37. ____ I need quiet time to think.</p> <p>38. ____ When I need to make a decision, I prefer to think about it before I talk about it.</p> <p>39. ____ I am interested in self-improvement.</p> <p>40. ____ I understand my thoughts, feelings, and behavior.</p> <p>41. ____ I know what I want out of life.</p> <p>42. ____ I prefer to work on projects alone.</p> <p style="text-align: center;">____ TOTAL for Intrapersonal</p>
<p>19. ____ I like math.</p> <p>20. ____ I like science.</p> <p>21. ____ I problem-solve well.</p> <p>22. ____ I question why things happen or how things work.</p> <p>23. ____ I enjoy planning or designing something new.</p> <p>24. ____ I am able to fix things.</p> <p style="text-align: center;">____ TOTAL for Logical-Mathematical</p>	<p>43. ____ I enjoy being in nature whenever possible.</p> <p>44. ____ I would enjoy a career involving nature.</p> <p>45. ____ I enjoy studying plants, animals, forests, or oceans.</p> <p>46. ____ I prefer to be outside whenever possible.</p> <p>47. ____ When I was a child I liked bugs, ants, and leaves.</p> <p>48. ____ When I experience stress I want to be out in nature.</p> <p style="text-align: center;">____ TOTAL for Naturalis</p>

Multiple Intelligences Skills

SKILLS

Verbal/Linguistic

- Analyzing own use of language
- Remembering terms easily
- Explaining, teaching, learning, & using humor
- Understanding syntax and meaning of words
- Convincing someone to do something

Musical/Rhythmic

- Sensing tonal qualities
- Creating or enjoying melodies and rhythms
- Being sensitive to sounds and rhythms
- Using “schemas” to hear music
- Understanding the structure of music

Logical/Mathematical

- Recognizing abstract patterns
- Reasoning inductively and deductively
- Discerning relationships and connections
- Performing complex calculations
- Reasoning scientifically

Visual/Spatial

- Perceiving and forming objects accurately
- Recognizing relationships between objects
- Representing something graphically
- Manipulating images
- Finding one’s way in space

Bodily/Kinesthetic

- Connecting mind and body
- Controlling movement
- Improving body functions
- Expanding body awareness to all senses
- Coordinating body movement

Intrapersonal

- Evaluating own thinking
- Being aware of and expressing feelings
- Understanding self in relationship to others
- Thinking and reasoning on higher levels

Interpersonal

- Seeing things from others’ perspectives
- Cooperating within a group
- Communicating verbally and non-verbally
- Creating and maintaining relationships

Naturalist

- Deep understanding of nature
- Appreciation of the delicate balance in nature
- Feeling most comfortable when in nature

LEARNING TECHNIQUES

Verbal/Linguistic

- Read text and highlight no more than 10%
- Rewrite notes
- Outline chapters
- Teach someone else
- Recite information or write scripts/debates

Musical/Rhythmic

- Create rhythms out of words
- Beat out rhythms with hand or stick
- Play instrumental music/ write raps
- Put new material to songs you already know
- Take music breaks

Logical/Mathematical

- Organized material logically
- Explain it sequentially to someone
- Develop systems and find patterns
- Write outlines and develop charts and graphs
- Analyze information

Visual/Spatial

- Develop graphic organizers for new material
- Draw mind maps
- Develop charts, and graphs
- Use color in notes to organize
- Visualize material (method of loci)

Bodily/Kinesthetic

- Move or tap while you learn; pace and recite
- Use “method of loci” or manipulatives
- Move fingers under words while reading
- Create “living sculptures”
- Act out scripts of material, design games

Intrapersonal

- Reflect on personal meaning of information
- Visualize information / keep a journal
- Study in quiet setting
- Imagine experiments

Interpersonal

- Study in a group
- Discuss information
- Use flash cards with others
- Teach someone else

Naturalist

- Form study groups of people with like interests
- Choose courses related to nature, when possible
- Connect ideas to what you know about nature

Understanding and Using Learning Styles

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It is the first day of a new course. Upon walking into the room, you are met with sea of new faces of various shapes, colors, and expressions. Behind each face is an individual learner who is wondering how this new learning experience will proceed. You don't even know their names, and yet you are faced with the daunting responsibility to ensure that the individuals in your program learn a new level of skill or knowledge. Like all well-prepared instructors, you have arrived with an organized agenda and course plan that clearly stipulates what will be covered, how the program will proceed, what is expected of learners, and how they will be evaluated.

After brief introductions, you distribute the agenda. The individual differences are already emerging. Some learners will read every word of the syllabus, ask for clarification on several items, follow it closely, and regularly check off items as they are completed. Some will examine the content to determine if the course information will be thorough enough and if you, the instructor, are indeed knowledgeable enough to lead this program. Some are already wondering what practical relevance the program will have to their job responsibilities or to their lives in general. Still others are hoping that there is flexibility within those structured activities on the agenda, and if not, they are ready to hit the eject button.

As the instructor, how are you going to provide a learning environment that will satisfy the needs of each individual learner in your class? Is it your responsibility to teach to the various styles of the students or is the learners' responsibility to work within the system you have designed? After all, in the real world, don't mature, responsible adults have to learn to work in organizations and systems that do not necessarily fit their style?

The appropriate response to these questions is both yes and no. Yes, the instructor is responsible to provide learning activities appropriate for the group and the course content. But, it is the learner's responsibility to analyze the expectations and complete the necessary tasks in order to accomplish the learning goal; and the learner fulfills this role by engaging the necessary brain processes. However in your experiences as an instructor, you can't help but notice that some individuals seem naturally adept in their role as learners. Their style seems to allow them to effortlessly participate and successfully complete most tasks. Then there are those individuals whose style does not seem to fit the mold, causing them to feel uncomfortable and out of place, struggling along and making little or inconsistent progress. For both of these types of individuals, a better understanding of the various dimensions of learning style can be an effective tool to enhance their learning experiences and expand the possibilities for success. It can help the more successful learners become more conscious of why their natural patterns seem to work in their favor regularly. For those learners whose learning path seems unsteady, an analysis of learning skills can shed light on the source of the roadblocks and pave the way for developing compensating strategies.

This chapter is intended to demystify the concept of learning styles and provide a framework for implementation in the classroom. It includes an overview of the various definitions and components of learning style, an introduction to some available instruments, and how to assess the appropriateness of instruments for practical use. We conclude the chapter with some thoughts on the adaptation of learning style information in the design and implementation of programs.

THE MANY FACES OF LEARNING STYLES

In adult education, it is typical for an instructor to be someone with expertise in a particular field or area who has been asked to *teach* others. The result is often *instructors* whose tendencies are to teach either to their own natural style since it worked for them, or to teach the way they were taught. There may be no consideration for the variety of ways that knowledge and skills can develop.

In this scenario, you might think that the first step is to reconsider the agenda and determine if you can design learning activities that engage multiple types of style. Once you have accomplished that, then the learners will be able to connect at some level and everyone will be successful, right? The problem is, what exactly are multiple types of styles? Does it mean providing a combination of visual, auditory, and

kinesthetic activities? Or should activities be structured to coincide with Gardner's (2000) multiple intelligences? Which is better? Is there another way?

Actually it is not as simple as that. There are many dimensions to consider. Research concerned with individual differences supports the concept of different styles of thinking, learning, and personality (Ouellette, 2000). According to Ouellette, "the word style is used in common language to describe differences between people. Style is thus a set of individual qualities, activities and behavior that are maintained over a long period of time" (p. 2)

Another issue in discussions of learning style is the nature versus nurture argument. Numerous authors concur that individuals generally acquire their learning styles from nature. "Learning styles appear to be fixed very early in your evolution" (Ouellette, 2000, p. 2). Some say it is cemented by our early teens, yet others feel our style is part of brain development from the beginning, and that it can be identified in very young children. In either case, "the great advantage of defining styles is that they appear to be robust in terms of temporal stability" (p. 2). Therefore, learning style comes from nature, but from nurture comes conscious awareness and subsequent use of environmental opportunities. Nature is who you are and can be identified through the use of several different types of learning style profiles and instruments. Nurture is how that information is utilized. For our purposes in considering adult learners, we believe that style is fixed by early adulthood and doesn't change much after that.

As part of the nature versus nurture argument, the relationship between aspects of learning style, intelligence, ability, and personality becomes paramount. Although we generally agree with Riding and Rayner (1999), who refer to these aspects as distinct from one another, we feel they are unique yet interrelated concepts. The most related of these are intelligence and ability. In general, due to the overuse of intelligence testing, the term intelligence has become synonymous with assumptions about general cognitive ability. Intelligence based on testing represents a limited subset of cognitive skills and should not be confused with overall true abilities.

Rather than thinking about personality as a separate entity, we incorporate it as an aspect of learning style. In fact, our concept of learning style encompasses multiple facets of personality, perception, and cognitive preferences. Later in this chapter, we will return to aspects of personality as an integrated aspect of learning style.

At this point you might be asking, "Well, if style is fixed for the learners in my program, then what good does it do to identify it, if it doesn't change?" Although the natural style may not change, impacting the nurture part can still make a tremendous difference in the outcome. By raising the understanding of style to a conscious level, both the instructor and learner are then empowered to enlist strategies that can enhance the end result. According to Keefe (1979), diagnosis of learning style opens the door to more rational instruction, with the potential to provide "the most powerful leverage yet available to educators to analyze, motivate, and assist students" (p. 132). As such, he identifies learning style as "the foundation of a truly modern approach to education" (p.132).

Over the past 20 years, educators have witnessed an explosion of information and new knowledge regarding the physiology of the brain and its relationship to the learning process. Although a virtual deluge of new ideas has become available, the practical application of such knowledge has been limited and somewhat confusing. Particularly for adult learners, many theoretical models have attempted to simplify the construct of learning into concrete categories or points along a continuum. More recently the discussion has focused on the concept of metacognitive, a process of helping people *think about* or analyze their own individual styles of thinking and learning. The goal is to use metacognitive thinking as a reflective process to build new strategies that will become more automatic in the future. This has led to a shift in emphasis from a focus on teaching style to enhancing our understanding of the learning process. We will return to this concept later in our discussion of implementation and adaptations.

CONSTRUCTS AND DEFINITIONS

The construct of learning style is a complicated issue and cannot be defined in simple terms. To date there remains no one generally accepted model of learning style that seems to satisfy both theorists and practitioners. Educational researchers Snow and Jackson (1992) have suggested that the problem lies in the lack of clarity, as well as the lack of a common theoretical base and the educational validation of

contemporary learning style models. They suggest “a common theoretical base for the concept of style will be found in an integrated model which emphasizes interaction and adaptation” (p.85).

The model we feel is the most useful place to begin in examining the construct of style is Keefe's (1979) taxonomy, which does focus on integration by identifying the three major dimensions of brain function: cognitive, affective (personality), and physiological (perceptual). Cognitive styles relate to information-processing habits representing the learner's typical mode of perceiving, thinking, problem solving, and remembering. Each learner has preferred ways of perception, organization, and retention that are distinctive and consistent. Affective styles encompass aspects of personality that are related to motivation, emotion, and valuing. Affective learning styles are the learner's typical mode of arousing, directing and sustaining behavior. Although we cannot directly observe affective learning style, we can infer it from the learner's interaction with the environment. Physiological styles include sensory-based perceptual modes of reception that are dependent on the physical environment. To that area, we would add environmental factors such as light or noise and time-of-day rhythms.

As mentioned earlier, thinking and learning are complicated processes. The key to understanding these processes lies in an integrated approach that encompasses all three dimensions. We are not just visual or auditory learners. We are not merely concrete or abstract learners. Similarly, we are not just extroverts or introverts. *All* of these aspects of brain functions interact to make us who we are as learners. Therefore, the path to understanding lies in examining all three dimensions.

How Can I Identify My Learning Style?

Identifying an individual's style usually begins with a learning-styles instrument. In order to select the appropriate instrument for possible use, we suggest applying that framework presented above. In other words, an effective analysis of learning style should include instruments from all three dimensions: cognitive, affective, and physiological (James & Blank, 1993). For example, in order to determine if an individual is more visual or auditory, a perceptual instrument is needed to determine the strength of an individual's reliance on a particular perceptual modality. It is important to note that these instruments do not measure acuity, but rather the reliance on information received through that modality. Examples of perceptual style instruments include the *Multi-Modal Paired Associates Learning Test III* (MMPALT III) (Institute for Learning Styles Research, 1997) or the *Barbe-Malone Modality Index* (Barbe & Malone, 1980). Although offering valuable information, the results of these types of instruments alone are limited to only one aspect of learning style.

Another dimension of learning style is referred to as cognitive style which is assessed through information-processing instruments. Two of the more popular of these are *Gregorc's Style Indicator* (1999) and Kolb's *Learning Style Inventory* (1999). Most of these instruments tend to be bipolar, placing individuals at some point along intersecting continua. For example, Kolb's model ranges from concrete experience to abstract generalization on one continuum and from active experimentation to reflective observation on the other. The result is that the learner falls in one of the resulting four quadrants. As with the perceptual instruments, models within this dimension are helpful but cannot provide a complete representation of the complex construct of learning style.

The third dimension of learning style instruments reviewed by James and Blank (1993) is personality style. Examples of these include the *Myers-Briggs Type Indicator* (1999) and the Keirsey Temperament Sorter (1998a). Both are based on the works of Carl Jung and both report results on the basis of four bipolar scales identified as extrovert/introvert, sensing/intuitive, thinking/feeling, and judging/perceiving. The Myers-Briggs inventory tends to be widely used in business environments, as well as in education. Lawrence (1997) has developed one of the major books that links the Myers-Briggs instrument with aspects of teaching and learning. The Myers-Briggs, Keirsey, and other affective instruments help us to identify common patterns within the dimension of personality.

In response to the need for a more interactive, integrated approach, as called for by Snow and Jackson (1992), Johnston and Dainton (1996) developed the *Learning Combination Inventory*. Based on the Interactive Learning Model (Johnston, 1006), this instrument focuses on the four patterns that emerge as a result of the interaction of cognition, conation (performance actions), and affectation. The uniqueness of this model lies in its three-dimensional framework, attempting to more accurately represent the complexity of human learning. The instrument identifies the degree to which an individual naturally uses each of the four identified patterns: sequence, precision, technical reasoning, and confluence. Rather than

a bipolar continuum, the result is a more comprehensive interactive profile in which each of the four patterns is integrated within the three dimensions of brain processing.

FACTORS TO CONSIDER WHEN SELECTING INSTRUMENTS

How should adult educators go about the critical step of reviewing and selecting learning-style instruments for particular use? Based on the tri-dimensional taxonomy presented here, the best assessment of learning style is obtained when considering aspects of each of the three dimensions: physiological (perceptual), cognitive, and affective (personality). As an instructor, once you have determined which dimension(s) will be most useful for your situation and learners, there are several factors to consider in selecting the right instrument.

Evaluation and eventual selection of a learning-style instrument should depend on three major facets. These include the appropriateness and soundness of the conceptual base, or the theoretical underpinnings on which the instrument was developed; the research data supporting the instrument's soundness and usefulness; and finally, practical considerations that determine the feasibility of using a particular instrument in a particular setting. All three facets are crucial in determining which instrument might be appropriate for a particular purpose. Table 6.1 provides specific questions to consider regarding each facet. In addition, each facet is discussed in more detail in the following sections.

Table 6.1 Questions to Guide a Review of Learning Style Instruments

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1. Conceptual Base
 - a. What is the basic information about the instrument?
 - b. Where can the instrument be obtained?
 - c. What is the stated purpose for the instrument?
 - d. What are the subtests of scales?
 2. Research Data
 - a. What validity information is available?
 - b. What reliability information is available?
 - c. What evidence of instrument development for adults exists?
 - d. Do any norms for adults exist?
 3. Practical Considerations
 - a. How much does it cost to administer and score each instrument?
 - b. What options are available related to forms, levels, or scoring?
 - c. What practical strategies for applications are provided for both the instructor and learner based on the results of the instrument?
 - d. What aspects of the instrument make it difficult to use?
-

Conceptual Base

An instrument's conceptual or theoretical base can be determined by a careful examination of its title, stated purpose, subscale titles, and intended audience. If possible, the technical manual accompanying the instrument should be examined to determine the constructs used to develop the instrument and what it purports to measure; however, not all instruments have this information available. Practitioners could contact the developer of the instrument or review journal articles reporting on the results of the usage of that particular instrument. The advantage of reviewing the professional literature is that it often presents a more balanced and objective evaluation of an instrument than the developer or technical manual will. In addition, an internet search for possible listservs or forums in which other practitioners may be using and discussing the instrument regularly can be an excellent and up-to-date source of critical feedback about the advantages, disadvantages, and practical applicability options of the instrument.

Research Data

If the conceptual base upon which the instrument was built appears to be sound, it is also important to investigate the aspects of statistical measurement utilized in the development stages. Whether the instrument under consideration is effective and appropriate depends on the information provided with respect to validity, reliability, and norms. The test manual typically provides a summary of measurement techniques as well. Each of these concepts is discussed below.

Validity. As a measurement concept, validity encompasses the appropriateness, meaningfulness, and usefulness of the resulting test scores. It involves the use of evaluative judgments based on empirical evidence to bolster the adequacy and appropriateness of the inferences made (Messick, 1989). Test developers and measurement specialists believe that the validity of an instrument is the most crucial aspect to consider when evaluating its appropriateness. The process of validation entails the accumulation of extensive data to provide evidence that the instrument measures what it claims to measure. Validity is not merely a single dimension, but rather a composite of concepts supported through quality research and test development efforts.

Different conclusions require different types of evidence to support validity. Four dimensions of validity are generally cited in discussions of these issues: content, concurrent, predictive, and construct validity. Content validity relates to whether the material represents the concepts being considered. In other words, do the items match the intended purpose of the instrument? Concurrent validity refers to the degree to which other instruments measure similar concepts. Predictive validity considers the extent to which the instrument can anticipate what will happen at some future time based on an individual's current responses. Construct validity speaks to the underlying foundational aspects of a trait (or construct). Messick (1989) believes that construct validity is the most important and most valuable form of validity.

Reliability. Estimates of reliability are determined by whether the results of an instrument remain the same over time or can be measured in several alternative formats—test/retest (administering an instrument on two occasions to the same individual with a time interval in between), internal consistency (comparing patterns of responses based on specific formulas), consistency between alternate forms, and consistency among test administration.

Norms. Norms are developed to provide standards of comparison so that one individual's score can be viewed as similar or dissimilar to the greater population sampled. Norms can be established based on multiple characteristics such as age, gender, race and ethnicity, socioeconomic status, or education level.

Practical Considerations

Following are some of the more practical considerations to keep in mind when evaluating learning-style instruments for possible use in a particular setting with a particular target group.

Physical Characteristics. Among the important considerations in evaluating learning-style instruments are the physical characteristics of the instrument itself. For those in paper format, physical characteristics include the instrument's overall appearance, page size, number of pages, the existence of a separate answer sheet or self-carboning pages, the instrument's attractiveness, binding, clarity, size of print size, and other related factors. There are similar issues to consider if the instrument is computer generated or web-based, such as font size and overall screen-face factors that make it user friendly.

Cost. Cost is an important consideration, especially if an instrument will be administered to a large number of learners or clients. For either paper or web-based instruments, typical costs range from no charge, for those instruments in public domain, to fairly costly per copy for some proprietary instruments. Related concerns include the minimum number of copies that can be ordered; whether the instrument must be ordered in multiples of 25, 50, or some other quantity; and whether related materials must be ordered in addition to the instruments.

Administration. The mechanics of administering the instruments to learners or clients must also be considered. Instruments that are difficult to administer may yield questionable results due to difficulties with simply getting the instruments into the hands of respondents and making sure they understand how to

complete them. Administrative factors include whether the instructions are clear, whether a test administrator is needed, how many sheets are involved, how many test booklets or other forms are needed for each learner, whether media or related equipment is necessary (for example, video equipment or computer support) and whether the instrument can be group administered or must be administered one-on-one.

Scoring and interpretation. These are important considerations to keep in mind when selecting instruments. Scoring concerns include whether the instruments can be scored immediately locally or whether they must be submitted to another location and, if so, what the cost and turnaround time are. If they can be scored locally, can they be self-scored or must a test administrator do it? Another factor is whether any special training or certification is required for someone to score the instruments. Interpretation of scores is an additional concern. Can respondents interpret their own score with information made available to the, or must a trained test administrator provide the interpretation? If the latter, how involved and time-consuming is the interpretation process?

Documentation. Some potentially functional instruments end up being of limited use because they are not accompanied by sufficient or accurate documentation. Documentation might include an administrator's guide, a technical manual, and other materials providing background information. Well-designed instruments come with comprehensive documentation, including validity and reliability data, an explanation of norms, information on the theoretical or conceptual bases of the instruments, and addresses of people to contact in order to arrange test administration, scoring, and interpretation. Documentation available for the instruments mentioned in this chapter ranged from nonexistent to excellent.

Instruments

In the above section, we discussed crucial factors to consider in the selection of any instrument for use (see Table 6.1 for questions that can be used to review an instrument). In this section, as a demonstration of the above considerations, we provide a starting point for you by identifying a few currently available instruments (see Table 6.2). The instruments in Table 6.2 are organized by the three dimensions. Of the many instruments that exist in the marketplace, it should be noted that the selection of those identified here account for only a small portion.

To obtain a specific instrument mentioned in this chapter, several options are available on-line, you can start with the Internet, searching by either the authors' names or the instrument name. You are likely to find information on several levels: Direct accessibility and usability on-line; articles about or references to the instrument; or, in cases where little information is available, you may need to contact the publisher or the author directly.

This discussion of instruments and their selection is crucial for both the instructor/facilitator and the learner/student, because knowledge of appropriate selection criteria can assist instructors in using learning style instruments to assess learner strengths and limitations related to the tri-dimensional focus used in this chapter.

Table 6.2 Sample List of Available Learning Style Instruments

Physiological

Multi-Modal Paired Associates Learning Test (MMPALT-III). (1997)

Performance test that measures recall of paired information in each of the seven perceptual modalities.

Information available online at: www.learningstyles.org

DVC Learning Style Survey for College. (Jester & Miller, 2000).

Identifies perceptual learning preferences. Available online (no fee) at:

<http://www.metamath.com/lsweb/dvclearn.htm>

VARC. (Fleming, N., 2001). 13-item questionnaire profile of perceptual preferences;

Available online (no fee) at: <http://www.active-learning-site.com/vark.htm#fleming>

Cognitive

Gregorc Style Delineator. (Gregorc, 1999).

Self-report instrument; involves 10 sets of four items to be rank ordered.

Grasha-Riechmann Student Learning Style Scale (GRLSS). (1982).

Examines social learning style. Sample instrument can be completed online at:

<http://www.ltsseries.com?LTS/sitepgs/grslss.htm>

Herrmann Brain Dominance Instrument. (1980).

Instrument can be completed on line (fee required) at: <http://www.hbdi.com/>

Learning Combination Inventory. (Johnston & Dainton, 1996).

Self-reporting; self-scoring; identifies the strength of four interactive learning patterns. Can be purchased online at: www.letmelrn.org

Learning Style Inventory 3. (Kolb, 1999).

Identifies four learning style dimensions based on the experiential learning model. Available online (fee required) at: <http://www.hayresourcesdirect.haygroup.com/Products/learning/lsius.htm#lsi>

Sternberg-Wagner Thinking Styles Inventory. (Sternberg, 1997).

Identifies four forms of thinking based on a governmental model. Available online (no fee) at:

<http://www.ldrc.ca/projects/projects.php?id=48&>

Affective

Index of Learning Styles (ILS). (Silverman & Felder, 2002).

Identifies four dimensions of personality preference. Available online (no fee; not validated) at:

<http://www.crc4mse.org/IL/Index.html>

Learning Style Inventory. (Silver, Hanson, & Strong, 1995).

Based on Jung's model' identifies teaching/learning categories.

Myers-Briggs Type Indicator. (1999).

Available online (fee required) at: <http://www.discoveryourpersonality.com/MBTI.html?source=Google>

The Temperament Sorter II. (Keirsey, 1998b).

Based on Myers-Briggs. Available online (no fee) at: <http://keirsey.com/>

Mixed Domains

Learning Style Analysis (LSA). (Prashing, 2001).

30 items; measures the combination of 48 preferences in both perceptual and social domains.

<http://www.creativelearningcentre.com/products.asp?page=LSA&sub=about&lang=&cs=NZ%24&cr=1&the me=main>

CITE. (Babich & Randol, 1976).

Identifies preferences in both perceptual and social domains. Available online (no fee) at:

<http://www.ops.org/north/tc/lessons/integ12/int12learning/StylesFrame.htm>

Productivity Environmental Preference Survey. (Dunn, Dunn, & Price, 1988).

Learning styles and environmental preferences inventory; information available at

<http://www.learningstyles.net/>

IMPLICATIONS FOR PRACTICE IN ADULT EDUCATION

Regardless of the learning setting, the most important question to be answered is "How do I apply this knowledge of learning style in my situation as either an instructor or as a learner? This is the *adaptation* part of the concerns raised by Snow and Jackson (1992) mentioned earlier in this chapter. It may help to compare the process of decoding learning style to that of unlocking a bank safe deposit box. At the bank, the box cannot be opened with only one key, it requires both the customer and the bank official to use their keys simultaneously. In this case, we are suggesting that three keys are needed: one representing physiological/perceptual aspects, one representing cognitive aspects, and one representing affective/personality aspects. Physiological/perceptual is how we take in information through the senses and the environment, cognitive is how we process that information and act upon it, and affective/personality is how our individual idiosyncrasies and characteristics react or impact with that information or are impacted by it. For the instructor, once the three key areas have been assessed and/or identified, the new knowledge becomes essential in creating integrated learning experiences or activities. For learners, opening the box

provides a means for enhanced ability to use the knowledge of their integrated style in order to successfully navigate any type of learning situation. So often learning style proponents only advocate one of the three key areas and then do not proceed to integrate this information into the learning situation. We propose that all three areas, as represented by the three keys, are essential to integrating and adapting elements of learning styles for maximizing learning potential. With knowledge of all three key areas as instruments to unlock the strategies contained in the box, instructors and learners can integrate and adapt their knowledge of instructional methods to assist students in reaching their fullest potential.

Instructor

As the instructor, it is important to think of yourself first a lifelong learner. Therefore, understanding the integrated aspects of your own distinct learning style dimensions becomes the initial step in applying this information in an instructional setting. The entire process becomes a metacognitive tool in your hands. The awareness you gain can then be applied to any learning situation by analyzing the task, determining the necessary skills or strategies, and selecting a variety of activities appropriate for the situation and to the learners.

The results from the administration of a series of instruments provides a basis for facilitators to plan different types of learning opportunities and multiple ways for learners to represent their learning accomplishments and products. If the instructor is more interested in using the most effective teaching methods, then a cognitive or perceptual style instrument might be most beneficial. In addition, instructors may use the knowledge gained from certain instruments to predict how individual students might perform, depending on the type of task. Understanding affective or personality issues might relate to the social setting preferred by each student. Do the students prefer group interaction to independent study? Or perhaps with a partner is the best strategy. Again, in order to obtain a complete picture of the *whole* learner, a facilitator should consider using multiple instruments, at least one from each the three key areas. For additional ideas on suggested strategies in each area, see Table 6.3.

Learners

Particularly for adults, learning-style instruments can be a source of empowerment by encouraging each individual to reflect on the results and subsequently to apply that knowledge to a particular learning effort. Again, this becomes a metacognitive tool or a way to learn about personal learning strengths and needs. Multiple instruments are needed so that learners are able to examine the many dimensions of their own personal learning tools. The results can help individuals understand what is needed to be effective learners and how to strategize when conditions are not ideal. If the task requires skills that an individual lacks, the learner might recognize this and consciously search for compensating strategies and support. This is particularly helpful considering the self-directed nature of most adult learners and the value of understanding what is needed in the design of personal learning tasks. Many adults are fearful of new learning tasks merely because they have never felt confident as a learner. Helping learners recognize their potential and identify their most effective strategies can create new avenues for many adults who would otherwise never venture into new learning situations. In addition, developing an understanding of individual differences in learning entices many instructors into encouraging the concept of styles as a means of addressing identified student needs. Table 6.3 provides suggested strategies in each domain.

Table 6.3 Suggested Strategies for Instructors and Learners

Dimensions	Instructor/Facilitator Strategies	Learner/Student Strategies
General Strategies	Offer a variety of types of assignments and evaluation methods.	Use an appropriate instrument to identify your specific strengths and limitations in each domain.
Physiological/ Perceptual	For each learning activity, provide as many modality alternatives as possible. Analyze the learning activity and vary the means of student interaction with the material. Think in terms of visual/print, auditory tactile/kinesthetic options.	Identify the modality strengths needed for the assignment and search for alternatives. Visual/Print Modality: Use pictures, graphs, charts, reading materials, writing, color coding, highlighting, flashcards, word processing, key notes in text

margins.
 Auditory Modality: Use verbal information (lectures), audio technology (tapes, CDs, computers), other people (discussions, debates, learning communities/study groups, interviews), read aloud, record yourself.
 Tactile/Kinesthetic Modality: Look for opportunities to have a hands-on approach such as models, manipulatives, drawing, constructing, role playing, physical motion activities, physical games, nonverbal activities, field work.

Cognitive

Repeat and review directions.
 Provide extra time.
 Provide a sample of a completed project.
 Provide detailed directions or a project rubric.
 Provide opportunities for independent activities.
 Offer hands-on assignments.
 Encourage student-generated assignment ideas.
 Provide extra time for trial-and-error work.

Write out orderly directions or an outline for yourself when directions are unclear.
 Learn to prioritize steps if it seems there is not enough time to complete all steps in the sequence.
 Review notes to determine what details you are missing.
 Prioritize your responses and start with the most important information; if time allows, return and fill in the gaps.
 Determine what role you have in a group assignment and stick to it.
 Turn the assignment into a game, timing or testing yourself.
 Take a 10-minute break every 30 minutes of work.
 Underline key words and features in the assignment.
 Stay focused until completion.
 Find the relevance in the assignment.

**Affective/
 Personality**

Provide opportunities for a variety of social learning preferences to include collaboration, independent study, participatory planning, and competition.
 Emotional aspects include positive feedback needed by individuals, recognizing that some learners need more attention and others require minimal recognition.
 Recognize and address the varying levels of structure preferred by each student.

Recognize your social learning preferences such as collaborative/participatory, independent, or competitive.
 Try not to take negative feedback too personally.
 Look for opportunities for collaborative interaction.
 Identify environments that support more independence in learning.
 Determine the level of structure preferred.

SOME FINAL THOUGHTS

If a man does not keep pace with his companions, perhaps it is because he hears a different drummer. Let him step to the music which he hears, however measured or far away.

--Henry David Thoreau

When Thoreau wrote these lines, we think he was referring to someone extremely different from the rest of society. However, as the understanding of human brain processing advances, we realize that what make us unique are our individual differences. Thoreau's oft-quoted lines, popular with many learning style enthusiasts, clearly acknowledge the individuality of human existence. The man who hears the different drummer is distinctive and often unlike the norm. However, based on contemporary knowledge of the brain and learning, we now recognize that by young adulthood, most people have developed a complex, individualized, routine pattern when faced with new tasks or learning opportunities. Therefore, whether or not we *let* individuals step to their own beat, most of time they will automatically proceed in their own way, regardless of the teaching style. For learners to be successful, it is imperative that instructors allow learners to march to their own beat while valuing their individuality and encouraging them both to understand and utilize their unique learning-style patterns. So they will flourish a learner in a multitude of learning environments.

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Review and Critique of Available Learning-Styles Instruments for Adults

Wayne B. James, William E Blank

Anyone who thoughtfully examines the learning process—particularly in adults—would conclude that it is, indeed, an extremely complex process. Although a considerable amount of research has been conducted on the dynamics of learning, we are only beginning to understand it. Researchers have attempted to identify and analyze many of the factors that appear to contribute to or inhibit efficient and effective learning. Much of this research has focused on elements external to the learner, such as the classroom setting, teaching methods and media, curriculum, and so on. Although less research has been conducted on elements internal to the learner, such as how the learner perceives, processes, interprets, stores, and recalls stimuli, many feel these elements are just as important, if not more so, in explaining and ultimately improving learning. The ways individuals learners react to the overall learning environment and its various elements are often said to make up the learner's *learning style*.

One of the challenges the learning styles field is facing is the lack of widely agreed-on terminology. The concept of how learners react to their learning environment is most often referred to as either *learning style* or *cognitive style* have often been used synonymously in the literature, although they decidedly are not the same. Learning style is the broader term and includes cognitive, affective, and physiological styles. We favor learning style over cognitive style because, like Keefe, we believe it is a broader term encompassing the entire learning process. We define *learning style* as the complex manner in which, and conditions under which, learners most efficiently and most effectively perceive, process, store, and recall what they are attempting to learn.

Learning-Style Dimensions

Before looking at instruments available for assessing the learning style of adults, we need to first establish a framework or taxonomy to use as a structure to assist in selecting and evaluating instruments for possible use. Most would agree that one of the important characteristics of any instrument – including a learning-style instrument – is that it should measure what it is supposed to measure. What are the various dimensions of learning style that instruments purport to measure? As with the definition of learning style, there is no universally accepted taxonomy of learning-style dimensions. But a taxonomy that is gaining in use is one that focuses on three major dimensions: information processing (cognitive), affective (for instance, personality), and physiological (for example, tolerance for noise, time-of-day rhythms).

Keefe (1987) describes each of the three dimensions of learning style. Cognitive styles, considered in Chapter Two, are information processing habits representing the learner's typical mode of perceiving, thinking, problem solving, and remembering. Each learner has preferred ways of perception, organization, and retention that are distinctive and consistent; these are cognitive styles. Affective styles, considered in Chapter Three, encompass aspects of personality that have to do with attention, emotion, and valuing. Affective learning styles are the learner's typical mode of arousing, directing, and sustaining behavior. We cannot directly observe affective learning style; we can only infer it from the learner's interaction with the environment. Physiological styles, according to Keefe (1987, p. 13), are "biologically-based modes of response that are founded on accustomed reaction to the physical environment, sex-related differences, and personal nutrition and health."

As adult education and training practitioners consider learning style instruments for possible use, it is necessary to keep in mind these three broad dimensions of style: information processing, affective, and physiological. Practitioners should determine what is to be measured and locate an instrument that measures it. For example, trainers interested in determining the social setting in which potential trainees prefer to learn – that is, whether they prefer to work alone, with a partner, in a group, for example – should first recognize that they are dealing with the affective dimension of learning styles. But adult basic education teachers who want to find out more about which teaching methods and media would be most appropriate for their students are concerned with the cognitive dimensions. Of course, practitioners

should keep in mind that they may often be seeking answers to questions cutting across two or even all three dimensions. Even if they are interested in only one dimension, many learning-style instruments involve two or three.

Factors to Consider When Selecting Instruments

Selection of a particular learning-style instrument hinges on several factors. First of these is determining the intended use of the data to be collected from learners using the instrument. The next step is to determine what instruments are available that match the intended purpose and then to evaluate or critique potential instruments. Finally, an instrument is selected and utilized. How should adult educators go about the critical instruments for a particular use?

We suggest that evaluation and eventual selection of a learning-style instrument should depend on three major criteria. These criteria include the appropriateness and soundness of the conceptual base, or theoretical underpinnings on which the instrument was developed, the research data supporting the instrument's soundness and usefulness, and, finally, practical considerations that determine the feasibility of using a particular instrument in a particular setting. All three criteria are crucial in determining which instrument might be appropriate for a particular purpose.

Conceptual Base. An instrument's conceptual or theoretical base can be determined by a careful examination of its title, stated purpose, subscale titles, and intended audience. If possible, the technical manual accompanying the instrument and that it purports to measure. There are times when this information is not available from the technical manual. Practitioners should get in touch with the developer of the instrument and can also review journal articles reporting on the results of using that particular instrument. Often the literature will present a more balanced and objective evaluation of an instrument than the developer or technical manual will.

An important step in examining the conceptual base of an instrument is to consider questions such as the following that pertain to the intended use of the instrument. First, the kind of information being collected must be determined; what do the authors or publishers state will be the nature and purpose of the resulting information? Does the instrument address information processing, personality factors, or perceptual learning—or all of these? Second, the kinds of decisions or judgments that can be based on the results of the instrument depend on its intended use. Administering an instrument merely to meet administrative or legal mandates is not a wise use of time or money. Finally, a related issue concerns the theoretical underpinnings of the instrument. Do they match what practitioners are trying to measure and ultimately improve?

Research Data. Whether the instrument under consideration is effective and appropriate also depends on the information provided with respect to validity, reliability, and norms.

Validity. As a measurement concept, validity encompasses the appropriateness, meaningfulness, and usefulness of inferences made from test scores. It involves the use of evaluative judgments based on empirical evidence to bolster the adequacy and appropriateness of the inferences made (Messick, 1989). Test developers and measurement specialists believe that the validity of an instrument is the most crucial aspect to consider when evaluating its appropriateness. Since the process of validation entails much data accumulation to provide evidence that the instrument measures what it purports to measure, different conclusions need different types of evidence to support validity. Validity is not a single dimension, but rather a composite of measures that can be supported through quality research and test development efforts.

Dimensions often cited in discussions of these issues include the following: content, concurrent, predictive, and construct validity. Content validity refers to the degree of relevance and representativeness of the material on the assessment instrument. Concurrent validity considers whether a particular instrument is similar to other instruments measuring the same thing. Predictive validity considers the extent to which the instrument can anticipate what will happen at some future time based on an individual's current responses. Construct validity speaks to the underlying foundational aspects of a trait (or construct). Messick (1989) believes that construct validity is the only type of validity that needs to be considered, since it subsumes all the other forms.

Reliability. Reliability is determined by whether the results of an instrument remain the same over time and can be measured in several alternative formats – test/retest (administering an instrument on two occasions to the same individuals with a time interval in between), internal consistency (comparing patterns of responses based on specific formulas), consistency between forms, and consistency among administrators.

Norms. Norms are established to provide standards of comparison so that one individual's scores can be viewed as similar or dissimilar to the scores of others. This ideally includes consideration of the characteristics of the population sampled. Such characteristics can include age, gender, race and ethnicity, socioeconomic status, education level, and so on. In the literature, test/retest and internal consistency are the most often cited measures of reliability of learning-style instruments.

Practical Considerations. Following are some of the more practical considerations to keep in mind when evaluating learning-style instruments for possible use in a particular setting with a particular target group.

Physical Characteristics. Among the important considerations in evaluating learning-styles instruments are the physical characteristics of the instrument itself. Physical characteristics include the instrument's overall appearance, page size, number of pages, whether there is a separate answer sheet, whether it includes self-carboning pages, the instrument's attractiveness, binding, clarity and size of print, and related factors.

Cost. Cost is an important consideration, especially if an instrument will be administered to a large number of learners or clients. Typical costs range from no charge, for those instruments in the public domain, to several dollars per copy for some proprietary instruments. Related concerns include minimum number of copies that can be ordered, whether the instrument must be ordered in multiples of twenty-five, fifty, or some other quantity, and whether related materials must be ordered in addition to the instruments.

Administration. The mechanics of administering the instruments to learners or clients must also be considered. Instruments that are difficult to administer may yield questionable results due to difficulties with simply getting the instruments into the hands of respondents and making sure they understand how to complete them. Administrative factors include whether the instructions are clear, whether a test administrator is needed, how many sheets are involved, how many test booklets or other forms are needed for each learner, whether media or related equipment is necessary (for example, slide projector or computer), and whether the instrument can be group administered versus individually administered.

Scoring and Interpretation. These are important considerations to keep in mind when selecting instruments. Scoring concerns include whether the instruments can be scored immediately locally or whether they must be sent to another location and, if so, what the cost and turn around time are. If they can be scored locally, can they be self-scored or must a test administrator do it? Another factor is whether any special training or certification is required for someone to score the instruments. Interpretation of scores with information made available to them, or must a trained test administrator provide the interpretation? If the latter, how involved and time-consuming is the interpretation process?

Documentation. Some potentially useful instruments end up being of limited use because they are not accompanied by sufficient or accurate documentation. This documentation may include an administrator's guide, a technical manual, and other materials. Well-documented instruments come with comprehensive documentation, including validity and reliability data, an explanation of norms, information on the theoretical or conceptual bases of the instruments, scoring, and interpretation. Documentation available for the instruments reviewed in this article ranged from nonexistent to excellent.

Description and Critique of Learning-Style Instruments

In this section, we present some basic information and a brief critique of selected learning-style instruments. The instruments reviewed include all three of the major dimensions discussed earlier—perceptual modalities, information processing, and personality factors. A brief description of each instrument with a bibliographical citation follows.

Perceptual Modality

Barbe-Milone Modality Checklist (Barbe and Milone, 1980) consists of ten sets of three statements asking individuals to check the one "most like" them.

Multi Modal Paired Associates Learning Test-Revised (MMPALT II) was revised by Cherry (1981) based on a previous version developed by French (1975a, 1975b) and Gilley (1975). It consists of seven performance-based subtests of ten items, each covering seven sensory modalities.

Swassing-Barbe Modality Index (Barbe and Swassing, 1988) is also performance-based instrument testing recall of sensory data within three modalities.

Information Processing

Grasha-Riechmann's Student Learning Style Scales (Hruska and Grasha, 1982) consist of sixty self-report Likert statements.

Gregorc's Style Delineator (Gregorc, 1982) is a self-report instrument that includes ten sets of four items that must be rank ordered.

Hemispheric Mode Indicator (McCarthy, 1986) consists of thirty-two pairs of bipolar statements rated on a Likert scale.

Herrmann's Brain Dominance Inventory (Herrmann, 1990) is a self-report instrument using a variety of different formats to obtain scores on the seven subscales.

Kolb's Learning Style Inventory (Kolb, 1985) involves rank ordering four choices within twelve sets of statements.

Schmeck's Inventory of Learning Process (Schmeck, Geisler-Brenstein, and Cercy, 1991) involves sixty-two true-false statements.

Witkin's Group Embedded Figures Test (Oltman, Raskin, and Witkin, 1971) is a perceptual test of ability to match simple designs within twenty-five more complex figures.

Personality Factors

Canfield's Learning Styles Inventory (Canfield, 1988) consists of thirty clusters of four self-report statements that must be rank ordered.

Honey and Mumford's Learning Styles Questionnaire (Honey and Mumford, 1989) includes eighty self-report agree-disagree statements.

Keirseey Temperament Sorter (Keirseey and Bates, 1984) involves seventy bipolar self-reported items.

Myers-Briggs Type indicator (Briggs and Myers, 1997) exists in several different forms; the most commonly used version consists of 126 bipolar items.

Silver and Hanson's Teaching, Learning, and Curriculum Models serves as the basis for several instruments for both teachers and students: *Learning Preference Inventory* (Silver and Hanson, 1980a) *Learning Style Inventory* (Silver and Hanson, 1980a) and *Teaching Style Inventory* (Silver and Hanson, 1980b). The Learning Style Inventory includes thirty sets of four self-description items that must be ranked in order of preference.

Sternberg's Thinking Styles Questionnaire (Sternberg and Wagner, 1991) includes 104 self-report strategies related to thinking skills, rated on a Likert scale.

Combination Instruments

Center for Innovative Teaching Experiences (CITE) Learning Styles Instrument (Babich and Randol, 1976) is a self-report instrument of forty-five items.

Dunn, Dunn, and Price's *Productivity Environmental Preference Survey* (PEPS) (Dunn, Dunn, and Price, 1988) consists of 100 Likert-scales self-report items.

Hill's *Cognitive Style Mapping* (Hill, 1977; Nunney, 1978) involves self-report Likert response system of 224 items.

National Associations for Secondary School Principals' *Learning Style Profile* (Keefe and others, 1989) consists of 126 items of mixed format. Although originally intended for use with high school students, it appears to have a solid research base, as discussed in Keefe and Monk (1990).

In our analysis of selected learning-style instruments, we subjected a variety of instruments to intensive scrutiny, considering both practicality and research-based concerns. Using available information (which may have been incomplete for some instruments), we compared selected instruments based on the previously specified criteria.

Research Results

This section presents a brief summary of representative research studies involving selected learning-style instruments. Research reviewed for this section included some conducted by other researchers as well as several studies conducted by the authors and their doctoral students. One of the most important and troubling results of numerous research studies is that they often fail to yield solid evidence that the construct of learning style truly exists. Often, the results of various tests of reliability and validity are contradictory or inconclusive. Also troubling is the fact that some of the instruments developed for use with children have been applied to adults without determining whether this is appropriate. Bonham (1988) succinctly subtitled an article "Let the Buyer Beware," indicating reservation about the appropriateness of various instruments. However, some research does support cautious use of the concept of learning style. Hannum and Hansen (1989, p. 119) concluded that "unfortunately the research evidence on learning styles is quite mixed. For all its intuitive appeal, it is rare to find clear examples of these styles that significantly influence the ability of a person to learn when his/her is not attended to."

Since space is limited, only research involving perceptual modality (cognitive) instruments will be touched on; however, the reader should be reminded that this body of research is fairly representative of the research that has been conducted in the other learning-style dimensions (affective and physiological).

Instruments related to perceptual modalities show discrepant results. Studies reported by the authors and others (James and Blank, 1991; James and Galbraith, 1985) support the use of the MMPALT II with adults. In an experimental study, Hutchison (1992) found that student learning performance (as measured on a written examination) was affected by perceptual dominance (as measured by the MMPALT II) in print and aural modalities. Grady (1992) administered four instruments, including MMPALT II, Barbe-Milone Modality Checklist, and CITE, to a sample of 100 adults in an attempt to address construct validity through a multi-trait, multi-method process. Grady was unable to document construct validity through a multi-trait, multimethod process. Grady was unable to document construct validity, and two of the instruments (CITE and Barbe-Milone) failed to demonstrate suitable reliability for her specific population.

James and Blank (1993) calculated Pearson product moment correlations between a variety of subtests purporting to measure the same construct using a variety of instruments. Since the sample size was limited ($n=26$), this investigation should be regarded as exploratory; equivalent subscale correlations need to be determined using larger numbers of subjects. But these data represent an initial attempt to address validity and reliability issues across a range of learning-style instruments for adults.

Pearson correlations between the Swassing-Barbe Modality Index perceptual modality subtest scores and the Dunn, Dunn, and Price PEPS corresponding scores were low: visual $r=0.163$; auditory $r=-0.033$; tactile $r=-0.264$; kinesthetic $r=-0.133$. Correlations between the PEPS and the MMPALT II were also low and often negative: auditory $r=-0.056$; visual $r=-0.322$; tactile/haptic $r=0.109$; intake/olfactory $r=-0.343$. Another study by Coolidge-Parker (1989) indicated a similar lack of correlation between these two instruments.

Correlations between the MMPALT II and the Swassing-Barbe (both performance-based instruments) correlated somewhat better with each other than either correlated with the PEPS (visual $r=0.170$; aural $r=0.451$; kinesthetic $r=0.631$; visual/print $r=0.251$; kinesthetic/haptic $r=0.291$).

In summary, although various authors claim strong reliability and validity for their instruments, a solid research base for many of these claims does not exist.

Concerns and Cautions

Adult education practitioners and researchers should be cautioned about the use of existing learning-style instruments. Perhaps the most important caution is that, given the conflicting and inconclusive evidence regarding the validity and reliability of many instruments, it is imperative to use data derived from them with great care when making decisions regarding students and programs. These data should be treated as potentially useful—but not all-important—pieces of information in the decision-making process.

Other cautions include the following: avoid administering instruments to populations for which they were not developed or normed; use instruments specifically developed for special populations such as special needs learners; and be careful not to use results inappropriately. A final caution: Keep in mind whether an instrument is measuring true learning strength or predisposition or, rather, simply measuring preference.

Conclusion

It seems clear that the research related to various aspects of learning style and learning-style assessment has yielded mixed results. Continued research is warranted on all aspects of the topic. However, practitioners need to be cognizant of the limitations related to each particular instrument and should use the information obtained from instruments as an awareness tool rather than a research “truth.” The selection of a particular learning-style assessment instrument depends on the identified need for such an instrument along with the support of an appropriate research base and practical considerations for use.

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