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Increasing the Effectiveness of University/College Instruction: Integrating the Results of Learning Style Research into Course Design and Delivery

Blue Wooldridge

"It is a sad but indisputable fact that much of the teaching that goes on in our colleges and universities is of very poor quality. Indeed, virtually any college student can relate stories about the incredible tribulations he suffered at the hands of incompetent instructors" (Cahn, 1978, p. ix). Yet, as the report entitled *Faculty Development in a Time of Retrenchment* points out, a curious thing about teaching is that, although it is the most central business in the university and college world, it is the least talked about. One rarely hears an intelligent discussion of it (Group for Human Development in Higher Education, 1974). Cahn goes on to suggest that "the crisis in college teaching . . . results . . . from a failure to recognize the crucial principle that intellectual competence and pedagogical competence are two very different qualities. One cannot be an outstanding teacher without thorough knowledge of subject matter, but to possess that knowledge does not guarantee the ability to communicate it to a student" (1978, p. ix).

The lack of pedagogical training for faculty is well documented. In the past, the Ph.D., with its emphasis on specialized study in the discipline and its predominant orientation to research, was considered the necessary credential for teaching. Today, with an increasingly diverse student body and research that clearly identifies the elements of effective college teaching, a greater realization exists that faculty preparation should include other areas of knowledge as well (Claxton & Murrell, 1987, p.78).

Traditional doctoral programs, which form the core of the training of university faculty, do not concern themselves with teaching future faculty about the teaching and learning process. Theories of how people

learn and the consequences of different educational strategies are not addressed in a systematic way by most doctoral programs. In fact, concern with educational issues such as appropriate teaching strategies, important characteristics of students, and effective pedagogical strategies are sometimes viewed disdainfully by faculty in traditional academic programs (Wooldridge & Janhna, 1990).

Malcolm Knowles (1973), among others, points out that understanding how a person learns is a major requisite for a successful educational program. The question of how a person learns is the focus of the concept of learning style (Pigg, Busch, & Lacy, 1980). Learning styles can be defined as characteristic cognitive, affective, and psychological behaviors that serve as relatively stable indicators of how learners perceive, interact with, and respond to the learning environment (Keefe, 1979).

Cognitive styles are information processing habits of representing the learner's typical mode of perceiving, thinking, problem solving, and remembering. Affective styles refer to those motivational processes viewed as the learner's typical mode of arousing, directing, and sustaining behavior. Physiological styles are biologically-based modes of response that are founded on sex-related differences, personal nutrition and health, and accustomed reactions to the physical environment (Keefe, 1979, pp. 4, 8, 11 & 15).

Some researchers believe that the concept of learning style "is the most important concept to demand attention in education in many years and is the core of what it means to be a person" (Guild & Garger, 1985, p. viii). Studies have shown that identifying a student's learning style and providing appropriate instruction in response to that style can contribute to more effective learning (Claxton & Murrell, 1987). Information about certain of these characteristics can also help faculty become more sensitive to the differences that students bring to the classroom. As Doyle and Rutherford (1984) point out, "the wide popularity of proposals and programs for matching learning styles would seem to have two sources. First, the logic underlying the approach is compelling. Learners differ in a wide variety of ways and these differences are likely to influence how they respond to and benefit from a given instructional method or program. . . . Second, the approach seems to offer an intelligent and practical framework for the organizational problems of dealing with diversity among students" (p. 20). However, "except for some relatively isolated situations and work of particular individuals, . . . it is fair to say that learning style has not significantly affected educational practices in higher education" (Claxton & Murrell, 1987, p. 1).

A major obstacle to improving instructional effectiveness through an understanding of learning styles is the lack of consensus as to definitions of important concepts in this field. In this chapter, a variety of learning styles that have been identified as having specific relevance to the improvement of the learning process will be discussed. A brief

description of each of these dimensions will be presented, with a description of learning style instruments that instructors can use to measure specific learning styles and take responsive action.

LEARNING STYLE DIMENSIONS IMPORTANT FOR IMPROVING THE LEARNING PROCESS

Keefe (1979) has identified several dimensions of learning styles that appear to have the most relevance to the improvement of the learning process. They are field independence versus dependence (Witkin et al., 1971); perceptual modality preferences (Price, Dunn, & Dunn, 1978); conceptual tempo (Kagan, 1966); leveling versus sharpening (Holzman & Klein, 1954); conceptual level (Hunt, 1977; Hunt et al., 1978; Price, Dunn, & Dunn, 1978); locus of control (Rotter, 1971); achievement motivation (McClelland, 1971); social motivation (Hill & Nunnery, 1973); and masculine-feminine behavior (MacCoby & Jacklin, 1974). Each of these dimensions will be described and discussed below.

Field Independence versus Dependence

This dimension of cognitive learning styles measures whether the learner uses an "analytical as opposed to a global way of experiencing the [subject matter] environment" (Keefe, 1979, p. 9). In the same book, he suggests that field independence versus dependence seems to have a great implication for improving the learning process.

The concept of field independence versus dependence is the most researched of all of the learning styles dimensions. Its founder, Herman A. Witkin, was listed among the 100 authors most cited in the *Social Science Citation* index (Goodenough, 1986), and as early as September 1981 there were almost 4,000 manuscripts related to this concept (Cox & Gall, 1981). Claxton and Murrell (1987) state, "the extensive body of research on field dependence and independence, however, has not significantly affected college teaching. . . . At the same time, however, these two dimensions may be the most fundamental ones" (p. 13).

In a field dependent mode of perceiving, perception is dominated by the overall organization of the surrounding field, and parts of the field are experienced as fused. In a field independent mode of perceiving, parts of the field are experienced as discrete from the organized ground. Persons who are labelled field dependent/global learners rely upon the environment of the learning situation for structure. Field dependent learners are sensitive to social cues without being alerted to them. They are interpersonally oriented and rely heavily on external stimuli. This motivates them to look toward others for reinforcement of opinions and attitudes.

The field dependent/global learner has a short attention span, is easily distracted, and likes informal learning situations. People with

this type of learning style view the teacher as just another individual. They respond best to a learning environment that evokes their feelings and experiences. They are less achievement-oriented and competitive than the analytic learner. For them learning is a social experience.

The field independent/analytical learner does not rely on the learning environment for referents. Field independent learners have an internal structure that enables them to analyze information and solve problems without outside assistance. In addition, field independent learners appear to be more active, autonomous, self-motivated, and task-oriented in their approaches to life. These individuals have the ability to analyze information from the learning situation and solve problems independently. The analytical-oriented learners resist distractions that would adversely affect their educational experience and have a longer attention span and greater reflectivity than global learners. They tend to be more sedentary and prefer formal learning situations, viewing the instructor merely as a source of information. They are competitive, achievement-oriented, and impersonal (Witkin et al., 1971; Witkin et al., 1977; Witkin & Goodenough, 1981).

There is one common theme running through the literature on field independence versus dependence research. Field dependent participants require more structure than do field independent participants to achieve the same level of learning. Whether this structure is manifested through a presentation of objectives and planned activities in human relation training (Mezoff, 1982), through structured lecture outlines (Frank, 1984; Ward & Clark, 1987), or in the inherent organization of the task material itself (Davis & Frank, 1979), its existence appears to remove any difference between the amount of material learned. This finding is ironic because, as the literature reviewed indicated, the field dependent learner prefers less structured learning environments such as discussion or discovery.

Field independence versus dependence is usually measured by such instruments as the Body Adjustment Test, Rod and Frame Test, or various embedded figures tests (Witkin & Goodenough, 1981). One frequently used instrument is the Group Embedded Figures Test (GEFT). The GEFT consists of a test booklet that presents 25 complex test figures plus two sample figures. Eight simple forms are printed on the back cover of the booklet; each is identified with a capital letter. The task presented is to find a simple figure located in a more complex design. This simple figure is to be outlined in pencil. The first part of the GEFT is a practice set consisting of seven items that are not scored. This practice set is intended to test comprehension of the test. Sections two and three consist of 18 figures. The test booklet is scored by visually comparing the traced simple figures with those provided in a special scoring key. Scores on the GEFT range from 0 to 18. Lower scores indicate a field dependent/global learner; higher scores reflect a tendency toward field independence/analytical learning. MacNeil (1980)

reviewed much of the relevant research on this topic and concluded that the cut-off point between field independent and field dependent learners is somewhere between 12 and 13 on the GEFT.

Perceptual Modality Preferences

This cognitive learning style dimension measures a learner's "preferred reliance on one of the sensor modes of understanding experience. The modes are kinesthetic or psychomotor, visual or spatial, and auditory or verbal" (Keefe, 1979, p. 9). A brief elaboration of each of the elements that make up this learning style dimension, taken from Price and Griggs's (1985) *Counseling College Students Through Their Individual Learning Styles* is provided below.

Auditory Preferences

This perceptual area describes people who can learn best when initially listening to a verbal instruction such as a lecture, discussion, or recording.

Visual Preferences

Learners whose primary perceptual preference is visual can recall what has been read or observed. When asked for information from printed or diagrammatic material, they often can close their eyes and visually recall what they have read or seen earlier.

Tactile Preferences

Students with tactile perceptual preferences need to underline as they read, take notes when they listen, and keep their hands busy, particularly if they have low auditory preferences.

Kinesthetic Preferences

Learners with kinesthetic preferences require whole body movement and real life experiences to absorb and retain material to be learned. These people learn most easily when they are totally involved. Acting, puppetry, and drama are excellent examples of kinesthetic learning; others include building, designing, visiting, interviewing, and playing.

Productivity Environmental Preference Survey

A useful learning style instrument for measuring this dimension is the Productivity Environmental Preference Survey (PEPS) developed by Price, Dunn, and Dunn (1978). This instrument claims to be the first comprehensive approach to the diagnosis of an adult's individual productivity and learning style. Further, the instrument aids in prescribing the type of environment, working conditions, activities, and motivating factors that would maximize individual output. PEPS does

not claim to measure underlying psychological motivation, value systems, or the quality of attitudes. Rather, it is said "to yield information concerned with the patterns through which the highest levels of productivity tend to occur. It therefore reveals *how* an employee prefers to produce or learn best, not *why*" (Price, Dunn, & Dunn, 1978, p. 2). The PEPS analyzes an individual adult's personal preferences for each of 21 different elements. These include, in addition to the four elements of perceptual modality preferences described above, noise level — quiet or sound, light — low or bright, temperature — cool or warm, design — informal or formal, unmotivated or motivated, non-persistent or persistent, irresponsible or responsible, structure — needs or does not need, learning alone or peer-oriented learner, authority figures present, learning in several ways, requires intake, functions best in evening or morning, functions best in late morning, functions best in afternoon, and mobility.

As can be seen from the brief description of PEPS provided above, this instrument also measures certain affective and physiological learning styles, which Keefe considers to have less implication for improving the learning process. These include the affective dimension of persistence or perseverance that Keefe characterizes as: "variations in learner's willingness to labor beyond the required time, to withstand discomfort and to face the prospect of failure. High persistence is characterized by the disposition to work at a task until it is completed, seeking whatever kinds of help is necessary to persevere. A low persistence style results in short attention span and the inability to work on a task for any length of time" (Keefe, 1979, p. 12).

Physiological learning styles that are measured by the PEPS include: health-related behavior, which is "individual response differences resulting from the physical imbalance of malnutrition, hunger, and disease. Dunn and Dunn refer to an aspect of this style as *intake*" (Keefe, 1979, p. 15); time rhythms or "individual variations in optimum learning patterns depending on the time of day" (p. 15); need for mobility, defined as "differences in learner need for change in posture and location" (p. 15); and environmental elements, which are "individual preferences for, or response to, varying levels of light, sound, and temperature" (p. 15). Although Keefe suggests that these physiological learning styles might have less implications for improving the learning process, this author thinks that investigation into learning variations has much potential for classroom research as suggested by Cross (1990).

Conceptual Tempo

Another important cognitive learning style that Keefe thinks has major importance for improving the learning process is conceptual tempo. Individuals differ in the speed and adequacy of hypothesis formulation and information processing on a continuum of reflection

versus impulsivity. Impulsives tend to give the first answer they can think of even though it is frequently incorrect. Reflectives prefer to consider alternative solutions before deciding and to give more reasoned responses (Keefe, 1979, p. 10).

Claxton and Murrell (1987) identify the instruments used to measure this tendency as the matching figures test and the identical picture test. In the identical picture test, for example, the subject is to study a picture of an object (the standard), such as a geometric design, a house, or a car, and then is shown several similar stimuli, only one of which is identical to the standard. The subject's task is to select the picture that is the same as the standard in a limited time. Impulsive subjects respond to this factor of conceptual tempo by glancing quickly at the sample and selecting the answer that appears most nearly correct. Reflective persons carefully examine each alternative before finally selecting what they believe is the correct one (p. 17).

This learning style dimension has important implications for university instruction. "Heavy reliance on multiple-choice examinations may not give an accurate picture of how much a student actually knows" (Claxton & Murrell, 1987, p. 17). Under pressure to achieve a certain grade, the impulsive person is unable to become more reflective, and the reflective learner might be unable to carry out sufficient deliberations in the time allowed.

Leveling versus Sharpening

The purpose of this cognitive learning style is to "isolate principals of organization in cognitive behavior, termed *cognitive system-principals*, that will account for or predict a person's typical modes of perceiving, remembering, thinking" (Holzman & Klein, 1954, p. 105).

This dimension measures individual variations in memory processing. Levelers tend to blur similar memories and to merge new percepts readily with previous assimilated experiences; they tend to overgeneralize. Sharpeners are inclined to magnify small differences and to separate memory of prior experiences more easily from current data; they tend to overdiscriminate (Keefe, 1979, p. 10).

Selection of levelers and sharpeners can be defined using a situation termed "schematizing" in which subjects are called upon to judge in inches the size of squares:

(Fourteen) squares varying from slightly more than 1" on a side to 14" were projected singly from a film strip on to the screen. Each square appeared for three seconds after which S had five seconds to record on a record sheet his absolute judgement of the size of the squares. At first only the first five smallest squares were shown, each three times and in fixed random order. Then, without warning and without interrupting the procedure, the smallest square of this series of five was removed and a square larger than any seen

thus far was added to the series. Each square in this new series of five squares was again presented three times. *In this way a square gradually shifted from being largest in one series of five to the smallest in another.*

Levelers were those who not only were inaccurate in detecting the position of the squares with a series throughout the test, but also showed a high percentage loss of accuracy when squares moved from the salient end position (i.e. largest or smallest of the series) to the middle position in any one series. They tended to judge all squares that occupied middle positions as similar in size. *Sharpeners* were those who effectively differentiated the squares in the middle position of each series and were also highly accurate throughout. (Holzman & Klein, 1954, p. 108-109)

Research has shown that levelers tend to seek a maximum simplicity of the cognitive field, whereas the sharpeners seek maximum complexity and differentiation (Holzman & Klein, 1954).

AFFECTIVE LEARNING STYLES

Affective learning styles are those dimensions of personality that have to do with attention, emotion, and valuing (Keefe, 1979, p. 11). The first of these learning style dimensions that Keefe thinks has implications for the improvement of the learning process is that of conceptual level.

Conceptual Level

Conceptual level is described as "a broad development trait characterizing how much structure a student requires in order to learn best. . . . Closely related to it are responsibility, the capacity of students to follow through on a task without direct or frequent supervision, and need for structure, the amount and kind of structure required by different individuals" (Keefe, 1979, p. 12).

Certain elements of this learning style, responsibility and the need for structure, are measured by PEPS.

It has been suggested that conceptual level may serve as the basis for "optimizing the teaching/learning process" (Hunt, 1977, p. 78). Hunt goes on to suggest that several characteristics of conceptual level theory contribute to its potential value for education.

- It identifies present information-processing skills.
- It indicates the specific process goals to be developed.
- It specifies the training environment most likely to facilitate such development.
- It applies both to students and to teachers.
- It permits a reciprocal analysis of the teaching and learning process.

Hunt (1971; Hunt et al., 1978) reviews research that identifies some of the distinguishing characteristics of students varying in conceptual level. Studies have found, for example, that students with low conceptual level are more likely to choose one of their numbers to direct them, while high conceptual level students are more likely to work without a leader; when two kinds of information are presented, low conceptual level students are more affected by what they experienced first. High conceptual level students have shown greater accuracy in person perception than low conceptual level students.

Differences have also been shown in teacher trainees varying in conceptual level and their initial teaching styles. For example, high conceptual level trainees were higher in reflective index scores than low conceptual level trainees. High conceptual level teacher trainees preferred to teach using the example rule (or inductive) approach, where low conceptual level trainees were more likely to use a rule-exempt approach, thus matching the preferences of students having similar conceptual level styles. Conceptual level is frequently measured by the Paragraph Completion Method (Hunt et al., 1977).

Locus of Control

This learning style concept is interested in variations in individual perceptions of causality in behavioral outcomes on a continuum on internality versus externality (I-E). The internal person thinks of himself as responsible for his own behavior, as deserving praise for successes and blame for failures. The external person sees circumstances beyond his control, luck, or others as being responsible for his behavior (Keefe, 1979, p. 13).

This I-E phenomena is frequently measured using Rotter's forced-choice 29 item scale for measuring an individual's degree of internal and external control. Using this scale, a subject reads a pair of sentences and then indicates with which of the two statements he more strongly agrees. Subject scores on the I-E can range from zero (the consistent belief that individuals can influence the environment — that rewards come from internal forces) to 23 (the belief that all rewards come from external forces) (Rotter, 1971).

I-E findings show that people differ in the tendency to attribute satisfactions and failures to themselves rather than to external causes and these differences are relatively stable (Rotter, 1971). Several studies that are relevant to the instructional processes include findings that lower economic children tend to be more external than children from richer, better educated families; among disadvantaged children in the sixth, ninth, and twelfth grades, the students with high scores on an achievement test were more internal-orientated than children with low achievement scores; internal students were more successful in getting other students to change their attitudes than were external

students; and, interesting enough, in today's public policy environment, nonsmokers have been shown to be significantly more internal than smokers (Rotter, 1971).

Achievement Motivation

David C. McClelland has suggested a theory of motivation closely associated with learning concepts (Gibson, Ivancevich, & Donnelly, 1994). His concept of achievement motivation is interested in individual differences in patterns of planning and striving for some internalized standard of excellence. Individuals with high achievement motivation are interested in excellence for its own sake rather than for any rewards it may bring. They set their goals carefully after calculating the success probability of a variety of alternatives. This style is also called need for achievement. This is probably the most thoroughly researched affective style (Keefe, 1979, p. 13).

McClelland proposes measuring need for achievement, not by asking an individual or by assuming that those who are observed working hard have a need for achievement, but rather, "study his fantasies and dreams. If you do this over a period of time, you will discover the themes to which his mind returns again and again" (McClelland, 1971). To measure an individual's relative need for achievement, affiliation, or power, McClelland uses the Thematic Apperception Test. "A person is shown pictures and asked to write a story about what he sees portrayed in them" (Gibson, Ivancevich, & Donnelly, 1994, p. 157). This mode of measurement is predicated on the assumption that people tend to write stories that reflect their dominant needs.

McClelland's proposed strategies for developing individuals with high need for achievement where there is no fear of success are reported in Gibson, Ivancevich, and Donnelly (1994)

- Arrange job tasks so that employees receive periodic feedback on performance, providing information that enables them to make modifications or corrections.
- Point out to employees models of achievement. Identify and publicize the accomplishments of achievement heroes, the successful people, the winners, and use them as models.
- Work with employees to improve their self-image. High in n-Ach [need for achievement] people like themselves and seek moderate challenges and responsibilities.
- Introduce realism into all work-related topics; promotions, rewards, transfers, development opportunities, and team membership opportunities. Employees should think in realistic terms and think positively about how they can accomplish goals. (Gibson, Ivancevich, & Donnelly, 1994, p. 160)

Social Motivation

This learning style dimension measures differences in value-based behavior based on variations in social and ethnic world view. Learners not only vary in socio-economic background, in cultural determinants and value codes, and in peer-group conformity but also are variously affected by the standards and expectations of these groups. "Differences in social motivation may derive from one of a combination of determinants" (Keefe, 1979, p. 14).

The major developments in this learning style dimension result from the work of Joseph Hill at the Oakland Community College in Michigan. In a book by Hill and Nunnery (1973), the principles of the educational sciences are described. These seven sciences are:

- symbols and their meanings, which are based on the belief that people use theoretical and qualitative symbols basic to the acquisition of knowledge and meaning;
- cultural determinants of the meaning of symbols, which are concerned with the cultural influences that affect what the symbols mean to particular individuals;
- modalities of influence, which are the elements that show how a person makes inferences;
- biochemical and electrophysiological aspects of memory-concern;
- cognitive style, which is the product of the first four sciences;
- teaching, counseling, and administrative style; and
- systematic analysis decision making. (Claxton & Murrell, 1987, p. 47)

These sciences are captured in a model of cognitive style mapping. Using the results of this mapping can lead to the design of more effective learning experiences. Terrell (1976) tested community college students to measure their level of anxiety and cognitive style. Students whose cognitive style matched the instructional mode tended to achieve higher grades and experienced greater reduction in anxiety (Claxton & Murrell, 1987).

Masculine-Feminine Behavior

Research, as well as conventional wisdom, reports that there are variations in typical brain-behavior responses of males and females. Researchers agree that males generally are more aggressive, and sensitive to spatial (visual) relations and perhaps to mathematical processes. Females are more verbal and excel in fine muscular control (Keefe, 1979).

MacCoby and Jacklin (1974) reviewed over 2,000 books and articles on the sex differences in motivation, social behavior, and intellectual ability to determine "which benefits about sex differences are supported

by evidence, which beliefs have no support, and which are still inadequately tested" (p. 109). Eight myths that MacCoby and Jacklin suggest are not supported by evidence are: girls are more social than boys; girls are more suggestible than boys; girls have lower self-esteem than boys; girls lack motivation to achieve; girls are better at role learning and simple repetitive tasks, boys are better at high-level tasks that require them to inhibit previously learned responses; boys are more analytic than girls; girls are more affected by heredity, boys by environment; and girls are auditory, boys visual.

There were four differences that did appear to be supported by evidence available at that time: boys are more aggressive than girls, girls have greater verbal ability than boys, boys excel in visual spatial ability, and boys excel in mathematical ability.

Finally, MacCoby and Jacklin found eight areas that are still questions, where more research needs to be conducted. Are there differences in tactile sensitivity? Are there differences in fear, timidity, and anxiety? Is one sex more active than the other? Is one sex more competitive than the other? Is one sex more dominant than the other? Is one sex more compliant than the other? Are nurturance and maternal behavior more typical of one sex? Is one sex more passive than the other? The authors summarize their findings by saying, "We must conclude from our survey of all the data, that many popular beliefs about the psychological characteristics of the two sexes have little or no basis. . . . The explanation may be that people's attention is selective" (MacCoby & Jacklin, 1974, p. 112).

IMPLICATIONS FOR UNIVERSITY AND COLLEGE ACTION

University academic departments must become interested in making learning style research an important part of the teaching and learning process. Manifestations of such interest can take the form of integrating the results of learning style research into the design and delivery of courses — faculty development activities, promotion of classroom-based research, orientations for students on their individual learning styles and how to develop strategies for adapting them effectively (including candidate understanding of student differences, including learning styles, when hiring new faculty), and conducting more research, relevant to the specific academic curriculum, on learning styles (many of these action items were first suggested by Claxton and Murrell, 1987). Each of these recommendations is discussed more fully.

Faculty Development

Faculty development activities, such as workshops, seminars, and similar activities, can be useful in helping faculty better understand the

concepts behind learning styles and how an understanding of these concepts can lead to an improvement in student learning.

This insight is important for more than understanding how to modify course design and delivery as suggested in the previous section. Research has indicated that teachers are more likely to use instructional methods that are congruent with their cognitive learning style. Wu (1968, as quoted in Bertini, 1980) found that field dependent student teachers in social studies ranked discussion as more important to the practice of good teaching than lecture, which was favored by more field independent instructors. "A discussion approach, it should be noted, not only emphasizes social interaction, but also gives the student more of a role in structuring the classroom situation" (Bertini, 1980, p. 95). After summarizing the relevant literature reviewing research on the relationship between instructors' cognitive styles and their preferred instructional methods, Bertini concluded: "On the whole, the evidence gathered suggests that field-dependent and field-independent teachers have different teaching preferences syntonetic with their own personal styles, and that, based on these differences, they may conduct their classes differently thereby showing different patterns of actual teaching behavior in the classroom" (1980, p. 96).

This natural tendency might have special significance for university and college faculty. Research findings indicate that subjects with undergraduate preparation in the social professions were significantly more field dependent than students with other undergraduate preparation (Wooldridge, 1994b). One could infer a significant number of university and college faculty are field dependent. Combining this hypothesis with the findings that instructors have teaching styles that are congruent with their own personal styles, it could be concluded that there might be a large number of classroom situations where field dependent instructors are using low or non-structured teaching methods with field dependent students. The research findings described earlier, however, suggest that such teaching methods and student characteristics combinations place the field independent student at a disadvantage.

In addition to increasing the sensitivity of the field dependent faculty member to the possible dysfunctional consequences of the congruent instructional style on field independent students, both field independent and field dependent faculty need to be made aware of how teacher to student matching or mismatching of learning styles can lead to bias in assessment. DiStefano (1970, as described in Bertini, 1980) found when teachers and students have similar cognitive styles they tended to describe each other in positive terms, not only in personal but intellectual characteristics as well. "Teachers often believe that students whose cognitive styles match theirs are smarter than those whose styles are different from theirs. They say that the former are

more intelligent, more logical, and more successful as students" (Bertini, 1980, p. 97).

These findings should also be of interest to field independent faculty members having their instructional effectiveness assessed by a class with a high percentage of field-dependent students.

Classroom Research

In October 1990, an article in the *Chronicle of Higher Education* stated that, "for teaching to gain prestige in higher education, faculty members must make pedagogy a subject of scholarly debate" (Watkins, 1990, p. A11). This article goes on to quote Lee S. Shulman, a professor of education at Stanford University, as saying, "teaching will be considered a scholarly activity only when professors develop a conception of pedagogy that is very tightly coupled to scholarship in the disciplines themselves" (p. A11). Commanding a professional base of knowledge of subject matter with knowledge of how to teach it effectively to others is the primary purpose of classroom research (Cross, 1990). "Classroom research is the careful, systematic, and patient study of students in the process of learning" (Cross, 1990, p. 2). Its goal is making teaching more professional based on understanding, insights, knowledge, and skill. This goal is congruent with Ernest L. Boyer's observation that "the time has come for us to inquire much more carefully into the nature of pedagogy. It's the most difficult and perhaps most essential work in developing future scholars" (Watkins, 1990, p. A12). The concept of different learning styles is an ideal topic for classroom research. Instructors can identify the various learning style profiles of the participants in each class and, using the Cronbach and Snow's (1969) concept of Aptitude-Treatment Interaction, design effective learning strategies.

Cronbach and Snow state: "The educator continually devises and applies new instructional treatments, hoping for improved results. He seeks the best methods of instruction for a given purpose. Since learners differ, the search for generally superior methods should be supplemented by a search for ways to fit the instruction to each kind of learner. One can expect interaction between learner characteristics and instructional method. Where these exist, the instructional approach that is best on the average is not best for all persons" (1969, p. 1).

Student Orientations

Orientation activities should be designed for students that will make them aware of their own learning styles, preferences, strengths, and weaknesses. Based on such insight, students can select courses and instructors that would lead to the most effective learning conditions for them (perhaps in contrast to those that the students would prefer or feel

more comfortable in). "Attention should also be given to helping students develop strategies for succeeding in courses taught in ways that are incongruent with their primary learning abilities" (Claxton & Murrell, 1987, p. 78).

Hiring New Faculty

It has been estimated that, during the next 20 years, more than half the faculty of any given university will probably retire. Colleges and universities will have to hire thousands of new faculty members to replace those that leave higher education. "Today, with an increasingly diverse student body and research that clearly identifies the elements of effective college teaching . . . a greater realization exists that faculty preparation should include other areas of knowledge as well" (Claxton & Murrell, 1987, p. 78). Departments and selection committees should include the candidate's knowledge of pedagogy, including the implications of different learning styles, as a selection criteria.

FUTURE RESEARCH

It is ironic that in spite of all of the research that was conducted in the area of learning styles (Claxton & Murrell, 1987; Keefe, 1979) there still remains so much left to be done. Learning style research is critically needed in the following areas: learning styles of minorities, women, and international students; differences in learning styles of the part-time, non-traditional students; implication of learning styles for the use of technology in delivery of higher education; and the implication of individual learning style differences for the selection of the most effective instructional instrument for different types of learning objectives. Each of these areas will be discussed below.

First, attention should be paid to the study of learning styles as they relate to minorities, women, and international students. Forecasts of the increased diversity of the work force by the year 2000 are plentiful (Johnston & Packer, 1987; Wooldridge & Maddox, 1994). This diversity will also be reflected in the academic community. In the coming decades, "there will be a new army of Hispanic students, one as large as that of the blacks. And there will be a much larger number of Asians. America's colleges and universities . . . have also become increasingly attractive to the better foreign students" (Keller, 1983, p. 13). Research is finding that there are different learning style profiles related to individuals with gender and racial differences. Further research directed at more precisely identifying these differences and their implications for the design and delivery of college level education is needed.

In addition to the change in ethnic, racial, and national backgrounds of students, a second major change in emphasis for learning style research should focus on non-traditional students. By 1990, the student

population increased 45 percent over the 1970s, from 8.6 million to 12.5 million, but the proportion described as traditional had fallen by more than one-fifth, to 57 percent. The rest of the students are older, commute, or study part-time. What is more, the "graying" of the campus so much in evidence today promises to persist indefinitely, as the national population continues to age (Green, 1989, p. 79).

Additional research needs to be conducted to determine the relationship between the different learning style dimensions that have important implications for improving the learning process, and such independent demographic variables as age or full versus part-time student status.

Third, emphasis should be placed on learning styles and their use in higher education technology. A major reason given for the decline in productivity in higher education is that college and university budgets are highly labor-intensive (Massy, 1989; Levin, 1989).

"Capital can be substituted for professional labor. . . . Now information technology is producing a 'second industrial revolution' and this one holds great promise for the knowledge industry including colleges and universities. Investment in computers, communication systems, and other kinds of intelligent machines can leverage faculty time" (Massy, 1989, p. 5).

However, research findings indicate a large number of the students enrolled in universities are field dependent. The literature suggests that field dependent individuals are interpersonally oriented and rely heavily on external stimuli. This motivates them to look toward others for reinforcement of opinions and attitudes. Field dependent people like to be with other people, show an interest in them, and are sociable. They appear to prefer to be physically close to people and emotionally open. For them, learning is a social experience.

In light of these characteristics of field dependent students, and in view of the assumption that a large percentage of university and college students are field dependent, research must be conducted to determine the effectiveness of using technology in the delivery of higher education course offerings (Wooldridge, 1994a).

Finally, the relationship of individual learning styles, types of learning objectives, and effective instructional methodology should receive additional attention. Within the past few years, some excellent work has been carried out that relates the effectiveness of different instructional methods (for example, lectures, films, case studies, role playing, etc.) to specific learning objectives (McCleary & McIntyre, 1972; Newstrom, 1980; Olivas & Newstrom, 1981; and Carroll, Payne & Ivancevich, 1972). Research needs to be conducted to test the "Contingency Approach to Instructional Design" (Wooldridge, 1978), which suggests the effectiveness of an instructional method is contingent on both the learning objective to be achieved and the learning style of the participant. University and college education would be enhanced

by an understanding of how the relative effectiveness of different teaching methods, optimal for a specified set of learning objectives, needs to be modified to take into account differences in learning styles of individual students (Wooldridge, 1978).

CONCLUSION

Higher education is operating in an environment that calls for greater accountability, including increased assessment of the quality of its instruction. Anything an academic department can do to improve its teaching process will respond to this legitimate demand from the clients of university and college education. Evidence has been presented in this study that suggests the concept of learning styles is an important element in the design of effective instructional design and delivery. Truly, "style is the most important concept to demand attention in education in many years [and] is the core of what it means to be a person" (Guild & Garger, 1985, viii). This study indicates there is sufficient diversity among the learning styles of university and college students to warrant increased attention to this concept by faculty members. Significant contributions to the enhancement of learning can be made by the integration of the findings of learning style research into course design and delivery. The higher education community would be negligent if it fails to take advantage of this opportunity to improve university and college education.

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