

**LEARNING STYLES AND LEARNING:
A KEY TO MEETING THE ACCOUNTABILITY
DEMANDS IN EDUCATION**

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Chapter 13

**THE FIELD DEPENDENCE/FIELD INDEPENDENCE
LEARNING STYLES: IMPLICATIONS FOR
ADULT STUDENT DIVERSITY, OUTCOMES
ASSESSMENT AND ACCOUNTABILITY**

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ABSTRACT

In this chapter the authors define and describe the Field Independence-Dependence (FI/FD) Cognitive Learning Style as developed by Herman Witkin. The evolution of FI/FD is described and discussed, along with significant research findings. Special emphasis focuses on research that demonstrate individual differences in students, and that suggest alternative instructional strategies for maximizing the achievement of learning outcomes. The chapter suggests that the integration of the results of such research into instructional design and delivery demonstrates the willingness of instructors to be held accountable for their efforts.

INTRODUCTION

How individuals learn, that is a person's learning style, has been the subject of learning style theory over the last fifty years. Most of the research in this area has focused primarily on perception or cognition with little attention, until the 1970s, toward practical applications (Streufert and Nogami, 1989). It was during that time that researchers involved in education and training demonstrated links between the design and alignment of training to individual teaching and learning styles, to successful training programs (Knowles, 1973). Since then, many studies also suggest that optimum student achievement occurs when the students' learning styles and the teacher's instructional methods are aligned (Terrell, 1976; Bertini, 1986; Davis, 1991; Moallem, 2003; Pithers, 2001; Saracho, 2003).

Unfortunately, learning style research has remained largely academic due to the nature of learning itself. Individual differences in learning preference, strategy, style, cognitive strategy and style, and confusion among the constructs themselves present a formidable venture for individualizing the design, development, and delivery of instruction across many instructional environments. But, recently more interest in learning style research has resurfaced, particularly for two reasons: the implications for closing the achievement gap between white and minority students and for outcomes-based assessments and accountability (Burke and Dunn, 2002). Educators believe that research in this area may help to improve academic achievement, and thus retention and graduation rates in schools. Instruction that improves achievement also helps to support particular pedagogical strategies and supports teachers who are required to account for their students' learning.

Furthermore, in the workplace, some researchers contend that understanding diverse learning styles may ultimately improve efficiency and productivity in industries and corporations (Adler, 2002; Hickcox, 1995). Application of learning styles in professional and organizational training, particularly for management training and development, has generally emphasized the individual (Boyatzis and Kolb, 1995; Lord and Maher, 1989; Streufert and Nogami, 1989). But, some studies have analyzed learning styles at the organizational level, and focus on the importance of transactional learning between individuals and the organization for more seamless development and productivity (Easterby-Smith, 1997; Hayes and Allinson, 1998; Swieringa and Wierdsma, 1992). In the current analysis, what remains relatively unchallenged is the assumption, supported by research, that if instructional materials and strategies are designed to accommodate different learning styles, then the outcomes of learning, as well as learning itself, are improved for most individuals (Canino and Cicchelli, 1988; McLoughlin, 1999; Smith, 2002).

Back in 1979, Keefe, in his identification and analysis of several learning concepts, recognized the bipolar learning style of field dependence/independence as among those learning style theories that were especially appropriate to the improvement of learning outcomes, particularly in terms of predictability. Of all the many learning style models that have evolved over the last thirty years including, Dunn and Dunn's Learning Styles (1978), Howard Gardner's Multiple Intelligence Theory (1983), Kolb's Learning Styles (1984), and Grasha's Learning Style Scales (1996), to name just a few, field dependence/independence still remains the most researched of all the learning style concepts (Pithers, 2002; Wooldridge, 1995). Witkin, himself, viewed field dependence/independence as a dynamic theory and was excited at the prospect of applying field dependence/independence in innovative ways based on contingent and incremental knowledge. Witkin believed that "field-dependence theory is still very much in evolution" and was certain that "it will appear quite different in the future under the impetus of newly emerging evidence" (Witkin and Goodenough, 1981, p. x). In this context, the purpose of this chapter is to examine the evolving applications of field dependence/independence learning theory and to suggest ways in which new ideas in this learning style theory may improve learning for a diverse student population and assessment outcomes in positive ways.

FIELD DEPENDENCE/INDEPENDENCE: ESSENCES AND EVOLUTION

According to Keefe (1979), field dependence/independence measures the degree to which an individual uses "an analytical as opposed to a global way of experiencing the environment" (Keefe, 1979, p. 9). Field dependent individuals engage a global organization of the surrounding field, and perceive parts of the field as fluent. In contrast, field independent learners discern discrete parts of the field, distinct from the organized background. On the one hand, field dependent learners depend on cues and structure from their environment and then make the learning process contingent on their experience in that environment. Field dependent learners tend to have short attention spans, are easily distracted, and prefer casual learning environments. In addition, field dependent learners choose instructional situations that elicit their feelings and experiences. Field dependent persons are also more socially oriented, less achievement-oriented and less competitive, than field independent individuals (Wooldridge, 1995). In sum, and particularly relevant to education in a global society shrunken by technology, "...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" (Wooldridge, 1995, p. 51).

On the other hand, field independent individuals, overall, are more analytical and independent than field dependent learners. In addition, these learners are characterized by their analytical approach and abilities to problem solving. These analytical learners tend to be more independent, more intrinsically motivated, and task-oriented in their learning processes than field dependent individuals. Field independent learners are also more focused and disciplined learners, and they are characterized by a longer attention span and a greater contemplative disposition than are field dependent learners. Thus, field independent individuals depend more on internal than external cues, and prefer formal learning environments conducive to their competitive and achievement-oriented learning style (Witkin et al., 1971; Witkin et al., 1977; Witkin and Goodenough, 1981; Wooldridge, 1995). Furthermore, Wooldridge (1995) reports in his review of the literature that field dependent individuals require more structure in terms of objectives and planned activities in human relations training, lecture outlines, or in the "inherent organization of the task material itself," (Wooldridge, 1995, p. 52), than do field independent learners. This appears to be true regardless of the amount of material learned. At the same time, these studies also indicate that field dependent learners, in contrast to their counterparts, "...prefer less structured learning environments such as discussion or discovery" (Wooldridge, 1995, p. 52).

The development of the concept of field dependency all started with the question: "How important are visual cues in perceiving the vertical direction of space?" (Goodenough, 1986, p. 5). In general, people know which way is up on the basis of information they receive from the visual environment around them. A room, for example, is filled with many vertical objects which correspond to the true upright in space. In addition, we make reference to sensations from within the body, as the body continuously adjusts itself to the downward pull of gravity in maintaining upright posture and balance (Witkin et al., 1977, p. 2). The answer to the question posed above was determined by creating a conflict between visual and gravitational cues.

One method for creating this conflict is the Rod and Frame Test (RFT) (Witkin and Goodenough, 1981). In this test, a luminous square frame is presented to the subject in a

completely darkened room. The frame can be rotated about its center clockwise or counterclockwise. Pivoted at the same center is a luminous rod which also can be tilted clockwise or counterclockwise, independently of the frame. Frame and rod, presented in tilted positions, are all the subject can see in the dark room. The subject's task is to adjust the rod to a position where it is perceived as upright, while the frame around it remains in its initial position of tilt (Witkin et al., 1977).

A second test that was developed to determine the roles of the visual and bodily standards in perception of the upright is the Body-Adjustment Test (BAT). In this test, the object of perception is the body itself, and the key is how people determine the position of their bodies in space.

The subject is seated in the chair which can be tilted clockwise or counter-clockwise; the chair is projected into the small room which can also be tilted clockwise or counterclockwise, independently of the room. After the subject is seated, the chair and room are brought to prepared tilted settings, and the subject is then asked to adjust the chair to a position where he experiences it as upright. From this account it is not difficult to see that the body-adjustment situation and the rod-and-frame situation are in fact structurally similar. In each there is an item—rod or body—surrounded by a visual field—frame or room—and the question is to what extent the perception of the item is determined by the surrounding framework. (Witkin et al., 1977, p. 5).

Witkin et al. (1977) describe vast differences among individuals when they participated in the body-adjustment and the rod and frame tasks. Some people perceive their own bodies as upright when they are fully aligned with the surrounding tilted room. In some cases, someone tilted as much as 35 degrees, and if he is aligned with the room, will claim that he is perfectly straight. Likewise, some individuals would state that a rod (in the RFT) which is tilted 30 degrees is perfectly upright if the frame is also tilted 30 degrees in the same direction. There are others who adjust the rod more or less close to the upright regardless of the position of the surrounding frame.

These research findings led to the development of a different terminology for describing these phenomena. "The concept that contrasting modes of establishing the upright reflected primary reference to the external field or to the body made 'field dependent' and 'field independent' appropriate designations for these modes" (Witkin and Goodenough, 1981, p. 14). Field dependency was defined as a bipolar personality dimension that assesses an individual's tendency to rely on the visual field or the body itself as a cue for locating the upright. FD was defined as a personality measure, not a measure of ability (Linn and Kyllonen, 1981). Witkin was searching for a value-neutral dimension of individual differences. "Field-dependent people evidently differ from field-independent people in how they perceive the upright, rather than in how accurately they perceive the upright" (Goodenough, 1986, p. 11). The finding was that people differ dramatically in degree of field dependence. "Witkin discovered that individual differences in the effects of visual cues are not merely errors of method. People showed remarkable self-consistency in degree of field dependence across many tests of orientation perception" (Goodenough, 1986, p. 6).

Further research linked the ability to locate the upright to other perceptual capabilities, including "success in locating camouflaged or embedded figures" and "a new interpretation of the field dependence construct" that "provided a new and much more convenient assessment method" (Goodenough, 1986, p. 7). In the Embedded Figure Test (EFT) the

subject is shown a simple figure and then required to find it in a complex design that is so patterned that each component of the simple figure is made part of a clear-cut, sub-whole of the pattern; the simple figure is thereby effectively hidden:

To locate the simple figure it is necessary to break up the organized pattern so as to expose the figure. It was found that subjects who had difficulty separating the sought-after simple figure from the complex design were the ones who could not easily keep body or rod separate from or frame in the orientation tests—in other words, were the ones who were field dependent. Conversely, people who were field independent in the orientation tests found it easy to overcome the influence of the organized complex design in locating the same figure within it. (Witkin and Goodenough, 1981, p. 15).

Later, a reference test was developed by Oltman, Raskin, and Witkin (1971) to facilitate group testing for cognitive style. In this Group Embedded Figure Test (GEFT), subjects are asked to locate a previously seen simple figure embedded within a larger, more complex figure. "The test is scored on the basis of the total number of simple forms correctly traced. Scores may range from zero to eighteen" (MacNeil, 1980, p. 355). Persons with lower scores are said to be field dependent. Field-independent individuals have scores approaching eighteen. MacNeil reviewed much of the relevant research on this topic and concluded that researchers assumed that the cut-off point between FI's and FD is somewhere between twelve and thirteen (MacNeil, 1980).

Witkin (Witkin and Goodenough, 1981) came to view field dependence as a dimension of autonomy, or "self-non-self" differentiation expressed in upright perception and in social functioning such that field dependent people "characteristically rely more on information that is perceived to come from the world of objects and people around them" (Goodenough, 1986, p. 11). By the early 1960's, the concept of field independence had been redefined as the capacity to overcome or analyze an embedding context in perceptual functioning (Witkin et al., 1962), and "(I)ndividual and even group administered versions of the Embedded-Figures Test became readily available and economical tools for use in measuring independence." Consequently, the Embedded-Figures Test eventually replaced the tests of upright perception and research on field dependence escalated (Goodenough, 1986, p. 8).

Field Dependence/Independence-Its Relation to Cognitive Style

The development and analysis of the field dependent/independent construct demonstrates Witkin's desire to investigate its origins in terms of how it is influenced culturally, genetically, physiologically, and in terms of personality and social dynamics, and attests to the complexity of this concept: "It is a major aim of the cognitive-style theorists to seek unifying themes that cut across traditional areas of research on human behavior." Witkin recognized in field-dependence theory "a common conceptual framework" (Witkin and Goodenough, 1981, p. 101). Toward this end, Sigal (1991) addresses several questions concerning "reconceptualizations" of field dependence theory and development (Sigal, 1991, p. 387). The first question Sigal asks is how is field dependence defined? In *Origins of Cognitive Style* (Witkin and Goodenough, 1981), Witkin describes field dependence as a cognitive style and vice versa. According to Sigal, this is akin to fishing in muddy waters, because cognitive style and intelligence are inherently difficult concepts to define and thus field dependence becomes mired in the murkiness of these constructs. To support this

argument, Sigal contends that "style" "is an overarching concept that refers to the notion that individuals display consistencies in modes of functioning in a variety of behavioral situations." (Sigal, 1991, p. 388). Thus, in this view, field dependence/independence is only one kind of behavioral consistency in a collection of other cognitive styles that also expose this type of consistency. Furthermore, if the construct itself is not clear, then the measurement of the construct is also questionable. Sigal believes that procedures used to assess field dependence /independence actually measure related, but different cognitive characteristics. Finally, Sigal argues that the term consistency itself has multiple definitions. For example, consistency may refer to a particular skill or talent, or it may describe a pattern of behavior that is the same across several different tasks as distinct from the qualitative nature of the outcome (process versus product).

Allinson and Hayes (1996) consider cognition as a continuum of styles and conclude that, "Interest now (centers) on how far individuals are analytical or intuitive in their cognitive style." In addition, the authors consider the degree to which "it is possible to integrate the two and develop a whole brain approach and whether or not this can be assisted by training or education." (p. 132). This perspective includes and is consistent with Sternberg's (1998) view of learning style as a fluid construct, such that learners adapt their learning style to particular situations.

Related to this question are two more fundamental and often debated issues in the cognitive/learning style literature; is field dependence a measure of intelligence or talent? Does field dependence indicate ability or preference? Sigal believes that regression analyses might provide some answers to the first question in terms of separating "...general intelligence or analytic intelligence from field independence" (Sigal, p. 389), but he feels that the answer to the second question is still tentative. Sigal summarizes the complexity of these interrelated concepts and measurements in the following argument:

Ability as reflected in the field-independence research seems tied to a competence model, a skill in disembedding. Such a skill is necessary for performance on many intelligence test items (Guilford, 1967; Thurstone, 1938; Wechsler, 1939). If considered as an ability, then there is reason to assume that this ability can vary from low to high. If this is the case, it poses problems differentiating style as an ability compared to preference. If preference is the construct of choice, then variation in preference refers to variation in intensity of commitment to a perspective, but may or may not interfere with competent functions. If on the other hand, field dependence is an ability, then it follows that it is difficult to untangle it from general intelligence—also an ability or set of abilities employed in the performance of tasks. (Sigal, 1991, p. 390).

Sigal (1991) concludes his reflections concerning the nature of field dependence by suggesting that field dependence is really a "pseudo-cognitive phenomenon" (p. 390) that is a collection of behaviors that are reclaimed from cognitive ability. These patterns of behaviors then determine an individual's mode of "...organizing and categorizing the environment." (Sigal, 1991, p. 390). The implications of this analysis are that perhaps in observing field dependence or field independence, we are actually measuring a panoply of an individual's interacting characteristics contingent on not only the task itself, but also on the circumstances surrounding the task performance; "I ask: If field dependence is not intelligence, is intelligence field dependence?" (Sigal, 1991, p. 391).

Field Dependence/Independence Psychometric Studies

After a review of the research on field dependence/independence, MacNeil (1980) suggested that scores between 12 and 13 on the GEFT differentiate field dependent from field independent individuals. The measure was designed to reveal a respondent's "general tendency to function at a more differentiated or less differentiated" level (Witkin et al., 1971). The psychometric ratings generally for Witkin's tests were strong for reliability and good for validity (Hickcox, 1995).

A study by Lusk and Wright (1981) focused on instrumentation, as a threat to internal validity, on the Group Embedded Figures Test. The authors demonstrated in a previous study that a learning effect took place between the two sections of the Group Embedded Figures Test (GFT). The results supported the authors' hypothesis that the scores attained on the section worked first would be smaller (few embedded figures identified) than those attained on the subsequent section worked (more embedded figures identified). Hence practice may improve an individual's score on the GFT, and if a person is labeled field dependent or field independent.

Field Dependence/Independence: Implications for a Diverse Student Population

A recent report by the Educational Testing Service forecasts that African American, Hispanic, and Asian/Pacific Islander will account for 80 percent of the increases in undergraduates by the year 2015. Minorities as a group will increase their combined share of the undergraduate population from 29.4 to 37.2 percent. The percentage of African American undergraduates will change only marginally—from slightly less than 13 percent to slightly more than 13 percent. A 73 percent increase in the number of Hispanic American undergraduates from 1995 to 2015 will make Hispanics the country's largest college-going minority, accounting for about one in six undergraduates. Over the same time period, an 86 percent increase in the enrollment of Asians will make this group comprise more than 8 percent of the undergraduate student population (Carnevale and Fry, 2000). The same report states that some of the rise in undergraduate numbers by 2015 will be comprised of mature students, age 35 and older. Analysis projects that older students will account for about 31 percent of the projected 2.6 million rise in undergraduate enrollments. During 1999-2000, there were 151 associate degrees awarded to women for every 100 associate degrees awarded to men. By mid-decade, this ratio is projected to rise to 167 women per 100 men and by 2009-2010 the ratio is projected to rise to 173 women per 100 men.

The U.S. Department of Education projected undergraduate enrollments by gender in two and four-year post-secondary institutions. In the fall of 1999, there were 128 women enrolled in such college programs for every 100 men. By 2010, the Department of Education projects that the female/male enrollment ratio will rise above 138 (U.S. Department of Education, *The Condition of Education*, 2002, p. 130). The construct of Field Dependence/Independence learning styles provides special insight for this projected change in the demographics of the college student population. Wooldridge (1994, p. 378) points out "field independence is not equally distributed across all population groups." Females, blacks, and Hispanics generally appear to be more field dependent than are Asian or White male Americans. However, Allen

and Cholet (1979) estimated that gender accounts for less than 15 percent of the variance in field-dependence scores.

However, several other studies refute Witkin's conclusion that males tend to be more field-independent than females, and many studies are simply inconclusive concerning gender differences. Witkin attributed the gender difference to several factors, including hereditary and cultural. In addition, Witkin describes field dependence-independence as a stable characteristic of individuals. In his studies, which compared males and females in practice situations, although the scores of both sexes improved, there was still a definite difference between males and females and their relative field dependence (Johnson, Flinn and Tyer, 1979). These researchers report in their investigation the effect of practice and training in spatial skill scores from male and female drafting, mathematics, and liberal arts students on the Embedded Figures Test. The authors conclude from their study that gender differences reported in previous research, using the Embedded Figures Test might actually reflect differences in previous experience and population. Carter and Loo's (1980) conclusion in their study of psychometric data of the GEFT, is consistent with this notion. These researchers suggest that large differences in mean performance on the GEFT among data from Witkin et al. (1971), Renna and Zenhausen (1976), and Oltman, Raskin, and Witkin (1971) may be due to the effects of different populations and contexts. Thus, these factors may have some important implications in scores for males and females. Mykytyn (1989) supports this observation in a study conducted by administering the GEFT to 48 finance specialists. In this study, Mykytyn indicates the lack of significant gender-related differences and an increase in field *dependence* for subjects with more than the average experience in the organization. De Sanctis and Dunikoski (1983), in their study using the GEFT to evaluate business students, advise other researchers to consider the validity of the GEFT with regard to populations that are different from the norming population. This is because De Sanctis and Dunikoski report no gender differences, contrary to previous research, including Witkin's own validity information. The authors suggest that the lack of gender differences in their population may have been due to their sample of business school subjects, which may be more homogeneous and field independent than the liberal arts students of Witkin's norming group. This conclusion appears to challenge the notion that as a group there are more differences between men and women than individual differences among men and women and so disputes gender as a factor in field dependence/independence. In qualified support of this view, Chin (1998) takes exception to the highly "value-laden," (p. 75) terms that Witkin uses to describe gender differences concerning field dependence-independence. Chin cites developmental data to support the idea that gender differences in field independence actually measure gender differences in visual-spatial abilities. Chin contends that field dependence-independence tests actually assess spatial abilities, rather than cognitive modes of learning. The author believes that this is a relevant consideration in view of Witkin's biased descriptive terms for field dependent females.

The field dependence/independence learning style construct also has special insights for the instruction of adults in general. The volume of literature on the adult learner has reached a consensus on two of their common characteristics-their capacity for self-directed learning and their need for a supportive interpersonal learning environment (Knowles, 1973). However the field dependence construct challenges any learning orientation that assumes a high degree of learning style congruence between learners.

Those adults who tend towards field-independence will have a relatively well-developed capacity for some aspects of self-directed learning-their analytical ability will enable them to conceptualize the various components of a learning task, to put order into disorganized elements of a learning field, and to be aware of their own needs and strengths as they progress towards meeting goals. On the other hand, those adults who tend towards field dependence will be relatively lacking in these skill (Joughin, 1992, p. 13).

Field Dependence/Independence: Instructional Implications

A major field of interest to researchers has been to relate the field-dependent/field-independent styles of learning to the design and delivery of educational/ training experiences. This study will now present descriptions of some of this research that describes the implications of field dependency for the design of human-relation training (HRT), learning from a lecture, relationship between learning style and recall, the relationship between learning style and learning high- and low-structured information from a lecture, the relationship of learning styles and study technique, and learning styles and memory.

The Relationship of the Field-Dependent Continuum and Human Relations Training

Recognizing that the effectiveness of human relations training (HRT) varies with the type of participants, Mezoff (1982) sought to explain why one kind of HRT may be effective for some people but unproductive for others. Research has shown that certain people are more amenable to HRT than others. "Typically, wide differences are seen in the extent to which individual members 'take to' the sensitivity-training experience" (Harrison, 1966, p. 518). Mezoff points out that: "Research in education and psychotherapy suggests that cognitive style variables can account, in part, for the differential effectiveness of various educational and therapeutic programs (1982, p. 16).

Mezoff first differentiated HRT along the dimension of structured-unstructured. He suggests that HRT is structured and that "Structured training takes place with specific learning goals and objectives determined in advance by the training staff," including "the sequence, timing, and pace of the activities throughout the program," such as "role plays, simulation games, micro-counseling, and video-feedback training (p. 15)." He goes on to suggest that unstructured HRT is participant-controlled. Much of the learning is "processed" during or after the events of the training. "The purest example of unstructured HRT is the T-group (also known as sensitivity training)" (Mezoff, 1982, p. 15). Mezoff then reviewed the considerable literature on FI for two purposes: (1) to understand interpersonal behavior in the HRT setting better, and (2) to hypothesize the relationships that might make for successful or unsuccessful matches between participants of varying cognitive styles and HRT programs with varying degrees of structure. This review of the literature led Mezoff to conclude that for most circumstances structured HRT is more appropriate than unstructured HRT, since unstructured HRT seems to be systematically biased against individuals with FD learning styles. Furthermore, groups that are heterogeneous in cognitive styles have distinct advantages, since they allow group members to observe examples of behaviors they might try

to develop in themselves. Human relations trainers must recognize that their interventions are likely to be differentially effective with persons of different learning styles. "What is effective for an FD trainee may be ineffective for an FI (or vice versa)" (p. 29). Human relations trainers should try to compensate for a trainee's stylistic weakness. "For example, FI's tend not to focus on interpersonal interactions. The trainers, therefore, should continually make explicit references to this domain so that FI's will remain alert to it and focus on it" (p. 30). Mezoff concludes by observing: "we infrequently modify our training designs to accommodate the perceptual or cognitive styles of our participants" (p. 30). The tentative conclusions of this study are of most importance to public administration faculty that utilize these types of instructional strategies and are more attune to individual differences.

THE RELATIONSHIP OF FIELD-INDEPENDENCE-DEPENDENCE AND LEARNING FROM A LECTURE

Frank (1984) believes that discovering "specific processing differences between field-dependent and field-independent students" has powerful potential in guiding the development and implementation of "classroom strategies that capitalize on the characteristics of the different styles of students" (p. 677). He suggests that one area of investigation that might uncover specific ability differences is the relationship between cognitive style and the effectiveness of study technique. Witkin and Goodenough (1981) suggest that field-independent individuals have greater ability to break up an organized field into its basic elements and provide structure for an ambiguous stimulus complex. Such skills should be extremely useful in academic settings where students are frequently required to take notes. The purpose of the Frank study was to assess the extent to which FI and FD learning performance benefits from note-taking under increasing degrees of external structural support. In addition, exploratory analyses were conducted in an effort to detect differences in the kind of notes taken by field-independent and field-dependent students while listening to a taped lecture (Frank, 1984). Frank concludes that: "The typical classroom procedures in which teachers lecture and students take notes may favor the performance of field-independent students over field-dependent students" (Frank, 1984, p. 677). Thus, he suggests, instructors may want to provide students with additional organizational aids while lecturing, perhaps through outlines or a handout. "By clearly presenting the structure of the lecture, the teacher may be able to help the performance of the field-dependent student without hindering the performance of the field-independent student" (Frank, 1984, p. 677). An alternative would be to provide field-dependent students with structured training explicitly designed to enhance note-taking skills.

COGNITIVE STYLE, STUDY TECHNIQUE AND RECALL AND RECOGNITION

Annis and Davis (1978) point out that although there has been an increasing emphasis in instructional research on the techniques used by students in their efforts to learn from written

material, there still is a great deal of disagreement regarding the most effective study technique to use in studying an assignment. Students put a great deal of effort and a lot of faith into commonly-used study methods, which include reading only, underlining, formal outlining, marginal notes, and note-taking; yet there has been very little systematic research on the effectiveness of these study methods. "That which has been done has yielded inconsistent results with little support for any particular study technique" (Annis and Davis, 1978, p. 175). These authors feel that this might be due to the fact that students have been arbitrarily assigned to study conditions without any concern for the student's preferred method of study. In addition, previous studies have neglected the effects of different cognitive styles on the effectiveness of various study techniques. The purpose of the Annis and Davis study was to ". . . investigate the effect of the variables of study technique (read, underline, or notes), preference for study technique (preferred or non-preferred), review (review or no review), and cognitive style (field independent or field dependent) on tests of recall and recognition (p. 176)."

The experimental design consisted of three levels of study technique (read only, read and underline, read and take notes), two levels of preference (preferred or non-preferred), two levels of review (review or no review), and two levels of cognitive style (field-independent or field-dependent). The findings indicated that FI subjects using a non-preferred study technique with no review scored significantly better than FD students using a non-preferred study technique with no review. None of the other FI/FD comparisons reached significance. However, of the four possible conditions, FI students scored higher on the examination than did FD. The one exception was that FD students using a preferred study technique with no review scored better than FI students under the same conditions. The authors conclude "The results of the preference by review by cognitive style interaction indicate a tendency for field-independent subjects to score better than field-dependent subjects except when assigned to use both a less effective preferred study technique and no review (Annis and Davis, 1978)."

FIELD DEPENDENCY, OUTLINE CONDITION AND STRUCTURE INFORMATION FROM A LECTURE

As Ward and Clark (1987) point out: "In recent years research in cognitive styles has begun to focus on the relationship between individual differences in cognitive style and performance on educationally relevant tasks" (p. 259). Research indicates that under normal learning and instructional conditions, FI individuals perform better than FD students on a wide variety of different learning tasks. It has been suggested that this superior performance exists, because FI individuals display an active analytic approach to learning by seeking to abstract and use the organization of structured learning material and by seeking to impose their organization on ambiguous or loosely-structured material (Witkin and Goodenough, 1981). If FI's higher performance is due to their superior cognitive restructuring skills, perhaps providing external structural support to FD, individuals may allow them to compensate for poor restructuring skills and minimize performance differences between students of these two cognitive types. The research conducted by Ward and Clark (1987) was designed to investigate the effect of a structural outline on FD and FI students' learning and retention of structurally-important and less-important information from a videotaped lecture.

Subjects were first measured as to their field independence-dependence and then assigned to either an outline or no-outline condition. The basic instructional material was a twenty-minute videotape on the topic of bird migration. A hierarchical outline of the lecture was created. Information was considered of high structural (HS) importance if it specified a main topic or subtopic in the lecture. Information was considered of low structural (LS) importance if it specified a detail of a main topic or subtopic. Ward and Clark (1987) found that an outline contributed significantly to FD and FI participants' recall of HS and LS information, but the absence of an outline was detrimental to FD subjects. In this case, FI subjects had better recall of HS information than did FD subjects, but FD and FI subjects had the same recall of LS information. Furthermore, FD and FI participants revealed no differences in their recall of either HS or LS information when aided by an outline (p. 264).

EFFECT OF COGNITIVE STYLE AND LEARNING PASSAGE ORGANIZATION ON STUDY TECHNIQUE

Annis (1979) hypothesized that if field-independent persons are better than field-dependent persons at structuring material, it would seem likely that they would be better at focusing on and remembering material of high structural (HS) importance regardless of whether they were taking notes or reading only. In this study, it was shown that FI students scored better than the FD students in completing sentences of high structural importance regardless of whether the passage was organized or unorganized. The reason postulated for this superior performance was that FIs "... actively abstracted general principles and mediating concepts from the passage," but "field-dependent students are more likely" to use "the characteristics of the learning task" instead of "analyzing or imposing their own structure on it" (Annis, 1979, p. 624).

LEARNING AND MEMORY OF FIELD INDEPENDENT-DEPENDENT INDIVIDUALS

A study by Davis and Frank (1979) was undertaken in response to findings by Goodenough (1986) who suggested that the difference between field-dependent and field-independent people is *how* the learning or memory process occurs rather than in how *effective* that process is. This study discusses alternative explanations that emphasize developmental differences and differences in efficiency of performance between FI's and FD's.

Experiments were conducted concerning two types of memory, short-term memory and free recall. In the experiment with short-term memory, field-independent individuals were found to be more efficient than field-dependent individuals under conditions of high information load and when sources of potential interference were present. "In the case of free recall learning, the evidence reviewed indicated that the chances of field-independent individuals displaying superior recall increases as the inherent organization of the task material decreases" (Davis and Frank, 1979, p. 477).

FIELD DEPENDENCE AND SHORT-TERM MEMORY

Berger and Goldberger (1979) examined the relationship between field dependence and short-term memory. These researchers predicted that, relatively, field-independent individuals would perform better on short-term memory tests in which a large amount of interference is assumed to be present than would individuals who are more field-dependent. The findings supported this hypothesis and are consistent with the understanding of field independence as the ability to focus attention on the relevant aspects of a field. "In summary, the findings of the present study seem to give strong support to the conceptions of field independence as involving the ability to attend selectively and the tendency to be task-oriented" (Berger and Goldberger, 1979, p. 96).

COGNITIVE AND INSTRUCTION STYLE: THE LEARNING PERFORMANCE OF UNDERGRADUATE STUDENTS

Not all research findings support differential responsiveness to treatment by field-independent and field-dependent students. It had been suggested that optimal learning occurs when the instructional style of the teacher is matched to the particular strengths of the learner's cognitive style (Witkin et al., 1977). MacNeil (1980) investigated the relative effects of two different instructional styles: "discovery" in which general concepts are verbalized and taught as the *final* step in the instructional sequence. The discovery style also includes "a low degree of instructor guidance, and an emphasis on student-centered presentation methods, such as discussion, role-playing, self-paced workbook exercises, and group problem solving." In contrast, the "expository" strategy verbalizes generalizations in the *initial* step of instruction, and conversely uses "a high degree of instructor guidance, and an emphasis on teacher-centered presentation methods, especially lectures" (p. 355). The research question explored whether or not the learning performance of students differing in cognitive styles would be significantly affected by a particular style of instruction. "The results obtained from this study revealed that differential effects did not occur" (MacNeil, 1980, p. 357). However, MacNeil suggests that one possible explanation for the lack of significant interaction might have been the nature of the subject matter chosen for the unit of instruction. MacNeil points out that in other research that supported the "matching" theory, the educational topic used was a unit of mathematics (a subject area that stresses analytical skills). "Thus, it may be postulated that the difference in the nature of the subject matter used in these various investigations has affected the conclusions reached" (MacNeil, 1980, p. 358).

MacNeil's study falls under the heading of Aptitude-Treatment-Interaction (ATI) research (Cronbach et al. 1977). Advocates of this approach recommend that researchers try to find aptitudes that interact with variations in instructional treatment and to design instructional treatments to fit particular aptitudes of groups of students. As mentioned above, there have been several studies successful in finding that ATI's have used the cognitive style of field dependence/ independence as an aptitude variable (Adams and McLeod, 1979). McLeod, Carpenter, McCormack, and Skvarcius (1979) investigated the relationship between FI/FD and expository and discovery instructional style. "The results support the hypothesis that field-independent students will perform best when allowed to work independently,

whereas field-dependent students perform best when given extra guidance" (Adams and McLeod, 1979, p. 348).

Rollock (1992) evaluated whether certain learning conditions could bring out effects of style as distinct from ability. The purpose of Rollock's study was to determine whether field dependent students' achievement could be higher than field independent students on a test of freshly-learned material when learning required social awareness. Rollock concluded from his study that field dependent students performed better than did their field independent colleagues under learning conditions in which interpersonal skills were required.

This brief summary of only a few of the thousands of studies that have discussed the educational implications of the field independence/dependence dimensions of learning styles clearly demonstrates that different instructional techniques are required for effective instruction of students at each of the polar extremes of this dimension.

IMPLICATIONS FOR ENHANCING STUDENT LEARNING OUTCOMES

As Cronbach and Snow state (1977, p. 1):

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.

There are many ways to relate the field dependent/independent styles of learning to instructional methodologies. One approach is to categorize the instructional methodologies into degrees from formal/unambiguous to informal/ambiguous learning environments. This dichotomy is particularly important, since research has shown that field dependents and field independents react differently to these two learning situations (Mezoff, 1982). In light of the characteristics of field-dependent students already described, field dependents would prefer discussion or discovery modalities in which they can interact with others, while field independent students like a lecture format in which they can take in the information autonomously. Based on these descriptions, one would suspect an informal training environment would be the most effective for the global-learner whereas the formal environment would be the most effective learning environment for the analytical-oriented student. Research has indicated, however, that there are some very important exceptions to this conventional wisdom. In a structured learning environment, there appears to be no difference between the amount of material learned by either the global relational or the analytical learner. However, when the material to be learned lacks clear inherent structure therefore requiring that the learner provide organization as an aid to learning, field-dependent persons are likely to have greater difficulty as compared to field independent students. This apparent need on the part of field dependents for structure in order to facilitate the learning process leads to several strategies for effective instruction. For example, in a class having field-dependent students which might prefer discussion, effective instruction would require questions or a list of suggested topics to guide the discussion. Or, if the instructor is using case studies as the teaching method, the instructor should provide the field dependents with questions to focus their discussion. Likewise, the characteristics of the learning style of field-

independent students require some specific attention from an astute instructor. Field-independent individuals do not seek out external feedback; thus, a field-independent student, while working alone on a project, might be going completely down the wrong track and not recognize this until after the assignment has been completed. In an ongoing class project, perhaps the instructor could require progress reports and monitor those to insure that the field-independent student has perceived the correct method for responding to the assignment.

Since field-dependent people are particularly interested in the social aspects of their surroundings, it is obvious such people are better at learning material with social content. Thus, if a course activity required the learning of socially-related material, the instructor could assume the field-dependent students would learn the material quite readily. On the other hand, it was shown while field-independent students are not particularly sensitive to social material, once being alerted they are to look out for certain social related facets of the learning experience, they will learn the material just as well as the field-dependent student will. Thus, an observant instructor is apt to see that sufficient clues are provided in a socially-oriented learning situation to assist the field-independent student learning process.

The motivation for learning, apparently, is also extremely important in the degree to which field-dependent and field-independent people learn. To some degree, perhaps contrary to conventional wisdom, evidence suggests that field-independent persons tend to learn more than field-dependent persons when the motivation is completely intrinsic. However, when there are external rewards for learning, whether material or non-material in nature, there is no difference in how much learning takes place. Recognizing this difference, the instructor might want to make sure there are extrinsic rewards available to stimulate the field-dependent learner.

There is one common theme running through the literature on field independence/dependence research reviewed in this study (Mezoff, 1982; Murphy, 1982; Frank, 1984; Witkin and Goodenough, 1981; Annis and Davis, 1978; Ward and Clark, 1987; Annis, 1979; Davis and Frank, 1979; Berger and Goldberger, 1979; Adams and McLeod, 1979; McLeod, Carpenter, McCormack and Skvarcius, 1979; Witkin et al., 1977). Field-dependent participants require more structure than field-independent participants in order 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 and Clark, 1987), or in the inherent organization of the task material itself (Davis and Frank, 1979), its existence appears to remove any difference between the amount of material learned. This finding is ironic since, as the literature reviewed indicated, the field-dependent learner prefers less structured learning environments such as discussion or the discovery mode.

FIELD DEPENDENCE/INDEPENDENCE: IMPLICATIONS FOR FACULTY ACCOUNTABILITY

Faculty at institutions of higher education currently work in environments that demand accountability. There are few ways to respond to these demands more compelling than to show key stakeholders how serious faculty are about identifying strategies for enhancing student learning. Knowles (1973), among others, points out that understanding how a person

learns is a major requisite for a successful educational program. Studies have shown that identifying a student's learning style and then providing appropriate instruction in response to that style can contribute to more effective learning (Claxton and Murrell, 1987). Thus it behooves today's faculty to be aware of important student learning styles and how to design and deliver instruction in response to them.

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 students' 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 teachers are more likely to use instructional methods that are congruent with their cognitive learning style. Wu (1968, as quoted in Bertini, 1986) for example, found that more 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...emphasizes social interaction" and "gives the student more of a role in structuring the classroom situation" (Bertini, 1986, p. 95). After summarizing the relevant literature reviewing research on the relationship between instructors' cognitive styles and their preferred instructional methods, Bertini concluded that "field-dependent and field-independent teachers have different teaching preferences syntonic with their own personal styles" and consequently they may demonstrate "different patterns of actual teaching behavior in the classroom" (1980, p. 96).

This natural tendency might have special significance for public administration faculty, since the research findings of this study showed many of the subjects had undergraduate preparation in the "Social Professions," and these subjects were significantly more field-dependent than students with other undergraduate preparation. Assuming public administration faculty approximate this distribution, one could infer a significant number of public administration 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 public administration faculty are using low or non-structured teaching methods with field-dependent students. The research findings described in the previous section, however, suggest that such teaching methods/student characteristics combinations place the field-dependent 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-dependent students, both field-independent and field-dependent faculty need to be made aware of how teacher/student matching or mismatching of learning styles can lead to bias in assessment. DiStefano (1970, as described in Bertini, 1986) found when teachers and students had 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, 1986, 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.

CONCLUSION

Guild and Garger stated that "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" (1985, p. viii). Of all the learning styles developed (Keefe, 1979, Wooldridge, 1995) field independence-dependence appears to have the most potential for the improvement of the educational experience.

What insights has research on this important learning style contributed to the improvement of the instructional process? First, in a field-dependent mode of perceiving, perception is strongly 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. Moreover, as this chapter has pointed out, these differences have important learning implications since they also reflect differences in interpersonal orientation, attention span, comfort with different degree of structure of the learning situation, competitiveness, and attention span.

Next, this learning style dimension is not equally distributed among the student population. Research has suggested sex, as well as ethnic/racial differences in Witkin's dimension of field independence/dependence. Students might also differ in their responses in light of their undergraduate major.

Finally, research suggests that instructional effectiveness can be enhanced by responding to the field independence/dependence learning style of an individual student. However, not as some learning style researchers (Dunn, Dunn and Price 1978) have suggested, by providing instruction in a form that is congruent with the student's preference, but rather by selecting instruction methods in light of research on this particular style. There is one common theme running through the literature on field independence/dependence research reviewed in this study. Field dependent participants require more structure than field independent participants, in order to achieve the same level of learning. Moreover, research on the field dependence learning style construct raises serious questions about some of the most cherished assumptions of "andragogy."

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). It has as its goal 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 the most essential work in developing future scholars" (Watkins, 1990, p. A12). Although there have been many false starts, there is no better time than the present during present accountability trend in education to make the concept of different learning styles mandatory in instructional research and classroom pedagogy.

The prominence of the field independence/dependence learning style has clearly not been overstated. As Messick (1986), of the Educational Testing Service, once said, "I once heard a noted perceptual psychologist remark that (although) cognitive styles were exciting concepts," they were also long on promise and short on delivery. But, such was not the case for field dependence-independence, for which "its early promise has been fulfilled, and its potential continues to offer ample collateral for exciting forays. That, we owe to Herman Witkin. That is his intellectual legacy" (p. 117).

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