The Cognitive Style of Nursing Students: Educational Implications for Teaching and Learning

Kim A. Noble, PhD, RN, CPAN; Susan M. Miller, PhD; and James Heckman, PhD

ABSTRACT

As cognitive and kinesthetic demands on nursing students increase, so does the need for optimal learning environments. Witkin's empirically supported measure of field dependent/independent cognitive style assesses the manner in which students perceive and process information and classifies them along a continuum of field dependence to field independence.

Witkin's Groups Embedded Figures Test (GEFT) was administered to 876 students enrolled in 10 health care programs. Statistically significant differences in the GEFT mean scores of students enrolled in the different programs were discovered. The effect size was moderate. Undergraduate nursing students scored higher on the GEFT than did graduate or RN-to-BSN nursing students. However, nursing students were classified as more field dependent than students in other health-related disciplines. Due to their cognitive processing requirements, field-dependent nursing students may be at risk for academic failure. Therefore, instructional strategies tailored to students' needs should be incorporated into the nursing curriculum.

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Dr. Noble is Assistant Professor, Department of Nursing, College of Health Professions, and Dr. Heckman is Associate Professor, Department of Physiology, Temple University, Philadelphia, Pennsylvania; Dr. Miller is Assistant Professor, Department of Educational Foundations and Special Services, Kent State University, Kent, Ohio. At the time this article was written, Dr. Miller was Assistant Professor, Department of Psychological Studies in Education, Temple University, Philadelphia, Pennsylvania.

Address correspondence to Kim A. Noble, PhD, RN, CPAN, Assistant Professor, Department of Nursing, College of Health Professions, Temple University, 3307 N. Broad Street, Philadelphia, PA 19140; e-mail: Kim.noble@temple.edu.

The preparation of nursing students for health care in the 21st century requires that programs deliver instruction in the most effective and efficient manner possible. To better ensure that all nursing students have an opportunity for success, diversity in students' learning needs should be considered. Nursing education researchers have endeavored to identify individual differences that influence learning and content mastery. Researchers have examined academic preparation, personal demographics, noncognitive variables (e.g., personality, self concept) and cognitive variables (e.g., locus of control, learning style, cognitive style). Learning style has been of particular interest to researchers in nursing education (DeCoux, 1990; Griggs, Griggs, Dunn, & Ingham, 1994) and in many other disciplines. However, this variable has been criticized on both theoretical and measurement grounds.

The aspect of student diversity on which this article is focused is a cognitive style known as *field preference*. Field preference is well established in the psychological and educational literature as a variable that affects how students learn and process information. Field preference has been used in several studies in nursing education, as a description of clinical behaviors (Hodson, 1985), as a predictor of academic achievement (Talarczyk, 1989), and as a correlate to cumulative grade point average among baccalaureate nursing students (Ostrow, 1986). However, in the field of nursing education, the way in which field preference can be applied to the development and use of pedagogical strategies has not been explored.

Field preference is characterized by a learner's approach to the perception, acquisition, processing, organization, and application of information (Messick, 1984). The theory of field preference originated with Herman Witkin's observations while in a World War II fighter plane in dense fog: some pilots decreased in navigation accuracy; others had no difficulty with the loss of visual information. Dr. Witkin took this observation back to his laboratory and over the

next 40 years conducted exhaustive research that helped define and describe the field preference construct (Chinien & Boutin, 1993).

Field preference is represented by a bipolar set of traits, with field dependence and field independence at opposing ends of a continuum (Witkin, Moore, Goodenough, & Cox, 1977). In most cases, an individual favors one style but may display varying degrees of preference in either direction. Field dependence-independence affects not only an individual's functioning in an educational setting, but also many other aspects of life and personality. For example, field-dependent individuals rely on facial cues and a social frame of reference, whereas field-independent individuals exhibit an internal frame of reference and a more impersonal orientation when engaged with others. Those with a field-dependent cognitive style prefer vocations featuring human contact, whereas field-independent individuals prefer solitary vocations (Witkin et al., 1977). Field preference characteristics have been found to be relatively stable over time and pervasive across many aspects of personality (Witkin et al., 1977). Field dependence-independence does not correlate to intelligence; instead it is one determinant of the methods an individual uses for information acquisition (Messick, 1984). Rather than focusing on *how much* is learned, this cognitive style focuses instead on *how* it is learned (Witkin et al., 1977).

Field-dependent learners are so named because they use or depend on the context in which information is obtained. Field-dependent learners may attend to environmental features and cues that are salient, but irrelevant, to a learning task. This cognitive style inhibits the ability of such learners to reorganize their perceptions. These learners have great difficulty separating a larger whole into its component parts, causing them to rely on the organization embedded within the information they are learning (Kahtz & Kling, 1999; Witkin & Goodenough, 1981). Field-independent learners have an analytical style evidenced by their ability to grasp the whole as the sum of the individual parts. They can identify elements and impose their own structure on the learning environment, especially in learning situations where structure is less obvious. They are independent learners, with a strong internal frame of reference and sense of separate identity. They approach unfamiliar situations by breaking them into discrete parts to find the solution, a process termed *cognitive restructuring* (Witkin & Goodenough, 1981).

Research findings suggest that field-independent learners tend to be better problem solvers (Hsu & Wedman, 1994; Nasser & Carifio, 1993; Robertson & Alfano, 1985; Witkin et al., 1977). Field-independent individuals use a sequenced, systematic form of problem solving. Because of their analytical approach, they are able to generate hypotheses for testing and determine the solutions of problems. Field-dependent learners use a holistic problem solving style, but their inability to break apart larger problems leads to use of less efficient or random forms of trial and error in problem solving.

Field-dependent and field-independent students approach educational tasks differently and have a preference for different learning environments. Field-dependent students learn best in an environment that provides a high degree of structure and organization in the presentation of content. They rely on an instructor to provide clear objectives, task directives, and an organized presentation of information. Field-dependent students do not learn well in a lecture environment, in part due to a lack of interaction with the instructor. They prefer learning environments that include group interactions and a social exchange of information. They are more successful when feedback is available (Roberts & Park, 1984). Field-independent learners prefer the impersonal lecture environment and autonomous learning. They do not seek interaction with the instructor or peers as a fundamental part of their learning process. For example, Hodson (1985) compared the clinical behaviors of field-independent and field-dependent nursing students and found that field-independent students spent less time interacting with their instructors then did their field-dependent peers. Field-independent students do not require a high degree of content organization, and imposed external organization may interfere with their attempts to restructure the content.

> Due to their cognitive processing requirements, field-dependent nursing students may be at risk for academic failure. Therefore, instructional strategies tailored to students' needs should be incorporated into the nursing curriculum.

The purpose of this study was to identify the cognitive style of nursing students and other health profession students. The understanding of student field preference may be useful in the development and refinement of nursing school curriculum. It may be used to design optional learning environments and instructional strategies that are optimized for students with differences in field preference, with the expectation that students would select the environments or strategies that best suit their own cognitive style. Knowledge of their own field preference may assist the students in this selection by helping them develop metacognitive strategies to optimize learning. Knowledge of the field preference of non-nursing health professional students (e.g., medicine, physical therapy) may be helpful to instructors who teach both nursing and non-nursing students. Instructors must realize that "one size does not fit all" and that to be most effective, they

must consider how best to teach populations with different cognitive styles. As nursing programs expand interdisciplinary collaboration, nursing education will include more instructors from other disciplines. The rapid development of technology (e.g., computer software and patient simulators) now makes it more feasible to provide optimal learning environments and optional learning strategies.

METHOD

Sample

The sample consisted of 876 student volunteers from 10 health science programs at a large urban university. Seven of the programs were graduate or professional degree programs; three were undergraduate (i.e., the generic undergraduate, RN-to-BSN, and health information management programs). The majority of participants (n = 565, 64%) were graduate students (**Table 1**).

Most students who volunteered were female (n = 577, 66%). The relative proportion of male and female participants varied considerably by program (**Table 1**). Dentistry and medicine were the only samples in which male students outnumbered female students (dentistry: 67% to 33%, medicine: 53% to 47%). Physiology and podiatry program samples were composed of more equal numbers of male and female students. Female participants comprised a larger percentage of the samples from all other programs including the nursing programs.

Respondents self-reported their race/ethnicity. Across programs, 59% of the participants were White (n = 517). Eighteen percent were Asian (n = 153), 15% were Black (n = 131), 2% were Hispanic (n = 18), 0.3% were Pacific Islander (n = 3), 1% were multiracial (n = 9), and 5% indicated other (n = 40). Less than 0.1% of racial/ethnicity data were missing. The relative race/ethnicity composition of participants varied among programs (**Table 2**).

TABLE 1

Students' Gender Across Programs

Program	No. Female	No. Male
Medical	100 (47%)	113 (53%)
Dental	46 (33%)	94 (67%)
Podiatry	27 (59%)	19 (41%)
Physical therapy	51 (77%)	15 (23%)
Occupational therapy	17 (94%)	1 (6%)
Physiology	8 (53%)	7 (47%)
Generic undergraduate nursing	129 (84%)	24 (16%)
Graduate nursing	58 (87%)	9 (13%)
RN-to-BSN nursing	90 (90%)	10 (10%)
Health information management	51 (88%)	7 (12%)
Total	577 (66%)	299 (34%)

Success in this task requires the individual to ignore confusing visual information to identify and outline the hidden figure.

Instrument

Field preference was measured by the Group Embedded Figures Test (GEFT) (Witkin et al., 1977). The GEFT is a timed, 20-minute, pencil-and-paper instrument. It consists of one practice section and two scored sections; there are 9 items in each section. Each item is a complex geometric design embedded in a simple geometric figure. The simple figure is pictured on the back of the testing booklet. Students are required to hold a mental image of the simple form as they attempt to locate and outline it within the complex design. Success in this task requires the individual to ignore confusing visual information to identify and outline the hidden figure. One point is given for each correctly identified simple figure, with a total score ranging from 0 to 18. Field preference is a continuum, with a higher score indicating field independence and a lower score indicating field dependence (Witkin, Oltman, Raskin, & Karp, 1971).

The GEFT has been used and tested extensively in the psychological and educational literature (Goodenough, Oltman, Snow, Cox, & Markowitz, 1991; Witkin & Goodenough, 1981). Melancon and Thompson (1987) noted that the frequent use of the GEFT may be because of its "exceptional psychometric integrity" (p. 7). The GEFT has a reported reliability coefficient of 0.82 (Witkin et al., 1971). Various strategies have been used to determine field-dependent and field-independent classifications. Typically, the mean or median of the sample under examination is used as a cut-point for classification, with students falling above the cut-point classified as field independent and those falling below the cut-point classified as field dependent (Dwyer & Moore, 2002; Khine, 1996; Rickards, Fajen, Sullivan, & Gillespie, 1997; Roberts & Park, 1984). Some researchers have suggested that students whose scores fall at or near the center of the continuum are field neutral, meaning these students vary in their preference depending on the context (Rush & Moore, 1991; Weller, Repman, Lan, & Rooze, 1995).

Procedure

Approval to conduct this study was granted by the university's Institutional Review Board, and permission was obtained from relevant college deans, department chairs, and faculty. Student participation was voluntary. The GEFT was administered to participants in groups; sessions were scheduled based on course and students'

TABLE 2
Students' Race and Ethnicity Across Programs

Program	Asian	Black	White	Hispanic	Pacific Islander	Multiracial	Other
Medical	54 (26%)	15 (7%)	124 (59%)	2 (1%)	0 (0%)	0 (0%)	15 (7%)
Dental	30 (22%)	3 (2%)	90 (65%)	5 (4%)	1 (<1%)	0 (0%)	9 (7%)
Podiatry	4 (9%)	5 (11%)	34 (74%)	1 (2%)	0 (0%)	1 (2%)	1 (2%)
Physical therapy	5 (8%)	17 (26%)	41 (62%)	3 (4%)	0 (0%)	0 (0%)	0 (0%)
Occupational therapy	1 (5%)	3 (17%)	14 (78%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
Physiology	3 (20%)	3 (20%)	8 (53%)	0 (0%)	0 (0%)	0 (0%)	1 (7%)
Generic undergraduate nursing	26 (17%)	34 (22%)	76 (50%)	3 (2%)	2 (1%)	4 (3%)	8 (5%)
Graduate nursing	9 (13%)	22 (33%)	33 (49%)	0 (0%)	0 (0%)	0 (0%)	3 (4%)
RN-to-BSN nursing	8 (8%)	8 (8%)	79 (79%)	2 (2%)	0 (0%)	2 (2%)	1 (1%)
Health information management	13 (22%)	21 (36%)	18 (31%)	2 (3%)	0 (0%)	2 (3%)	2 (3%)
Total	153 (18%)	131 (15%)	517 (59%)	18 (2%)	3 (<1%)	9 (1%)	40 (5%)

Note. N = *871; 5 students (3 medical, 2 dental) did not report their race/ethnicity. Total row percentages may not equal 100% due to rounding.*

schedules. Following an explanation of the study, each participant signed a consent form and completed a brief demographic form and the GEFT.

DATA ANALYSES AND RESULTS

All analyses were conducted using SPSS version 13 software. The means, standard deviations, and sample sizes for each program of study are presented in **Table 3**. The programs are organized by GEFT mean scores, in descending order.

GEFT scores can range from 0, the field-dependent end of the continuum, to 18, the field-independent end of the continuum. Mean scores for graduate and RN-to-BSN nursing students were 8.00 and 7.50, respectively; the median score for each was 7.00. Scores in each sample ranged from 0 to 18 but were clustered near the field-dependent end of the continuum: The lower one third of each distribution fell at or below 4.00, whereas the upper one third fell at or above 10.00. The mean score for undergraduate nursing students was 9.97, the median score was 10.00, and scores ranged from 0 to 18. For this sample, scores were more evenly distributed across the continuum: The lower one third of the distribution fell at or below 8.00, whereas the upper one third was at or above 13.00.

To clarify differences among students in all programs, a one-way ANOVA was conducted, with program of study as the independent variable and GEFT score as the dependent variable. Two programs, occupational therapy and physiology, were not included in this analysis due to small sample sizes. Groups were statistically significantly different (F = 57.504, p = 0.000; η_p^2 = 0.33). The effect size reported is partial eta^2 (η_p^2), which can be interpreted as the amount of variance in the dependent variable scores explained by the independent variable (Trusty, Thompson, & Petrocelli, 2004). A moderate percentage of the variance in scores was explained by program of study (33%). A Tukey's honestly significant difference multiple comparison test was conducted post hoc to determine which groups were statistically significantly different from each other. All analyses were conducted at p = 0.05 level of significance. Results are indicated in **Table 3**.

> The means of students in graduate nursing and RN-to-BSN nursing programs did not differ from each other or from health information management students.

The GEFT mean scores of graduate nursing students (mean = 8.00, SD = 5.07) and RN-to-BSN nursing students (mean = 7.50, SD = 5.14) were statistically significantly different from the GEFT mean scores of students in generic undergraduate nursing, physical therapy, podiatry, dental, and medical programs (**Table 3**); programs that do not share the same superscript differ significantly from each other. The means of students in graduate nursing and RN-to-BSN nursing programs did not differ from each other or from health information management students as indicated by the shared superscript "e." No other program shares this superscript, indicating that, overall, students

in those programs (including generic undergraduate nursing) had higher GEFT scores (i.e., were more field independent).

Table 3 shows that the GEFT mean score of generic undergraduate nursing students (mean = 9.97, *SD* = 4.77) was statistically significantly different from the GEFT mean scores of students in dental (mean = 13.65, *SD* = 4.40) and medical (mean = 15.35, *SD* = 3.00) programs. Students in the latter programs were the most field independent. There were no differences between the GEFT mean scores of generic undergraduate nursing students and those of students in physical therapy and podiatry programs. The superscripts in **Table 3** identify the remaining statistically significant differences among students in physical therapy, podiatry, dental, and medical programs.

TABLE 3

Comparisons of GEFT Mean Scores of Health Professional Programs

Program	Mean Score	*SD*	Sample
Medical	15.35[b]	3.00	213
Dental	13.65[c]	4.40	140
Podiatry	11.67[c,d]	4.42	46
Physical therapy	11.62[d]	4.07	66
Occupational therapy[a]	10.78	6.41	18
Physiology[a]	10.67	4.52	15
Generic undergraduate nursing	9.97[d]	4.77	153
Graduate nursing	8.00[e]	5.07	67
RN-to-BSN nursing	7.50[e]	5.14	100
Health information management	7.45[e]	4.78	58

Note. N = *843. Mean scores are presented in descending order. Possible range is 0 to 18. Higher scores indicate field independence; lower scores indicate field dependence.*

[a] *Occupational therapy and physiology were omitted from the ANOVA due to small sample size.*

[b-e] *Means in the same column that do not share superscripts differ at* p < *0.05 in the Tukey's honestly significant difference comparison.*

An ordinary least squares linear regression was conducted to capture the effect of program of study, along with controlling for other potential relevant variables (i.e., gender, race/ethnicity) on GEFT scores. Program of study was recoded into three dummy variables: professional, consisting of medical, dental, and podiatry programs; nursing, consisting of undergraduate, RN-to-BSN, and graduate nursing programs; and other, consisting of physiology, occupational therapy, physical therapy, and health information management programs. Race/ethnicity was recoded into three dummy variables: White, Asian, and Black. Regression results indicated an overall model that significantly predicted scores on the GEFT (adjusted R^2 = 0.28, F[5, 870], p = 0.000). Regression results are indicated in **Table 4**. Note that in the regression analysis, the proportion of variance accounted for, adjusted R^2, is a measure of effect size or practical significance of all entered variables on the dependent variable (Cohen, 1988; Trusty et al., 2004). For this study, the magnitude of the effect size was moderate (28% of the variance) (**Table 4**).

All other things equal, being in a professional program added 3.89 points to the GEFT score over what would have been the case had the student been enrolled in the other programs (i.e., physical therapy, occupational therapy, physiology, or health information management). Being in a nursing program subtracted 1.24 points from the GEFT score over what would have been the case had the student been enrolled in the other programs (i.e., physical therapy, occupational therapy, physiology, health information management). In addition, being classified as White added 2.35 to the GEFT mean score, compared with students who had been classified as Black. This is almost twice the increase for the Asian students (i.e., a 1.20-point increase).

Within the larger health education context, nursing students were the most field dependent of all students tested, with the exception of students in health information management.

DISCUSSION

There were two findings of importance to nursing education: Within the larger health education context, nursing students were the most field dependent of all students tested, with the exception of students in health information management. When students in the three nursing programs were compared, generic undergraduate students had a statistically significantly higher GEFT mean score than did graduate or RN-to-BSN nursing students.

TABLE 4

Summary of the Regression Model

Predictor	b	Significance
Gender	–0.531	ns
White	2.35	0.000
Asian	1.20	0.014
Professional program (medical, dental, podiatry)	3.89	0.000
Nursing program (undergraduate, graduate, RN-to-BSN)	–1.24	0.005

Note. $R^2 = 0.29$, *Adjusted* $R^2 = 0.28$, $p = 0.000$. *b = standardized regression coefficients, ns = not significant.*

The finding that graduate and RN-to-BSN nursing students were more field dependent than were students in all but one group is consistent with earlier findings (Witkin & Goodenough, 1981). Field-dependent students favor vocations requiring a high degree of human contact and refined communication skills. Witkin et al. (1977) reported that field-dependent individuals gravitated toward the service occupations, such as nursing, education, and social work. Conversely, field-independent individuals prefer vocations that allow for independent or solitary work, such as scientific research, or fields depending on the analytic and logical skills, such as the sciences or mathematics. Findings from many studies involving a range of occupations support the notion of a correspondence between field preference and vocational selection (Barrett & Thornton, 1967; De Russy & Futch, 1971; DeSanctis & Dunikoski, 1983; Fergusson, 1992; Frank, 2001; Johnson, Prior, & Artuso, 2000; Kelleher, 1994; McRae & Young, 1988; Murphy, Doucette, Kelleher, & Young, 1997; Petrakis, 1981; Pincus, 1985; Wieseman, Portis, & Simpson, 1986).

Findings revealed that gender was not a predictor of performance on the GEFT; however, program of study and race/ethnicity were found to be predictors.

It is important to note that not all nursing students are cast in the same mold. The GEFT mean score of the generic undergraduate nursing students was statistically significantly higher than the mean scores of RN-to-BSN and graduate nursing students. Prior studies involving the field preferences of nursing students have used samples comprised of undergraduate nursing students. These studies yielded slightly higher GEFT mean scores for undergraduate nursing students but are consistent with our findings. Hodson (1985) reported a mean score of 11.11 (*SD* = 4.38) for a sample of undergraduate nursing students. Ostrow (1986) reported similar mean scores for two groups of senior nursing students (mean = 11.00, *SD* = 4.56; mean = 10.88, *SD* = 4.88). Also testing senior nursing students, Talarczyk (1989) obtained a GEFT mean score of 11.30 (*SD* = 4.45). The weight of evidence indicates that the average undergraduate nursing students' score falls at the center of the field-dependent to field-independent continuum.

This study was not designed to identify reasons for differences in field preference between undergraduate nursing students and RN-to-BSN or graduate nursing students. An obvious difference between these groups is that undergraduate nursing students have not yet had experiences that would acculturate them in the nursing discipline, nor have they had time to self-select out of the field. Most students in the RN-to-BSN and graduate programs were practicing nurses returning to school for additional educational preparation. It may be that their lower GEFT scores are representative of the enculturation of practicing nurses to their occupation. Perhaps clinical experience facilitates the contextual collection of information from the work environment, and with nursing experience comes a preference for a field-dependent approach to information acquisition. The profession of nursing requires individuals to interact with a variety of multidisciplinary team members, patients, and families; it requires individuals to collaborate and receive feedback from others; and it requires individuals to integrate a scientific foundation into the care of patients and rapidly assimilate information in a holistic fashion. Collectively, these occupational attributes provide a better match for individuals who are more field dependent. Field-independent individuals who fail to acculturate may leave the profession.

Regression analysis helped isolate the relative influences of gender, race/ethnicity, and program of study on a student's GEFT score. There is some empirical evidence to suggest that gender and race/ethnicity influence performance on the GEFT. In this study, the distribution of students by gender and race/ethnicity differed dramatically among programs (**Tables 1 and 2**). Findings revealed that gender was not a predictor of performance on the GEFT; however, program of study and race/ethnicity were found to be predictors. Educators who teach nursing students as well as students in other health-related disciplines should consider their students' cognitive style and race/ethnicity. Being classified as White and enrolled in a nursing program added 1.11 more points to the GEFT mean score than would have been the case if the student had been classified as Black and enrolled in the physical therapy, occupational therapy, physiology, or heath information management programs. Being Asian and enrolled in a nursing program yielded a GEFT mean score 0.04 points lower than would have been the case if

the student had been classified as Black and enrolled in the physical therapy, occupational therapy, physiology, or heath information management programs.

IMPLICATIONS FOR NURSING EDUCATION

When nursing curricula are being designed, we suggest the two major findings of this study be considered: the relatively lower GEFT mean scores of nursing students compared with students in other health professions and, concurrently, the wide variability in GEFT mean scores among students within each of the three nursing programs. When developing instruction for an entire class of nursing students, an instructor should consider embedding strategies that would benefit the average nursing student. Our findings revealed that the average graduate or RN-to-BSN nursing student tends to be more field dependent (means = 8.00 and 7.50, respectively); although the average undergraduate nursing student falls near the center of the field-dependent to field-independent continuum (mean = 9.97).

On the other hand, we found wide variability in the scores of nursing students within each program. The greatest variability occurred with undergraduate nursing students. Their GEFT median score was 10.00 and the distribution was not significantly skewed. There was less variability in the GEFT mean scores of graduate and RN-to-BSN nursing students. The GEFT median score for students in these two groups was 7.00; that is, half of the students fell at or below this score. This score is low and indicates a more field-dependent cognitive style. As mentioned previously, one third of the students in these two groups had scores of 4 or below, which indicates that they are highly field dependent.

Instructors should consider providing enhanced learning strategies from which field-dependent or field-independent students can select.

Research findings indicate that field-dependent students benefit from enhanced strategies that gain and focus their attention. The uses of these strategies are not preferred by field-independent learners although, overall these strategies have not been found to interfere with their learning (Rickards et al., 1997). This suggests that instructors should consider providing enhanced learning strategies from which field-dependent or field-independent students can select. Strategies that have direct application to nursing education are presented in the following paragraphs.

One class of strategies involves helping field-dependent learners by providing external organization to the presentation of content. It is good instructional practice to present didactic information in a manner that emphasizes relationships among elements. However, field-dependent learners benefit from strategies that go beyond well-organized lectures. These students have difficulty understanding the inherent structure of a given content or generating their own structure and thus, they benefit from the provision of written organizers such as handouts or lecture outlines that can be provided online. On the other hand, this strategy has not been found to benefit field-independent learners, who often prefer to develop their own outlines (Frank, 1984; Kiewra & Frank, 1986, 2001; Weller et al., 1995).

A characteristic of field-dependent learners is the inability to determine which salient elements in the environment are important. Thus, a second class of strategies to increase the learning and retention of field-dependent nursing students involves signaling the important learning facts, concepts, principles, and skills. Signaling "serves to cue the learner to the important test content and its organizational structure" (Rickards et al., 1997, p. 508). Given that any class of nursing students contains 30% to 50% field-dependent learners (i.e., at or below a GEFT score of 7.00), extensive use of signaling is suggested. Signaling can be as simple as stating the importance of a concept or the bolding of key text. Signaling can also be more complex, as in a software program's feature of providing definitions for highlighted concepts. Rickards et al. (1997) reported that the use of signaling resulted in a greater increase in learning for field-dependent students compared with field-independent students, while at the same time not interfering with the learning of field-independent students. Signaling was also found to be important to nursing students in the clinical setting (Hodson, 1985). Due to the inherent complexity of such authentic environments, field-dependent learners can be easily overwhelmed by the great variety of stimuli, making it difficult to identify which of the many variables in the environment is important.

Field-dependent learners are social learners. They rely on the interactions with others as their primary source of information (Witkin & Goodenough, 1981). A strategy that supports this preferred mode of learning is the small collaborative group, which provides content in a social frame of reference. This strategy was tested by Rollock (1992), who reported statistically significant higher post-test scores for field-dependent students who learned in an interactive small group setting, compared with those who learned in a lecture format (Norris, 1986). An interactive small group setting may provide increased student and faculty interaction, which, by helping to clarify difficult topics and by providing additional cues, will increase the learning of field-dependent students. Optional opportunities for interactivity can be made available through the use of various communication technologies (i.e., e-mail, listservs, advanced collaborative software).

It is considered good instructional practice to provide feedback to students in the form of a correct response with

accompanying rationale. However, research suggests that this strategy is more important for field-dependent learners than it is for field-independent learners. Roberts and Park (1984) and Khine (1996) found that field-dependent students who were given both the correct answer and the rationale on multiple-choice questions scored better than did field-dependent students who did not receive feedback or received only the correct answer. The provision of feedback did not improve the learning of field-independent students. With limited class time, it is often difficult to provide extensive feedback on course work, quizzes, and examinations. To meet the needs of field-dependent learners, perhaps optional review sessions could be offered or elaborated feedback could be provided through online delivery.

Metacognition (i.e., thinking about thinking) is often overlooked as a strategy that should be a component of any curricula. Lu and Suen (1995) compared the performance of field-dependent and field-independent undergraduate students on multiple-choice questions and performance-based assessments that measured application of learned content. The scores of the field-dependent and field-independent students did not differ on the multiple-choice questions. However, the field-independent students scored statistically significantly higher on the performance-based assessment items. The researchers concluded "the use of [performance-based assessment] can be expected to be obscured by cognitive style and give the [field-independent] student an unfair advantage" (Lu & Suen, 1995, p. 14). If this finding is replicated, nurse educators will need to provide field-dependent learners strategies so they can better analyze and solve performance-based questions. The key may be training students to improve their metacognitive abilities. Rush and Moore (1991) found that when field-dependent students were provided restructuring training as a metacognitive strategy they were better able to analyze, restructure, and solve problems. This skill will aid field-dependent learners when they encounter the increasing number of authentic assessments (i.e., applied problem solving and higher order thinking) used in nursing education.

The idea of training students to recognize their own cognitive style and possibly to modify their approach to learning has critical implications for developing nursing curricula. By training students to become aware of their own cognitive style and its implications about learning, students will be better able to select optimal instructional strategies that are consistent with their own style. In addition, by training students to restructure their cognitive approach, they will be better able to adapt to a given instructional environment.

To make it feasible to reach both field-dependent and field-independent learners, we suggest that instructors provide optional enhanced strategies for field-dependent learners. The use of technology makes the availability of optional strategies more feasible than in the past. For example, instructors can use course delivery systems to provide advanced organizers in the form of lecture outlines, handouts, and lecture notes in which important and relevant concepts have been highlighted. Students who prefer learning in social situations, typically field-dependent students, can use technology to extend their interactions with each other beyond the walls of the classroom through online technologies. Students who prefer independent learning can be provided didactic and investigative software to use on their own (Butz, Duarte, & Miller, 2006; Heckman, Miller, & Noble, 2006).

CONCLUSION

In a sample of more than 800 students enrolled in health-related programs at a large urban university, nursing students in RN-to-BSN and graduate programs were found to be more field dependent than all other student groups, except for those in the health information management program. Due to the variability in GEFT scores among students in the three nursing programs, not all nursing students could be classified as field dependent. Nonetheless, many nursing students were found to have a more field-dependent cognitive style. This approach to information acquisition may put nursing students at a disadvantage in preparing for their profession. Through the use of tailored educational strategies, nurse educators can better support field-dependent learners in didactic as well as clinical learning environments. Further research on the selection and effectiveness of educational strategies, the use of technology to deliver optional instructional environments, and the use of metacognitive training for field-dependent nursing students is needed. As collaborative and interdisciplinary features of nursing education continue to develop, we suggest that attention broadens to identify strategies that include field-independent learners.

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