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ABSTRACT

Cognitive style indicates how a learner thinks and responds to the environment. Cognitive styles of education majors appear to have an impact on performance in preservice education coursework. This study classifies as field dependent or field independent the cognitive styles of 537 education majors at Auburn University (Montgomery, Alabama) and investigates the relationship of the students' cognitive style to their academic performance across curricula. Findings indicate that the subjects were predominantly field-dependent, socially oriented learners. Findings also indicate a significant correlation between low grades and a field-dependent cognitive style. (IAH)

A Follow-Up Study on Learning Styles: Using Research to Facilitate Educational Excellence

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A FOLLOW-UP STUDY ON LEARNING STYLES USING RESEARCH TO FACILITATE EDUCATIONAL EXCELLENCE

An understanding of the role of learning styles in teaching and learning is important for teacher educators for at least three reasons. First, it can aid instructors in broadening teaching methods and curricula to accommodate more students' preferred styles (Neill, 1990). Friedman and Alley (1984) suggest that instructors tend to employ teaching methods that fit their learning styles rather than the styles of their students. Second, as these accommodations are made by instructors, students are assisted in expanding their repertoire of styles, and their school performance is strengthened (Matthews, 1991a). Third, this understanding is helpful in training Education majors to facilitate learning of students that they will encounter in their classrooms. Research supports a classroom environment that accommodates preferred learning styles of students (Dunn, Beaudry, and Klavas, 1989). Dunn and Dunn (1978) advocate that teachers initially match teaching style with student learning style and then use mismatched teaching styles to strengthen alternative learning styles.

Learning styles are individual preferences for environmental, sociological, emotional, physical, and psychological stimuli in the learning environment. Researchers examine these dimensions and define them differently. The concept of cognitive style has been studied by a number of researchers. Witkin (1976) has

researched field dependent/field independent cognitive styles. Kagan (1964b; 1964a) has addressed impulsive/reflective and thematic/analytic styles, while Messick (1976) has researched distractibility and categorization. Guilford (1967) has examined convergent and divergent thinking. In addition to the study of dimensions of cognitive styles other researchers like Dunn and Dunn (1978), and Keefe (1982) have studied environmental, sociological, emotional, and physical dimensions of learning style.

The present study focuses on field dependent/field independent (FD/FI) cognitive styles. Cognitive style implies individual preference and personality in perceiving and organizing data. It indicates how the learner thinks and responds to the environment rather than reflecting intelligence or special ability. Field dependent and field independent learners have preferred perceptual differences. FD learners are attuned to learning and retaining social information and enjoy group interaction; they favor structure and teacher direction and feedback; they seek reinforcement and are affected by criticism; they benefit from instruction in problem solving. FI learners, on the other hand, are task-oriented and set self-regulated goals. They can organize and analyze a plan and they seek less guidance in problem solving than do FD learners. They are less affected by criticism and they like to work individually. (Witkin, Moore, Goodenough, & Cox, 1977;

Piotrowski, 1984). A person with a field independent style prefers relatively impersonal situations and maintains greater psychological and personal space from others than do field-dependent persons (Greene, 1976).

Research indicates that cognitive style is a vital variable that can affect the educational process in several ways. It can affect students' academic choices and vocational preferences. It can affect students' approaches to learning and teachers' approaches to conducting classes in terms of achievement. Teachers' cognitive styles affect their teaching approaches. While field-independent teachers generally organize and plan their own materials with little input from students, field-dependent teachers have a tendency to use an interpersonal style of instruction and to solicit student input. Cognitive style can also affect the process of student and teacher interaction in the classroom (Witkin, 1976; Dunn, 1987).

The importance of these elements of cognitive style has not been fully researched. It is interesting to note that even as maturational changes occur, most people remain somewhat fixed in cognitive style. Males tend to be more field-independent than females, but it is unknown if cultural influences are involved (Sigel & Brodzinsky, 1977).

Cognitive styles of Education majors appear to have an impact on performance in pre-service education coursework (Wieseman, Portis, & Simpson, 1991). A two-year study of 537 students enrolled in an introductory education course

revealed that students with higher means (M) on the Group Embedded Figures Test (Witkin, Oltman, Raskin, & Karp, 1971) tended to perform academically better than those with lower means. Matthews (1991b) found in a study of upperclassmen across majors that Education majors tended to select "conceptual over applied learning styles and social over independent learning styles" (p. 19). She found some students in this group preferred a neutral style which she and Canfield (1988) report is associated with students whose performance is less successful than students who have a preferred style. She further points out that Education majors, in general, do less well on standardized tests that require application and advocates, along with Claxton & Murrell (1987), that faculty in Education use a variety of instructional strategies that address match/mismatch of styles between instructor and student to facilitate expansion of student styles.

Purpose

The purpose of this research was to investigate the academic performance across curricula of students who participated in a previous study that identified cognitive styles and performance in an introductory education course (FED 104) at Auburn University at Montgomery.

The Group Embedded Figures Test

To determine field-dependent and field-independent cognitive styles, the Group Embedded Figures Test (GEFT) was designed by Witkin, Oltman, Raskin, and Karp (1971). The

GEFT is a timed test designed for group administration. The test requires subjects to locate and mark embedded figures in eighteen complex designs. The range of scores is (field-dependent) 0 to 18 (field-independent). Scores indicate the degree of cognitive style.

Reliability estimates for males and females is .82 as corrected by the Spearman-Brown prophecy formula. These estimates are comparable with those associated with the Embedded Figures Test (EFT). Validity is less conclusive. The 1971 manual is still being distributed with testing materials; it cites limited data as a basis for establishing validity. Validity with male undergraduates (-.82) is greater than with females (-.63). The authors state that the test must still be considered as a research instrument.

More information about technical considerations is found in research literature than in the manual. Cantwell (1986) reports several studies that indicate that the GEFT discriminates differently across different populations. Other studies indicate that the GEFT does not seem to show a difference between males and females (Bergum & Bergum, 1981; Lusk & Wright, 1982). Cantwell (1986) states that more data is needed in the manual regarding different group norms, reliability, and validity. The present study will add to available data.

Subjects

The subjects were students enrolled in a freshman introductory education course. They were administered the

GEFT during part of one class session during two academic years (1989-90 and 1990-91). A total of 537 students was tested. The students were enrolled in 22 sections of the course which were taught by five (5) instructors. Four hundred forty-eight (448) students were female and eighty-nine (89) were male.

Results

The FD/FI scores, course grades, and gender were collected for each subject. Mean and standard deviation FD/FI scores are reported in Table 1 by gender and Table 2 by course grades.

Table 1

Mean & Standard Deviation Field - Dependent/Independent Scores by Gender

Group		N	%	Mean	SD
Gender:	Female	448	83.4	8.98	5.10
	Male	89	16.6	9.92	5.51
All Students		537	100.0	9.13	5.18

Table 2

Mean Field-Dependent/Independent Scores by Course Grade

Course Grade	N	%	Mean	SD
A	228	42.5	10.21	5.10
B	180	33.5	8.69	5.11
C	76	14.2	8.83	5.13
D	28	5.2	5.93	4.82
F	25	4.7	6.96	4.38
All Students	537	100.0	9.13	5.18

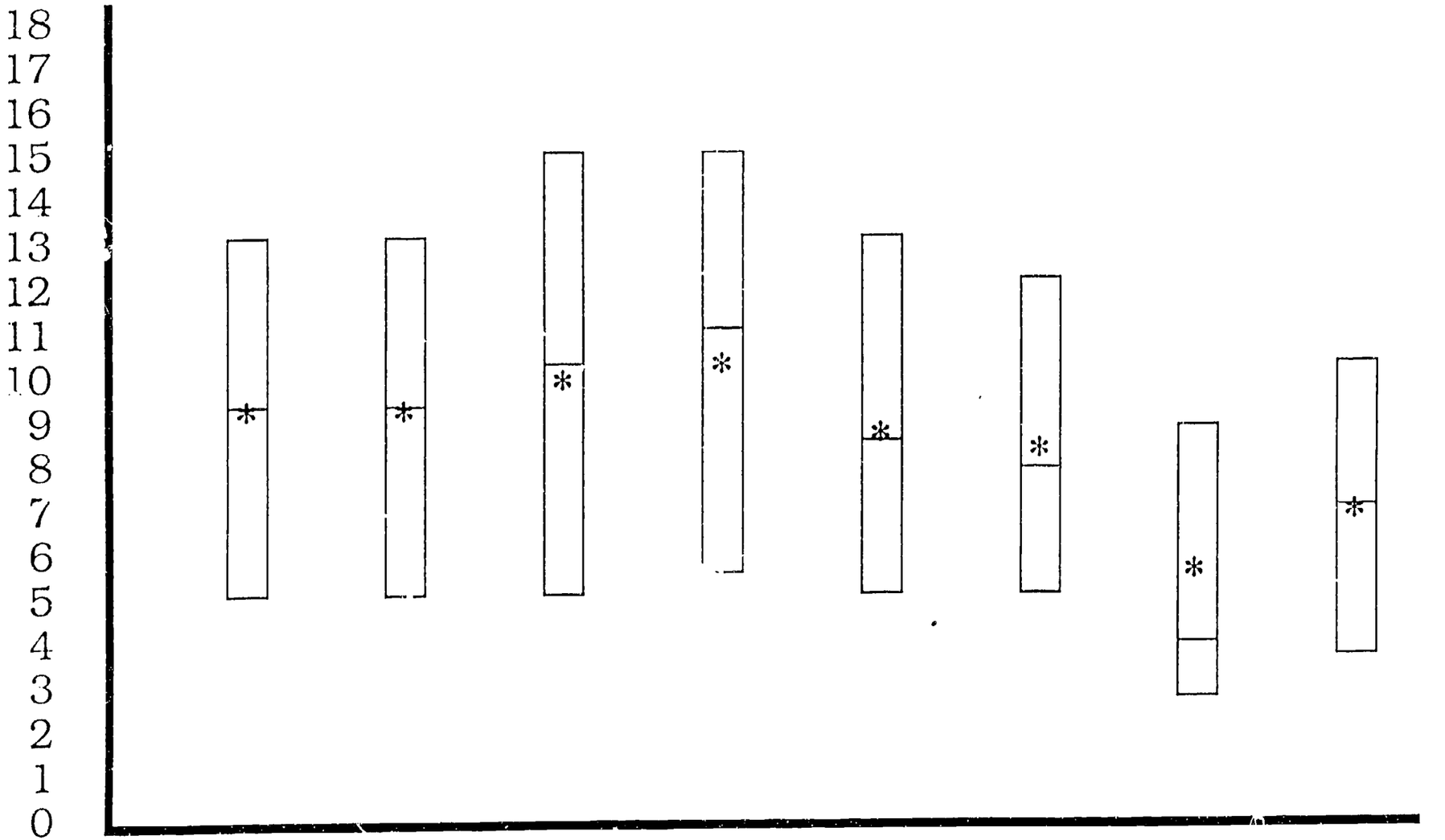
The mean FD/FI scores for female and male students were different (8.98 for females and 9.92 for males). The mean

score for all students was 9.13. However, the mean scores for students when the scores were sorted by course grades indicated some variability. Students with course grades of A had the highest mean score (10.21) and students receiving a course grade of D had the lowest mean score (5.93). The mean scores for the various course grades did not follow a pattern that was expected by the authors.

The box plots reports FD/FI scores sorted by gender and course grade. The box plot for female and male students were very similar and they were similar to the box graph for all students. Males had a higher third quartile score than the females. This suggests slightly more variability in the middle 50% of the males than the female students.

The box plot for students' scores when sorted by the five course grades was not similar. First, the box graphs for the students making grades of B, C, D, and F were smaller than the graph for students making an A. This suggests that the students' dependent/independent scores for those grades were bunched closer together, thus less variability than the students making As. The top of the box plots (the third quartile scores) were different for the five grade groups - A = 15, B = 13, C = 12, D = 8.5, and F = 10. The bottom of the box plots (the first quartile scores) were very similar - A = 5.5, B = 5, C = 5, D = 3, F = 4. This further suggests that the middle 50% of the students were bunched together in some course grade groupings, for example for the students making D and F, than for those

Box Plot for Field - Dependent/Independent Scores by Gender and Course Grade



All Students	Female	Male	A	B	C	D	F
N = 537	N = 448	N = 89	N = 228	N = 180	N = 76	N = 28	N = 25
x = 9.13	x = 8.98	x = 9.92	x = 10.21	x = 8.69	x = 8.82	x = 5.92	x = 6.96

making As. The diversity of the middle scores of the five grade groups was further demonstrated by other measures of central tendencies, the mean and median scores. The mean scores for the five groups were A = 10.21, B = 8.69, C = 8.82, D = 5.92, and F = 6.96, and the median scores were A = 11, B = 8.5, C = 8, D = 4, and F = 7. The box plots and central tendencies data suggested that some groups were bunched together more than others, and there was little similarity between the representations for the middle score for the five groups.

The relationship between the course grade and the embedded figure scores was supported by correlation analysis. The Pearson Correlation coefficient between the embedded figures scores and the course grades was 0.219 ($p = 0.0001$). Thus, the null hypothesis that the correlations equals zero must be rejected and we concluded there was a correlation between test scores and course grades.

This relationship between course grade and embedded figure scores was analyzed with analysis of variance procedures. The F value of 6.96 with 4 and 532 degrees of freedom was calculated; this F value is significant at the 0.0001 level. Thus there is a significant difference between the five course grade groups. Scheffe's Test was used for post-hoc analysis, and significance was found only between students with course grades of A and D. The other course grade comparisons were not found to be significantly different. Further analysis of students with a course grade

of D was achieved by comparing the embedded figures scores for the D students with all other students as a collapsed group of scores. This resulted in a t value of -3.60 which has a level of probability of 0.001.

The relationship between the embedded figures scores and gender was not supported by correlation analysis. The Pearson Correlations coefficient between these two variables was 0.068 ($p = 0.11$) which indicated the acceptance of the null hypothesis that the correlations equals zero between gender and test scores. Similarly the correlation between gender and grade was fond to be -0.078 ($p = 0.08$). The lack of significant correlations between gender and scores, plus gender and grade supports the interpretation of the comparisons of the box plots and group means.

The relationship between scores for female and male students was further analyzed using the T Test. The T Test for female and male students were calculated using embedded figure scores and course grades as the dependent variable. The T Test scores are reported in Table 3.

Table 3

T Test Scores Comparing Female and Male Students

Dependent Variable	Group	N	Mean Scores	T Score	P
Embedded Figures					
	Female	448	8.98	-1.49	0.13
	Male	89	9.92		
Course Grades					
	Female	448	3.08	1.79	0.075
	Male	89	2.85		

The t value of -1.49 between female and male students for the embedded figure scores was not significant. Similarly, the differences between course grades for the female and male students (1.79) was not significant. Some differences between female and male students' grades were noted, but the degree of this difference was not significant.

Student Performance in Other Courses

The researchers wanted to examine the performance of the FED 104 students in other courses which are required of all education students at Auburn University at Montgomery. A stratified sample of the 537 students were selected and their course grades in five additional courses were obtained from the students' transcript. The courses selected were History (HY 102, World History II), English (EH 102, English Composition II), Biology (BI 101 Principles of Biology), Speech (COM 101, Introduction to Human Communication), and Fine Arts (one of the courses in appreciation or history of

one of the arts).

This subsample was a stratified sample. All of the 537 students were ranked based on their field independent/dependent scores. A total of 35 students with independent/dependent scores within a range of 0-5 were randomly selected. A second sample of 35 students were randomly selected with scores ranging from six (6) to twelve (12), and a third sample of 35 students with scores of 13-18 were randomly selected. This resulted in a new sample of 105 students. The data was analyzed using field dependent/independent scores and course grades as the dependent variable.

The field dependent/independent scores, grades from six courses, and gender were collected for each subject in the subsample. The means and standard deviations for the field dependent/independent scores and course grades are reported by gender in Tables 4 and 5.

Table 4

Mean and Standard Deviation Field Dependent/Independent Scores by Gender

Group	N	%	Mean	SD
All Students	105	100	9.22	5.37
Female	90	86	9.16	5.28
Male	15	14	9.6	6.06

Table 5

Mean and Standard Deviation Course Grades by Gender

Groups	N	%	Mean	SD
FED 104	105	100	3.06	1.13
Female	90	86	3.11	1.13
Male	15	14	2.73	1.16
HY 102	83	100	2.55	1.15
Female	70	84	2.6	1.11
Male	13	16	2.31	1.38
EH 102	81	100	2.83	0.95
Female	70	86	2.86	0.97
Male	11	14	2.64	0.81
BI 101	66	100	2.83	1.03
Female	55	83	2.93	1.02
Male	11	17	2.36	1.03
COM 101	74	100	3.03	0.88
Female	65	88	3.06	0.90
Male	9	12	2.78	0.67
Fine Arts	64	100	3.20	0.91
Female	52	81	3.29	0.89
Male	12	19	2.83	0.94

The scores reflect some variability when sorted by gender. The male students had a slightly higher field dependent/independent mean score; however, the female students had slightly higher course grade means for each of the six courses. Since many of the students are currently enrolled in the program, some of the 105 students selected for the subsample had not completed each of the selected courses as of Fall, 1991, when the data from the transcripts were collected. Also, some of the selected students may have either changed to other majors within the university where all of the courses are not required, or they did not continue to pursue a degree program at the institution.

The relationship of the field dependent/independent scores for female and male students were further analyzed by calculating T test. The T test for female and male students were calculated using embedded figure scores and course grades as the dependent variable. The T test scores are reported in Table 6.

Table 6

T Test Comparing Female and Male Students

Dependent Variable	Groups	N	Mean	T Score	P
Embedded Figures					
	Female	90	9.16	-0.267	0.792
	Male	15	9.6		
Course Grades					
FED 104	Female	90	3.11	1.17	0.257
	Male	15	2.73		
HY 102	Female	70	2.60	0.723	0.481
	Male	13	2.31		
EH 102	Female	70	2.86	0.818	0.426
	Male	11	2.64		
BI 101	Female	55	2.93	1.66	0.118
	Male	11	2.36		
COM 101	Female	65	3.06	1.14	0.275
	Male	9	2.77		
Fine Arts	Female	52	3.28	1.53	0.145
	Male	12	2.83		

The t value of -0.267 between female and male students for the embedded figures scores was not significant. The differences between the course grades for the female and male students in all six courses also were not significant. Some differences between the female and male students were

noted, but these differences were not significant. The findings with the data from this subsample of 105 students agree with the results from the analysis of the data from the total sample of 537 students.

The grade distribution for the subjects in the subsample are reported in Table 7 for the six selected courses. The number of students receiving each grade and the percentage of students having completed the course are reported in the table.

Table 7

Distribution of Student Grades in the Six Courses

Grades	Courses N (Percent)					
	FED 104	HY 102	EH 102	BI 101	COM 101	Fine Art
A	48 (46)	18 (22)	22 (27)	21 (32)	26 (35)	29 (45)
B	32 (31)	30 (36)	29 (36)	21 (32)	27 (37)	23 (36)
C	13 (12)	21 (25)	26 (32)	17 (26)	18 (24)	9 (14)
D	7 (7)	8 (10)	2 (3)	6 (9)	3 (4)	2 (3)
F	5 (5)	6 (8)	2 (3)	1 (2)	0	1 (2)
N	105	83	81	66	74	64

The course grades in the six courses were analyzed by calculating correlations, difference values, and Chi Square. The relationship between the student scores in the six courses was examined with correlation analysis. The Person Correlation Coefficients for the student grades are reported in Table 8.

Table 8

Correlation of Student Grades in the Six Courses

Courses	Correlations/P					
	FED 104	HY 102	EH 102	BI 101	COM 101	Fine Art
Fine Art	0.414* p=.0007	0.476* p=.0002	0.416* p=.0014	0.375* p=.0005	0.434* p=.001	
COM 101	0.639* p=.0001	0.636* p=.0001	0.394* p=.001	0.614* p=.0001		
BI 101	0.465* p=.001	0.631* p=.0001	0.535* p=.0001			
EH 102	0.375* p=.0006	0.522* p=.0001				
HY 102	0.497* p=.0001					

All of the correlation coefficients were found to be significant when the grades for the six courses were compared. This suggested that the grades received by students in the other academic courses followed a pattern similar to those received in FED 104. This information was a surprise to the researchers. Though not reported in Table 8, the correlations between the course grades and gender along with course grades and field dependent/independent scores were not found to be significant.

The researchers did not expect to find significant correlations between all of the courses. The significant correlations prompted further analysis. The differences between course grades were computed and T scores were calculated. The resulting values are reported in Table 9. The courses listed second were subtracted from the courses

listed first. Thus positive mean differences indicate the larger grade was received in the course that is listed first. The probability values are reported only for the T scores that were found to be significant.

Table 9

Mean Differences Between Student Grades in the Six Courses and T Scores

Course Comparisons	N	Mean	T Scores	P (if significant
FED 104 - HY 102	83	0.54	4.42	0.0001
- EH 102	81	0.33	2.71	0.0082
- BI 101	66	0.47	3.83	0.0003
- COM 101	74	0.18	1.89	
- Fine Arts	64	-0.02	-0.12	
HY 102 - EH 102	73	-0.15	-1.29	
- BI 101	59	-0.12	-1.02	
- COM 101	67	-0.40	-3.71	0.0004
- Fine Arts	56	-0.57	-4.04	0.0002
EH 102 - BI 101	57	-0.04	-0.31	
- COM 101	66	-0.27	-2.36	0.0211
- Fine Arts	56	-0.34	-2.76	0.0078
BI 101 - COM 101	55	-0.27	-2.52	0.0149
- Fine Arts	47	-0.30	-2.05	0.0465
COM 101 - Fine Arts	54	-0.13	-1.02	

Significant mean differences were found between course grades in FED 104 and each of HY 102, EH 102, and BI 101. The positive mean values indicate the FED 104 course grades were generally higher than the other course grades except in Fine Arts. Significant mean differences were also found between each of HY 102, EH 102, BI 101 and both COM 101 and Fine Arts.

The relationship between student performance in the six courses and the field dependent/independent scores was also

investigated. The mean field dependent/independent scores are reported by course grade in Table 10.

Table 10

Mean Field Dependent/Independent Scores by Course Grades

Grade	FED 104	HY 102	EH 102	BI 101	COM 101	Art
A	9.50	9.33	11.04	9.24	9.73	10.24
B	9.53	10.53	9.48	10.14	10.48	9.26
C	9.31	8.86	9.46	7.76	8.00	9.78
D	7.14	9.38	8.00*	5.83	2.67*	2.50*
F	7.20	6.83	12.00*	18.00*	----	11.00*
No Grade	----	8.27	6.83	9.64	9.03	8.63

* indicate data from fewer than 5 subjects

Some of the data cells in Table 10 have few subjects. Because of this there might appear to be some oddities. For example, students making a grade of F in BI 101 and having a mean field dependent/independent score of 18.0 - which indicates extreme field independent - must be interpreted knowing that this was only one student and not a general trend.

The field dependent/independent scores were grouped into three groupings (0-5, 6-12, and 13-18). Then the data was further sorted by course grade for each course to yield a 3 X 5 (Scores X Grades) analysis. Chi-Square values were calculated. Those values are reported in Table 11. Some of the data cells had fewer than 5 data values, this makes the interpretation of the Chi-Square values for the subsample

courses difficult.

Table 11

Chi-Square Values for Scores X Grades By Courses

Courses	N	Chi-Square	P
All Subjects			
FED 104	537	31.301	0.0001
Subsample			
FED 104	105	2.721	0.951
HY 102	83	8.523	0.384
EH 102	81	3.865	0.869
BI 101	66	10.282	0.246
COM 101	74	11.280	0.08
Fine Arts	64	7.853	0.448

NOTE: Some of the data cells in each of the subsample courses had fewer than 5 data values.

The significant Chi-square value for the total sample of 537 students in FED 104 agrees with the earlier analysis in this paper. Having data cells with fewer than five data values makes the Chi-square interpretation difficult. For these reasons a one way Analysis of Variance values were calculated to compare the course grades in the subsample with the field dependent/independent scores used as the dependent variable. The resulting F values are reported in Table 12.

Table 12

Analysis of Variance Results for Course Grades

Courses	Degrees of Freedom	F Values	P
FED 104	4,100	0.49	0.744
HY 102	4,79	0.74	0.567
EH 102	4,76	0.53	0.716
BI 101	4,61	1.78	0.145
COM 101	3,70	2.67	0.054
Fine Arts	4,59	1.03	0.400

All of the F values were not found to be significant. Therefore, while there might be some variation in the grades in the six courses and the field dependent/independent scores, these differences were not significant.

Discussion

As a result of the data received from the subjects on the GEFT, the hypothesis that the students enrolled in the Introduction to Education class at AUM do not reflect the norm of being predominantly field-independent learners but instead are predominately field-dependent learners is accepted. This acceptance of the hypothesis is understandable in the light of considering the types of persons that would be attracted to the teaching profession. Teaching is a helping profession and is very people-oriented. FD people prefer involvement with others; they are attentive to social cues; and they are more interested in people than in abstract principles (Witkin, et. al., 1977). Thus, acceptance of the hypothesis of the current

study is supported by literature on field-dependent personalities. The majority of students selecting Education as a major at AUM are field-dependent, socially-oriented individuals.

The other piece of data reflected in this study is more discerning, i.e., the comparison of course grades with the GEFT score. The lower the course grade, the lower the student scored (on the GEFT). This indicates the students were more likely to be field-dependent. This correlation is a disturbing one. Even though it cannot be concluded that students who are extremely field-dependent are destined to fail in college coursework, there may be an indication that students who have not developed any strong field-independent skills are going to have a difficult time succeeding.

Another factor regarding the grade distribution is the distribution of the D and F grades. At the institution where the study was conducted, students majoring in Education cannot have a grade lower than C in education course work, and the D grade may indicate the students who have struggled to pass, while the F grade may indicate the students who, for whatever reasons, have given up on the course.

To determine if the above argument is true for the D and F students or just an unexplained historical event, the researchers will need to investigate these students further to see if, in fact, the D students persisted in their career choice.

In relationship to the data analyzed in the stratified subsample of the students' performance in other courses as compared with FED 104, the conclusions are very definite. Each course examined, HY 102, EH 102, BI 101, COM 101 and Fine Arts, is just as much of a predictor of academic success as the FED 104 course. The data are reflecting the consistency in an individual's academic performance across disciplines. Unfortunately, for the researchers, the consistency of the performance has no relationship to the individual's cognitive style as determined by the researchers using the GEFT.

To examine the above issue more definitively to see if cognitive style does influence academic success, it may be necessary to compare the GEFT scores of the stratified subsample with the performance in the selected courses and their ACT scores and possibly the Degrees of Reading Power Test.

Future Activities

Since the above research was done, the researchers, in an effort to disseminate their findings, have made a presentation to each Department in the School of Education. This presentation included collecting data on the individual faculty by giving them the GEFT and a Teaching Style Preference Checklist and explaining the implications of the study for Education majors. In the near future, the data collected on the faculty will be analyzed.

Another phase of this study will begin in the spring of

this year when the original subjects will be retested on the GEFT. The first testing came when they took their first Education course, and the retesting will occur at the end of each student's internship (or their last education course). Hopefully, the data gathered from this retesting will add a new dimension to the understanding of the learner and his cognitive style and will add to the data base for this instrument.

References

Bergum, J. E., & Bergum, B. O. (1981, April). Field dependence, perceptual instability, and ex differences. Paper presented at the Annual Convention of the Southwestern Psychological Association, Oklahoma City. (ERIC Document Reproduction Service No. 195 888).

Canfield, A. A. (1988). Learning styles inventory manual. Los Angeles: Western Psychological Services.

Cantwell, Z. M. (1986). Group embedded figures test in Keyser, D. J., & Sweetland, R. C. (Eds.). Test Critiques (5), (pp. 189-197). Kansas City: Test Corp. of America.

Claxton, C. S., & Murrell, P. H. (1987). Learning style: Implications for improving educational practices. (ASHE-ERIC Higher Education Report No. 4), Washington, D.C.: Association for the Study of Higher Education.

Dunn, R. (1987). Research on instructional environments: Implications for student achievement and attitudes. Professional School Psychology, 2, 43-52.

Dunn, R. Beaudry, J. S., Klavas, A. (1989). Survey of research on learning styles, Educational leadership, 46(6), 50-58.

Dunn, R., and Dunn, K. (1978). Teaching students through their individual learning styles: A practical approach. Reston, VA: Association of Supervision and Curriculum Development.

Friedman, P. & Alley, R. (1984). Learning/teaching styles: Applying the principles. Theory into practice, 77(1), 77-81.

Greene, L. R. (1976). Effects of field dependence on affective relations and compliance in dyadic interactions. Journal of Personality and Social Psychology, 34, 569-577.

Guilford, J. P. (1967). The nature of human intelligence. New York: McGraw-Hill.

Kagan, J. (1964a). Developmental studies of reflection and analysis. Cambridge, MA: Harvard Univ. Press.

Kagan, J. (1964b). Impulsive and reflective children. In J. D. Krumbolz (Ed.) Learning and the educational process. Chicago: Rand McNally.

Keefe, J. W. (1982). Assessing student learning styles: An overview. In Student learning styles and brain behavior. Reston, VA: NASSP.

Lusk, E. J., & Wright, H. (1982). Differences in sex and curricula on learning the Group Embedded Figures Test. Perceptual and Motor Skills, 53, 370.

Matthews, D. B. (1991a). The effects of learning styles on grades of first-year college students. Research in higher education. 32(3), 253-268.

Matthews, D. B. (1991b). Learning styles of education majors: Are they similar to those of other students? Presentation, 38th Annual Conference, Southeastern Regional Association of Teacher Educators, Little Rock,

Arkansas, Nov. 6-9, 1991.

Messick, S. (1976). Individuality in learning. San Francisco: Jossey-Bass.

Neill, J. (1990). Making sense of style. Educational leadership, 48(2), 4-9.

Piotrowski, C. (1984). Locus of control, field dependence-independence as factors in learning and memory. (ERIC Document Reproduction Service No. ED 247 495).

Sigel, I. E., & Brodzinsky, D. M. (1977). Individual differences: A perspective for understanding intellectual development. In H. Hom & P. Robinson (Eds.) Psychological processes in early education. New York: Academic Press.

Wieseman, R. A., Portis, S. C., & Simpson, F. M. (1991). An analysis of the relationship between cognitive styles and grades: New perspectives on success or failure of preservice education majors. Unpublished manuscript, Auburn University at Montgomery, School of Education, Montgomery, Alabama.

Witkin, H. A. (1976). Cognitive style in academic performance and in teacher student relations. In S. Messick (Ed.) Individuality in learning: Implications of cognitive styles and creativity for human development. San Francisco: Josey - Bass.

Witkin, H. A., Moore, C. A., Goodenough, D. R., and Cox, P. W. (1977). Field-dependent and field-independent cognitive styles and their educational implications. Princeton, NJ: Educational Testing Service Research Bulletin.

Witkin, H. A., Oltman, P. K., Raskin, E., and Karp, S. E. (1971). A manual for the embedded figures tests. Palo Alto: Consulting Psychologists Press.

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