

Learning Styles of Students in a College of Agriculture

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A number of factors that influence the educational process have emerged from research on human developmental stages and life phases. Learning style is one factor researchers claimed influence student educational performance (Dunn & Dunn, 1979; Claxton & Murrell, 1987; Garger & Guild, 1984; Saracho, 1989; Witkin, 1973). Gregorc (1979) described learning style as "consisting of distinctive behaviors which serve as indicators of how a person learns from and adapts to his/her environment. It also gives clues as to how a person's mind operates" (p. 234).

Learning style research has been applied at an ever-increasing rate to the problems of education (Doebler & Eike, 1979). Claxton and Murrell (1987) suggested that learning style could be an extremely important element in the move to improve curricula and the teaching process in higher education. Anderson and Adams (1992) indicated that more attention than ever was being focused on how to meet the challenge of increasing diversity in the classroom. Anderson and Adams (1992) argued that:

One of the most significant challenges that university instructors face is to be tolerant and perceptive enough to recognize learning differences among their students. Many instructors do not realize that students vary in the way they process and understand information. The notion that students' cognitive skills are identical at the collegiate level [suggests] arrogance and elitism by sanctioning one groups' style of learning while discrediting the style of others (p. 19).

Field-dependent and field-independent learning styles have been widely and extensively studied and have the broadest application to educational concerns (Witkin, Dyk, Faterson, Goodenough, & Karp, 1962). Witkin, Moore,

Goodenough, and Cox (1977) suggested that students who preferred a field-dependent learning style tended to perceive the world globally, found it more difficult to solve problems, were highly sensitive and attuned to the social environment, tended to favor the "spectator approach" to learning, and would adopt the organization of information to be learned. Additionally, students who preferred a field-dependent learning style were more extrinsically motivated and responsive to social reinforcement.

Conversely, students who preferred a field-independent learning style tended to view the world more analytically, found it easier to solve problems, and were more likely to favor "inquire" and independent study. In addition, field-independent students tended to provide their own structure to facilitate learning, were more intrinsically motivated, and were generally unresponsive to social reinforcement (Witkin et al., 1977).

Currently, research on field-dependent and field-independent learning style in colleges of agriculture is limited to the efforts of a few researchers (Escombe, 1988; Cano & Garton, 1992a, 1992b; Cano, Garton, & Raven, 1991, 1992; and Raven, Cano, Garton, & Shelhamer, 1993), and to a small number of graduate students and undergraduate students majoring in agricultural education. If educators in colleges of agriculture are to recognize and appreciate differences in students' learning style and meet the challenge set forth by Anderson and Adams (1992), an expansion of this research area is essential.

Purpose and Research Questions

The purpose of this study was to determine the preferred learning style of students enrolled in the College of Agriculture at a land-grant university. The following specific research questions were examined:

What was the preferred learning style of students enrolled in the College of Agriculture by gender as measured by the Group Embedded Figures Test?

What was the preferred learning style of students enrolled in the College of Agriculture by academic major as measured by the Group Embedded Figures Test?

What was the overall preferred learning style of students enrolled in the College of Agriculture as measured by the Group Embedded Figures Test?

Procedures

The accessible population for the descriptive study was senior students enrolled in the College of Agriculture at The Ohio State University during the Autumn Quarter, 1992 (N=388). An up-to-date list of seniors was obtained from the College Office and served as the frame for the study. A sample of 196 students was randomly drawn from the population of senior students. The sample size (n=196) was determined using Krejcie and Morgan's (1970) table of sample sizes, specifying a five percent margin of error.

The Group Embedded Figures Test (GEFT: Witkin, Oltman, Raskin, & Karp, 1971) was used to assess the preferred learning style of students, as either field-dependent or field-independent. Individuals scoring greater than the national mean (11.4) were considered to be preferring a field-independent learning style, while subjects scoring less than the national mean were considered to be preferring a field-dependent learning style (Witkin et al., 1971). The total possible raw score on the GEFT was 18.

The validity of the GEFT has been established by determining its relationship with its "parent" test, Embedded Figures Test (EFT), as well as the Rod and Frame Test (RFT), and the Body Adjustment Test (BAT) (Witkin et al, 1971). Because the GEFT was a speed test, internal consistency was measured by treating each scored section (sections two and three) as split-halves. Witkin et al., (1971) reported a corrected Spearman-Brown reliability coefficient of .82 on the GEFT.

Data collection was initiated by mailing students a letter of invitation strongly encouraging participation in the study. The letter was structured according to Dillman (1978) and specified four dates and times with two data collection sessions on each date. Students were invited to attend one of the eight sessions offered. Students were able to indicate their willingness to participate on a self-addressed, stamped postcard. Ten days after the initial mailing, follow-up efforts were conducted via telephone to determine students' willingness to participate in the study. A make-up data collection session was offered to students unable to attend their scheduled session. All data collection sessions were located in the same room.

A total of 47 percent (n=92) of the students in the sample participated in one of the eight scheduled or one make-up data collection session. Students who did not participate in the study were treated as nonrespondents and considered to be nonresponse error.

Nonresponse error was controlled by sampling the nonrespondents and comparing them with the respondents. A sample of 10 percent of the nonrespondents (n=11) was randomly drawn and statistically compared to the sample of respondents (n=92) on variables of interest as was suggested by Miller and Smith (1983). Using a t-test analysis, no significant differences ($p < .05$) were found between the sample of nonrespondents and respondents. The nonrespondent data were pooled with the respondent data, yielding a sample size of 103 (53.0%) and allowing generalization to the sample/population (Miller & Smith, 1983).

The data were analyzed using SPSS/PC+. Descriptive statistics such as frequencies, percentages, central tendencies, variance, and ranges were used to present the data. A t-test statistic was used to determine significant differences between groups. An alpha level of .05 was set a priori.

Results

The Group Embedded Figures Test (GEFT; Witkin et al., 1971) was used to gather data on the preferred learning styles of senior students enrolled in the College of Agriculture at The Ohio State University during the Autumn Quarter, 1992. The preferred learning style of senior students was dichotomized as either field-dependent or field-

independent. Senior students scoring less than the national mean (11.4) were considered to be preferring a field dependent learning style, while students scoring greater than the national mean were considered to be preferring a field-independent learning style.

A gender analysis (Table 1) indicated that 28.8 percent of the males preferred a field-dependent learning style, whereas a majority (71.2%) of the males preferred a field-independent learning style. Among females, approximately 50 percent preferred both field-dependent and field-independent learning styles. The raw GEFT scores ranged from 1 to 18 for males and 2 to 18 for females (Table 2). The raw mean GEFT score for males was 13.4 and 11.1 for females. Using a t-test, the gender difference in raw mean scores on the GEFT was found to be significant ($t=-2.71$; $p<.05$).

An analysis of the overall GEFT scores (Table 1) indicated that 38.8 percent of the senior students preferred a field-dependent learning style. Conversely, 61.2 percent of the senior students preferred a field-independent learning style. The raw mean GEFT score for senior students was 12.4 (Table 2). The raw GEFT scores for senior students ranged from 1 to 18.

Table 1. Preferred Learning Style by Gender (n=103)

Gender	GEFT			
	Field-Dependence		Field-Independence	
	n	%	n	%
Male	17	28.8	42	71.2
Female	23	52.3	21	47.7
Total	40	38.8	63	61.2

Table 2. Mean Preferred Learning Score by Gender (n=103)

Gender	n	Mean	SD	Range	t-value
Male	59	13.4	3.75	1-18	-2.71*
Female	44	11.1	4.62	2-18	
Overall	103	12.4	4.27	1-18	

Note: Raw scores are based on a maximum possible score of 18. * $p<.05$.

An analysis, using frequencies, percentages (Table 3), means, standard deviation, and ranges (Table 4) of students' preferred learning style by nine academic majors (Animal Science, Agricultural Economics, Horticulture, Agricultural

Education, Food Science, Dairy Science, Agronomy, Agricultural Mechanics) in the College of Agriculture revealed that of the 27 senior students majoring in Animal Science, 29.4 percent preferred a field-dependent learning style and 70.4 percent preferred a field-independent learning style. The raw GEFT scores ranged from 2 to 18 with a raw mean GEFT score of 13.1.

Table 3. Preferred Learning Style by Academic Major (n=103)

Major	GEFT			
	Field-Dependence		Field-Independence	
	n	%	n	%
Animal Science	8	29.6	19	70.4
Agr. Economics	11	52.4	10	47.6
Horticulture	7	43.8	9	56.2
Agr. Education	1	9.1	10	90.9
Food Science	3	37.5	5	62.5
Dairy Science	1	14.3	6	85.7
Agronomy	5	71.4	2	28.6
Agr. Communication	3	75.0	1	25.0
Agr. Mechanics	1	50.0	1	50.0
Total	40	38.8	63	61.2

Table 4. Mean Preferred Learning Style Score by Major (n=103)

Major	n	Mean	SD	Range
Animal Science	27	13.1	3.99	2-18
Agr. Economics	21	11.1	4.65	4-18
Horticulture	16	12.1	4.69	3-18
Agr. Education	11	15.6	2.70	9-18
Food Science	8	11.3	5.23	1-17
Dairy Science	7	13.7	2.29	11-17
Agronomy	7	12.3	2.63	10-17
Agr. Communication	4	8.8	5.38	2-15
Agr. Mechanics	2	10.5	3.54	8-13

Note: Raw scores are based on a maximum possible score of 18. Group range = 8.8 - 15.6.

Of the 21 senior students majoring in Agricultural Economics, 52.4 percent preferred a field-dependent learning style and 47.6 percent preferred a field-independent learning style. The raw GEFT scores ranged from 4 to 18 with a raw mean GEFT score of 11.1.

Of the 16 senior students majoring in Horticulture, 43.8 percent preferred a field-dependent learning style and 56.2 percent preferred a field-independent learning style. The raw GEFT

scores ranged from 3 to 18 with a raw mean GEFT score of 12.1.

Of the 11 senior students majoring in Agricultural Education, 9.1 percent preferred a field-dependent learning style and 90.9 percent preferred a field-independent learning style. The raw GEFT scores ranged from 9 to 18 with a raw mean GEFT score of 15.6.

Of the eight senior students majoring in Food Science, 37.5 percent preferred a field-dependent learning style and 62.5 percent preferred a field-independent learning style. The raw GEFT scores ranged from 1 to 17 with a raw mean GEFT score of 11.3.

Of the seven senior students majoring in Dairy Science, 14.3 percent preferred a field-dependent learning style and 85.7 percent preferred a field-independent learning style. The raw GEFT scores ranged from 11 to 17 with a raw mean GEFT score of 13.7.

Of the seven senior students majoring in Agronomy, 71.4 percent preferred a field-dependent learning style and 28.6 percent preferred a field-independent learning style. The raw GEFT scores ranged from 10 to 17 with a raw mean GEFT score of 12.3.

Of the four senior students majoring in Agricultural Communications, 75.0 percent preferred a field-dependent learning style and 25.0 percent preferred a field-independent learning style. The raw GEFT scores ranged from 2 to 15 with a raw mean GEFT score of 8.8.

Of the two senior students majoring in Agricultural Mechanics, one preferred a field-dependent learning style and one preferred a field-independent learning style. The raw GEFT scores ranged from 8 to 13 with a raw mean GEFT score of 10.5.

Because of gross disproportionate group sizes by major, statistical differences were not calculated among the nine academic majors. Rather, the group statistics reported in Tables 3 and 4 serve only as descriptive data for those senior students in the study. Caution should be exercised not to extrapolate data in Tables 3 and 4 to the population.

Conclusions, Recommendations, and Practical Importance

Senior students enrolled in the College of Agriculture at The Ohio State University tended to prefer a field-independent learning style. The raw mean GEFT score for senior students enrolled in the college was 12.4 of a maximum possible score of 18. Witkin et al. (1977) reported a mean GEFT score of 11.6 for college graduates.

Of the senior students enrolled in the College of Agriculture, males preferred a field-independent learning style, whereas females preferred a more field-dependent learning style. Persistent gender differences have been found in the field dependence/independence dimension by several researchers (Garger & Guild, 1984; Witkin, 1976), a finding supported by the current study.

Senior students in the study majoring in Animal Science, Horticulture, Agricultural Education, Food Science, and Dairy Science tended to prefer a field-independent learning style. Conversely, senior students in the study majoring in Agricultural Economics, Agronomy, and Agricultural Communication tended to prefer a field-dependent learning style.

Instructors should conceive learning style as referring to *actions* rather than ability of students. The key to utilizing information on students' learning styles is to incorporate students' learning style in the planning and delivery of instruction, while also helping students "stretch" their preferences for learning by teaching through other learning styles.

Because learning style affects the learning success of students in specific kinds of situations, instructors need to be sensitive to learning style differences - a charge leveled by Anderson and Adams (1992). Instructors should have insight of students' preferred learning style. Workshops on recognizing student learning styles should be offered to instructors. With leadership from the College of Agriculture teaching committee, learning style workshops should be designed and implemented by teacher educators in agricultural education with expertise in learning theories. At the styles workshops, faculty can gain knowledge about learning styles by having their own learning style assessed. Pat Guild, a leading researcher on learning styles, indicated that it is important for

instructors, when working with students, to understand both their own and the students' learning perspectives (Brandt, 1990), because as Dunn and Dunn (1979) suggested, instructors tend to teach the way they learn.

Knowledge of learning styles will allow instructors to be more insightful about how to adapt instruction and curriculum to learning differences that will build on students' greatest strengths and address their weaknesses. The use of learning style information will alert administrative leaders that the college is seriously interested in student learning; a purpose that needs to be embraced by instructors and administrators.

Students' learning style should be used to direct instructors to incorporate various teaching methods (e.g., discussion, role play, supervised study, lecture, case study, demonstrations, field trips, resource people, experiments), curriculum materials (e.g., textbooks, handouts, worksheets), and evaluation techniques (e.g., multiple choice, case studies, essays) into classroom discourse to reach students of differing learning styles.

Diversity in student learning styles identified in this study anchors the argument of the need for instructors to have a repertoire of teaching methods. Teacher educators in agricultural education should command leadership with the support from the college academic dean in offering seminars or workshops to instructors not having coursework in pedagogy to augment instructors' repertoire of teaching methods.

Students should have knowledge of their preferred learning style. During freshmen orientation programs, students should be assessed for their preferred learning style and offered counseling on how to adapt their learning style to various teaching styles they are destined to encounter in college classrooms. As a result, students will gain confidence in their learning strengths and develop various learning strategies for handling challenging situations that are certain to arise. Students will also begin to see how they learn most effectively and efficiently, allowing them to be better able to take more responsibility for their own learning.

Students and instructors need to accept and value the diversity of learning styles. Beginning as entering college freshmen, students should be counseled on learning and teaching style differences

and begin work on coping with these differences. Understanding differences in learning and teaching styles should enable students to improve their learning.

Academic advisors and college counselors should become knowledgeable about learning styles. Workshops should be offered to academic advisors and college counselors on learning styles. Knowledge about learning styles will allow academic advisors to diagnose students' preference for utilizing media, teaching methods, and curriculum materials that will capitalize on students' strengths, strengthen their weaknesses, and ensure success in coursework. Knowledge of student learning styles has great potential as a tool for college counselors to aid students in career planning (Witkin et al., 1977). Dembo (1988) suggested that students preferring a field-independent learning style will tend to choose occupations where there is less emphasis on interpersonal interaction, whereas students preferring a field-dependent learning style will tend to favor occupations that require involvement with others.

Research on learning styles in higher education should continue. Further research should investigate the stability of the current research reported and be expanded to other colleges of agriculture. For each academic major in colleges of agriculture, a representative sample of students should be drawn to assess students' learning style by major. Research should also be conducted to investigate if college modes of teaching tend to systematically favor one style of learning over another and how these modes of teaching related to the completion-rate of students as a result of their preferred learning style. Additionally, research should be conducted to determine if students taught in their preferred learning style score higher on tests, assignments, and attitude than those taught in a manner dissonant from their orientation. Because learning styles can be more complicated than the dichotomized learning style in this study, research should consider other learning styles in the future.

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