ANALYSIS OF THEORETICAL RELATIONSHIPS BETWEEN LEARNING STYLES OF STUDENTS AND THEIR PREFERENCES FOR LEARNING ACTIVITIES

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In their efforts to help students develop skills and master knowledge, vocational agriculture instructas are challenged by students with a wide variety of learning styles. Do we change the learning environment? Do we change the way our students learn? Or do we change the educational delivery system?

Human beings differ from one another in numerous ways. The demands of a particular situation drawn upon aptitudes that create individual differences in a person's response to a problem. A students performance in education is a product of whatever mixture of predispositions he/she brings to that performance that interact with the educational tasks and situations presented. Perkins (1985) alluded to some of these predispositions when he stated:

> It has often been suggested that intellectual competence depends on an individual's cognitive style, meaning various slow-changing characteristics that pervade a person's manner of thought and perception...Such characteristics differ from strategies, as the term is used here, in that strategies are specific actions to be taken at specific points in a problem solving or other process, Indeed, the distinction between strategies and cognitive style is not always made. However, I want to urge that the distinction is worth making. Because strategies occur at particular points within an ongoing process, whereas cognitive-stylistic characteristics pervade the process, the dynamics of learning one or the other might be quite different. Also, which one or what synthesis best accounts for intellectual competence is an important question. (p. 350)

A learning style consists of combinations of cognitive, affective, and physiological traits. Collectively, these traits are used to characterize how learners typically learn best. Learning style reflects individual differences in the way information is acquired, processed, and assimilated. Learning styles encompass four aspects of an individual's psychological makeup: a) cognitive styles or information processing habits; b) patterns of attitudes and interest; c) compatible dispositions to one's cognitive style: and, d) dispositions to use or not use certain learning tolls (Lawrence, 1984).

Studies of learning style suggest that individuals tend to place themselves in and seek out situations and tasks which will allow them to use their preferred modes of bringing new information into their cognitive structures. Knowledge about learning styles is a fundamental new tool for teachers and provides a deeper, more profound view of the learner than previously perceived. It is part of the basic framework upon which a sounder theory and practice of thinking, learning, and instruction may be built. However, a limited amount of research has been conducted on learning styles of agricultural education students. Cox, Sproles, and Sproles (1988) profiled learning styles of secondary agriculture students and suggested important modes of learning and individual differences. They concluded that more research is needed to characterize and categorize learning style.

One theory not investigated by Cox, Sproles, and Sproles has been put forth by Myers and Briggs (1985). These researchers theorized that students with a particular learning style prefer certain learning activities. To what extent does this theory hold for secondary agriculture students? How can agricultural educators use their knowledge of individual differences among learners to optimize learning experiences they provide for their students?

Purpose and Objectives

The purpose was to examine the learning styles and individual preferences of Iowa agriculture students for learning activities while in an agriculture course. The specific objectives were:

1. To determine the learning styles of Iowa agriculture students;
2. To test the Myers-Briggs theory that certain learning activities are associated with learning styles; and,
3. To analyze demographic variables related to learning activities.

Methods and Procedures

Population and Sample: The population consisted of 10,603 students enrolled in 262 secondary agriculture programs in the public high schools during 1987. Cluster samolinn was used because it was not possible to obtain a list of all members of the population. It was determined from Oliver et al. (IS63, 1985) that the minimum sample sire should be 325 respondents. This sample sire was increased by 50% to assure that the cluster sample adequately represented the population. A new minimum sample of 487 respondents was determined to be necessary. The effect size was set at .20 based upon user norms established by Ennis and Millman (1985).

The number of schools needed to generate the sample was based upon the statewide average number of students in each program. A computer-generated table of random numbers was used to initially select 25 schools for sampling. Telephone interviews were conducted to ascertain teachers' interest in cooperating in this study and to estimate the number of unduplicated 9th, 10th, llth, and 12th grade students enrolled in agriculture courses. Eighteen schools were selected for inclusion in the study. One instructor taught in two of the schools. A total of 668 students enrolled in agriculture courses in the 18 schools represented approximately 6% of all high school agriculture students in Iowa. The sampling error was estimated to be 3.8%.

Instrumentation: From a review of the literature, an information sheet was developed to collect demographic information as well as individual student preference data on how they learn in an agriculture course. Six items on the instrument sought specific information from the respondents: grade level, age, semester in agriculture classes, years in the FFA, leadership positions held, and the location of their home. Extensive reviews of the literature failed to yield related research pertinent to these variables. Nineteen questions were formulated to provide a profile of how students prefer to learn. The respondents were asked to indicate their preference for learning through various classroom teaching activities.

The Myers-Briggs Type Indicator™ (MBTI) Form G (Briggs & Myers, 1977) was administered to all respondents to determine their learning style. The MBTI was used because of its application to various populations. It has also been used extensively in research dealing with personalities and learning styles of high school students. The MBTI identifies four individual preferences or strengths that persons use in gathering information and making decisions. Using four of the eight factors, a person's leaming style is derived from a possible combination of 16 types. The MBTI has a test-retest reliability of .87.

The Myers-Briggs Type Indicator™ contains four separate indices which reflect one of four basic preferences directing the use of an individual's perceptions and judgment. The four preferences are: Extraversion or Introversion (E or I); Sensing perception or Intuition perception (S or N); Thinking judgment or Feeling judgment (T or F); and Judgment or Perception (J or P). The Sensing (-S-) and Intuition (-N-) preference reveals basic learning style differences. The MBTI provides information about the ways learners prefer to perceive meaning (sensing vs. intuition-a cognitive dimension), to express values and commitment (thinking vs. feeling), and to interact with the world (extraversion vs. introversion) (Keefe, 1982).

Data Collection and Analysis: Agriculture instructors in each of the randomly selected high schools were sent a letter requesting their participation and cooperation in the study. A package of school-coded test materials was forwarded to each of the 18. Students were administered the Myers-Briggs Type Indicator™ (MBTI) Form G (Briggs & Myers, 1977) during one class period. Students completed the information sheets during an additional class period. Instructors recorded information from students' cumulative folders to the student data sheets. Eight telephone calls were conducted to encourage nonrespondent instructors to complete the testing procedures, to verify identification numbers, and to ascertain other missing data. Data collection began in October and was completed in December 1987.

An identification number was assigned to each school and to each respondent. Descriptive statistical procedures used included frequencies, percentages, means, and standard deviations computed on items induded on the information and student data sheets. Spearman rho coefficients were used to determine whether two groups agreed on the rank order for selected learning activities examined. The .05 alpha level was used in the study.

Findings

Descriptive data about the respondents (N = 668) are provided in Table 1. The 10th grade class comprised the highest percentage of respondents whereas the lowest percentage was from the 12th grade class. The largest category of respondents had been enrolled in either one or two semesters of agriculture classes. The smallest category had been enrolled for seven semesters. More than half of the respondents had held one or hvo high school leadership positions.. Slightly more than one-quarter had held three or four leadership positions. Almost three-fourths of the respondents lived on farms The mean age of the respondents was almost 16 years. The typical respondent had been an FFA member three years.

Table 1
Demographic Profile of Respondents

Variabk	f	%
Grade		
9	172	25.8
10	187	28.0
11	163	24.4
12	146	21.8
Total	668	100.0
Semesters of Agriculture		
1 - 2	268	40.2
3 - 4	180	27.1
5 - 6	142	21.3
7	76	11.4
Total	666	100.0
High School Leadership Positions		
1 - 2	223	50.2
3 - 4	106	23.9
5 - 6	56	12.6
7 or more	59	13.3
Total	444	100.0
Farm Resident	497	74.6

	f	Mean	SD
Age	666	15.9	1.3
Years in FFA	638	3.2	2.1

Table 2 presents the means, standard deviations, and rankings of Iowa agriculture student preferences for 19 learning activities. The students were asked to rate on a scale from 1 to 99 their preferences for the 19 activities while learning in an agriculture course. A score of 1 indicated no preference, 50 some preference, and 99 very much preference.

Learning in laboratories and shop activities, had the highest mean and was much preferred by the students. The mean for this activity was almost 10 points higher with the mean of the next highest-ranked learning activity, working on group projects with classmates. Following my own impulses and being flexible, had the third highest mean and was less than one point lower than the students' second choice of learning activities.

Learning by formalized instruction (lectures, teacher assignments, homework) was of little preference to the students. This preference was ranked 18th and next to last. The lowest-ranked learning preference by a wide margin was when students had to memorize facts.

Table 3 contains the rankings of 15 learning activities by students with Intuitive or Sensing learning styles as determined by the MBTI. The MBTI provides information about ways learners prefer to

Tabk 2
Means, Standard Deviations, and Rankings of 19 Learning Activities& 668 Respondents

Learning Activity "In an agriculture course, I prefer to learn:":	Mean	SD	Rank
In laboratories and shop activities.	76.0	**23.9**	1
Working on group projects with classmates.	67.6	**24.3**	2
By following my own impulses and being flexible.	66.9	25.1	3
By being creative and original.	63.8	26.1	4
When someone takes a personal interest in me.	61.4	27.9	5
Observing specific things and activities.	60.6	24.7	6
From demonstrations in class.	60.1	26.6	7
Using audiovisual materials.	60.0	26.6	8
In discussion groups with my classmates.	59.9	26.8	9
When I can use a computer.	57.3	30.6	10
By thinking and reasoning by myself.	57.3	28.6	11
From personal relationships.	57.0	26.6	12
When materials is presented logically and orderly.	56.9	27.2	13
Through independent study.	43.4	**28.0**	14
From topics selected by other students.	41.8	26.7	15
By reading books and teaching myself things.	395	29.8	16
Giving reports on topics interesting to me.	39.4	31.8	17
By formalized instruction.	34.2	28.4	18
By memorizing facts.	28.2	26.1	19

Note. Means computed based on a 99 point scale where 1 = no preference, 50 = some preference, and 99 = very much preference.

Table 3
Rankings of 15 Learning Activities by Students with Intuitive or Sensing Learning Styles[a]

Learning Activity "In an agricultun course, I prefer to learn:"	Intuitive N = 210 Mean	SD	Rank[b]	Sensing N = 456 Mean	SD	Rank[b]
In laboratories and shop activities.	75.4	23.9	**1**	76.1	24.3	1
By being creative and original.	683	265	**2**	61.7	26.7	4
Working on group projects with classmates.	673	24.8	3	67.9	24.0	**2**
When I can use a computer.	524	29.3	4	54.7	31.0	**9**
Observing specific things and activities.	59.3	24.9	5	61.4	24.6	**5**
When someone takes a personal interest in me.	59.1	29.2	6	62.6	27.2	3
From demonstrations in class	58.8	28.0	7	60.7	25.9	6
From personal relationships.	57.7	26.7	8	56.9	26.6	7
When material is presented logically/orderly.	56.9	27.5	9	56.6	27.1	8
By reading books and teaching myself things.	43.9	31.8	10	37.3	28.6	13
Through independent study.	43.5	30.8	11	42.9	26.8	10
From topics selected by other students.	39.2	27.3	12	42.8	26.4	11
Giving reports on topics interesting to me.	37.6	32.7	13	40.0	31.3	12
By formalized instruction.	30.6	28.1	14	35.6	28.4	14
By memorizing facts.	24.9	25.4	15	29.2	26.3	15

[a] Only 15 of the 19 learning activities are correlated with the Intuitive-Sensing learning styles identified by the MBTI.
[b] Spearman rho correlation coefficient = .90; df = 13; p < .01.

perceive meaning (sensing vs. intuition). The Sensing (-S-) and Intuition (-N-) preference reveals learning style differences. According to Myers and Briggs (Lawrence, 1986), 70% of secondary students prefer the Sensing learning style. In this study, 6% of the agriculture students preferred the Sensing learning style and 31% the Intuitive learning style.

When the students were asked to rank their preferences for 19 activities while learning in an agriculture course, the rankings were not consistent with their preference for a learning style. Students with Intuitive or Sensing learning styles strongly preferred to learn in laboratories and shop activities. However, Myers and Briggs theorized that this learning activity should be highly associated with the Sensing rather than the Intuitive learning style.

This anomaly also held true for, working on group projects with classmates, observing specific things and activities, from demonstrations in class, and two other learning activities as well. By memorizing factors was ranked last by the students with either Intuitive or Sensing learning styles. According to Myers and Briggs, this learning activity should be closely associated with the Sensing learning style. A Spearman rho coefficient of .90 indicates that students with Intuitive or Sensing learning styles preferred the 15 learning activities to the same degree. This finding is not consistent with the Myers-Briggs theory that students with Intuitive or Sensing learning styles prefer different learning activities.

Table 4 presents the rankings of seven learning activities by students classified by the MBTI as Extroverts or Introverts. The extraversion-introversion preference shows the broad areas of students' natural interests. This pair of preferences refers to habitual, not consistent tendencies. According to Myers and Briggs, within the school population the expected distribution of Extroverts to Introverts is approximately 70-30%. The ratio of Extroverts to Introverts in this study was 58% 42%.

Table 4
Rankings of Seven Learning Activities by Students Classified as Extroverts or Introverts[a]

Learning Activity "In an agriculture course, I prefer to learn:"	Extroverts N=384 Mean	SD	Rank[b]	Introverts N = 283 Mean	S D	Rank[b]
Working on group projects with classmates.	705	23.8	1	64.0	245	1
By being creative and original.	65.3	26.2	2	61.7	26.0	2
By discussion groups with my classmates.	63.0	26.4	3	56.4	26.7	4.5
By thinking and reasoning myself.	58.8	41.7	4	55.6	29.4	6
When material is presented logically/orderly.	56.9	275	5.5	56.4	26.9	45
When I use a computer.	56.9	30.6	5.5	57.5	30.9	3
Giving reports on topics interesting to me.	40.4	32.0	7	37.7	31.4	7

[a] Only 7 of the 19 learning activities are correlated with the Extrovert-Introvert learning styles identified by the MBTI.
[b] Spearman rho correlation coefficient = .76; df = 5; p < .01.

Extroverts and Introverts tended to prefer the same types of learning activities. Both groups ranked, working on group projects with classmates and by being creative and original, as their two most-preferred learning activities. Giving reports on topics interesting to me was the least preferred of the seven learning activities. According to Myers' and Briggs' theory, all three of these learning activities should be associated with the extroversion learning style. A Spearman rho coefficient of .76 reveals that students with Extroverted or Introverted learning styles were in high agreement on their preferences for the seven learning activities. This finding is also not consistent with Myers-Briggs theory.

Table 5 presents interrelationships among selected variables studied in this investigation. There was a tendency for both Extroverts and Introverts to prefer the Sensing learning style; in fact, more than two-thirds (6%) of the agriculture students preferred this learning style. As shown in Table 5, the agriculture students tended to prefer the learning activities to the same extent regardless of gender, grade, place of residence, number of leadership positions in high school, or learning styles. Among the demographic variables, there were few, if any, relationships of practical consequence.

Tabk 5
Interrelationships Among Selected Varialbes

	Gender	Grade	Residence	Leader	I or E	Nor S	Learn. Act.
Gender		NR	NR	NR	.10[b]	NR	.91[c]
Grade			NR	NR	NR	NR	.90[d]
Residence				.24[a]	.11b	NR	.88[c]
Leaders					NR	NR	.96[d]
I or E						.71[b]	.76[c]
N or S							.90[c]
Learn. Act.							

([a] = Cramer's V; [b] = phi coefficient; [c] = Spearman rho coefficient; [d] = Coefficient of concordance (Nunnally, 1975). Relationships tested at .05 alpha level)

Conclusions

The findings confirm the Myers and Briggs finding (Lawrence, 1986) that 70% of secondary students prefer the Sensing (-S–) learning style. Myers and Briggs theorized that individuals preferring this learning style rely on experience rather than theory, trust the conventional way of doing things, and prefer to begin from what is known and real, and then move step by step tying each new fact to past experience. Such individuals then test for relevance in practical use. Learners preferring the Sensing learning style who are Extroverts need to know why before doing something and like group projects, class reports, and team competition. Meanwhile, introverts who prefer the Sensing learning style like lectures and enjoy working alone.

Most agriculture students in this study preferred a Sensing (-S–) learning style. When this preference is translated into learning activities, Myers and Briggs theorized that students need to move step-by-step through a new experience with their senses as fully engaged as possible. They thrive on established routines, work steadily and patiently and are interested in facts and details. They will seldom use their imagination and prefer memorizing to findings reasons. They overwhelmingly prefer experiential and activity-oriented instruction. These students prefer doing something with tangible objects rather than listening to what someone is saying unless it concerns an action or adds something definite to their picture of the physical world.

However, contrary to Myers-Briggs theory, students in this study who have Sensing or Intuitive learning styles preferred to learn the same way as noted by their rankings of the 15 learning activities. A similar finding was obtained when seven learning activities associated with introversion and extroversion were ranked by agriculture students classified as Extroverts or Introverts.

Iowa agriculture students also preferred the same learning activities regardless of gender, grade, residence, and number of leadership positions in high school. The majority of respondents favored the Sensing learning style, preferring to learn through a variety of instructional techniques that are unique to agricultural subject matter-team competition, group projects, and hands-on experiences. They overwhelmingly preferred interactive and experiential learning activities. The more conventional instructional techniques were met with much disfavor.

Recommendations

The findings suggest that agricultural educators should make heavy use of sequential exercises and experiments; group discussion and projects, team competition; brain-storming activities; demonstrations; and short, activity-oriented exercises that provide new skills.

In the absence of research to the contrary, instructors or agriculture students should insure that their instructional techniques reflect the preferred learning activities rather than the learning styles of their students. Because the findings relative to student preferences for the learning activities are contrary to Myers-Briggs theory, this study should be replicated to determine if agriculture students are in fact representative of a population different from the one Myers and Briggs included in their research.

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