THE COGNITIVE, PERCEPTUAL, AND INSTRUCTIONAL PREFERENCES OF AGRICULTURAL EDUCATION STUDENTS

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The educational community has devoted considerable effort to assessing the effectiveness of various instructional methods and teaching strategies. Research on teaching effectiveness has been inconclusive in identifying a singular method of instruction that works well with all individuals. A growing body of research suggests that students learn best when they are taught using methods that complement their preferred learning styles.

Thies (1979) defined learning style as a biologically and developmentally imposed set of personal characteristics that make a teaching method effective for some and ineffective for others. An instructional research model developed by Keefe and Monk (1988) characterized learning style as an umbrella term which encompasses the cognitive, affective, and physiological/environmental dimensions.

The effect of the instructional environment to stimulate or inhibit learning for students with selected learning style characteristics has been well documented (Dunn, 1987; Price, 1980). Findings from correlational studies (Dunn, Cavanaugh, Eberle, & Zenhausern, 1982) yielded sets of traits among students within the same age group or grade and among those having similar talents, achievements, and interests.

In addition to instructional environment, sensory preference influences the way students learn. Eight studies within the last 10 years revealed that when youngsters were taught with instructional resources that both matched and mismatched their preferred learning modalities, they achieved statistically higher test scores in modality-matched rather than mismatched treatments (Dunn, 1987). Children taught with multisensory resources through their most preferred modality and reinforced through their secondary or tertiary modality also had higher scores.

In four studies (Cholakis, 1986; DeBello, 1985; Miles, 1987; Perrin, 1984), students' sociological preferences were identified and instructional strategies were matched with their preferences. They achieved significantly higher test scores in matched conditions and significantly lower test scores when mismatched. Students' time preferences for learning--morning "early birds" versus afternoon "night owls"--also influenced achievement. Most students are not morning alert. At the elementary school level, approximately 28% appear to be "early birds." A majority (60%) of high school learners, on the other hand, remain most alert in the late morning and afternoon (Price, 1980).

As a result of research efforts in cognitive science (Larkin, McDermott, Simon & Simon, 1980; Newell & Simon, 1972; Simon, 1978) and education (Costa, 1985; Kirby, 1979; Sternberg & Caruso, 1985), much has been added to what is known about the development of human intellectual activity and processes. Thomas and Litowitz (1986) cited findings from research which showed that there are individual differences within the common processes and functions associated with cognition. A youngster's cognitive skills will be influenced by his/her predispositions--learning styles--toward acquiring and processing information--learning and thinking.

Several contemporary experiments in the direct teaching of cognitive skills have yielded positive results. Perkins and Salomon (1989) suggested guidelines for classroom practices that foster the transfer of knowledge and skills. Most efforts to cultivate general cognitive skills have not focused on bringing together context-specific knowledge with general strategic knowledge.

Methodology and educational research should focus on intermingling generality and context-specificity in instruction. A limited amount of research has been conducted on learning styles of agricultural education students. Rollins (1990) and Cox, Sproles and Sproles (1988) profiled learning styles of secondary agriculture students and suggested important modes of learning and individual differences. They concluded more research is needed to characterize and categorize learning styles.

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Purpose and Objectives

The primary purpose of this study was to profile the preferred learning styles of ninth, tenth, eleventh, and twelfth grade students studying agricultural education in Pennsylvania. Specific objectives of the study were to describe:

1. Demographic variables related to learning styles,
2. Students' cognitive learning styles--their approach to processing information,
3. Students' perceptual learning styles--initial responses to verbal or auditory information,
4. Students' instructional preferences--the modality through which they prefer to receive instruction.

Procedures

Population: Survey research methodology was used in this study. The target population for the study included all students enrolled in Pennsylvania Department of Education approved programs of agricultural education. The frame for this study included 201 agricultural education programs listed in the Directory for Vocational Education in Agriculture in Pennsylvania 1988-89. A stratified random sample of schools was used. Schools were stratified on the basis of geography and population density to reflect the diversity of Pennsylvania agricultural education programs. Ten schools were randomly selected by the researchers to participate in the study from the fall of 1988 through spring 1989. Sampling units were intact classes of ninth, tenth, eleventh, and twelfth grade agricultural education students. Based upon a population of 7137, the sample size (n=224) was determined from Oliver, Hinkle, and Hinkle (1983) with the effect size of .20 and the power of the statistical test equal to .85.

Instrumentation: The instrument used to collect the data for this study was the Learning Style Profile (LSP) developed by the National Association of Secondary School Principals. The Learning Style Profile consists of 23 subscales which provide data within three major areas--cognition, perceptual learning styles, and response to study and instructional environment modality. The LSP was developed in four phases from fall 1983 to early 1986 and is based on the work of noted cognitive psychologists Charles Letteri, Rita Dunn, and James Keefe (1988). Appropriate testing was completed as the instrument was developed to establish both construct and concurrent validity. The average internal consistency reliability measured by Cronbach's alpha is .61 with a range from .47 to .76 for the 23 subscales. Although the reliability figures for the subscales appear to be low, Keefe and Monk (1988) stated that these reliabilities are acceptable for short tests intended to collect initial diagnostic information. Since reliability is largely a function of the length of a test or subtest, longer subtests with similar items would provide considerably higher reliabilities. For example, if the typical 5-item subscale on the Learning Style Profile were expanded to 15 similar items, the average reliability would be approximately .82. In addition to the data collected using the LSP, demographic information were collected via an instrument developed by the researchers.

Data Collection: Data for this study were collected from November 1988 through March 1989. To insure consistency in the data collection process, all data for the study were collected by the researchers. The number of agricultural education students participating in the study was 224.

Analysis of Data: The data were converted to standard scores as per procedures developed by the authors of the LSP and as described in the Learning Style Profile Technical Manual (Keefe & Monk, 1988).

Comparisons were made between the agricultural education students' and the national sample. The national sample results are contained in the Learning Style Profile Technical Manual (Keefe & Monk, 1988) The national sample represents 5,000 students from grades nine through twelve.

Results

Students' Background: Of the 224 agricultural education students, 72 (32%) were females. Most of the students (98.2%) were white and ranged in age from 14 to 18 years old. The sample contained 14 ninth graders, 71 tenth graders, 57 eleventh graders, and 82 twelfth graders. Based upon state enrollment figures available for agricultural education, the sample underrepresents ninth graders and overrepresents twelfth graders.

Most (87%) of the agricultural education students were members of the FFA and 61% indicated that they were active or held positions of leadership in the organization. Fourteen percent had participated in FFA activities at the state or national level while 56% indicated their highest level of participation had been in their local chapter.

The highest percentage (23.9%) of 189 respondents who indicated they were employed in some capacity worked an average of 20 hours per week. Two-thirds (66%) of the respondents resided with both natural parents, more than one third (35%) were the oldest child in the family, and almost two-thirds (62%) had siblings.

Cognitive Learning Style: Data in Table 1 indicate that agricultural education students deviated by more than one point from the national norm on four of the five cognitive subscales: analytic, spatial, discrimination, and sequential. The analytic subscale, which is comprised of five items, measures the ability to isolate critical elements of a problem. Research (Keefe & Monk, 1988) has shown that persons low in analytic skill have difficulty with certain problem-solving tasks. Persons high in this skill excel in mathematics and the sciences which require taking some critical element of a problem and using it in a different way.

Table 1
Means and Standard Deviations for Cognitive Subscales for Agricultural Education Students and the National Sample

Cognitive Subscale	Ag Ed Students n = 224 Mean	sd	National Sample n = 5,000 Mean	sd
Analytic	1.06	0.93	2.76	1.48
Spatial	1.34	0.96	2.83	1.43
Discrimination	1.40	0.97	3.08	1.38
Sequential	4.13	1.62	5.25	1.35
Memory	5.86	2.59	5.98	2.69

The spatial subscale, also comprised of five items, measures a person's ability to identify a geometric shape, remember it, and discriminate it from other similar patterns. A considerable body of data suggests that a relationship exists between this skill and success in technical courses (i.e., drafting) and related occupations.

Discrimination skills, determined from another five item subscale are used to visualize important elements of a task and focus attention on required details. When compared to the national sample, agricultural education students would be less efficient in attending to a task, would be distracted more easily, and would be less successful at tasks requiring attention.

The sequential subscale, comprised of six items, measures an individual's ability to process successive and simultaneous mental tasks. For example, students were to determine whether a series of geometric shapes were present or absent in a set of simple puzzles.

Twelve items are used on the memory subscale to assess an individual's capability to retain an image of a complex figure long enough to make a judgment of whether or not it is the same or different in succeeding representations. Of the five cognitive subscales, the agricultural education students were most comparable to the national sample in this category. It should be noted, however, that both groups performed at a level of correctly answering less than 50% of the items.

Perceptual Learning Style: Table 2 presents the means and standard deviations of the agricultural education students and the national sample for perceptual responses. Three subscales--visual (15 items), auditory (15 items), and emotive (12 items)--measure the tendency of an individual to react to a series of words representing various concepts and objects in terms of visual, auditory, or kinesthetic modalities. Agricultural education students will process information through an auditory or emotive modality more so than a visual modality. On both auditory and emotive subscales, the

students scored similarly to the national sample. The agricultural education students who were included in the sample tended to process information in a manner similar to the students in the national sample.

Table 2
Means and Standard Deviations for Perceptual Responses - Initial Responses to Verbal Information for Agricultural Education Students and the National Sample

Perceptual Subscale	Ag Ed Students n = 224 Mean	sd	National Sample n = 5,000 Mean	sd
Visual Response	8.45	2.92	8.98	2.97
Auditory Response	4.63	2.33	4.33	2.44
Emotive Response	6.71	2.56	6.63	2.52

Instructional Preferences: Means and standard deviations for agricultural education students and the national sample for orientations and preferences to study are presented in Table 3. The persistence orientation score (four item Likert scale) indicated less willingness to work at a difficult task until completed or without adult supervision. Agricultural education students were only slightly more willing than the national sample to verbalize and state opinions (verbal risk subscale--four item Likert scale) even if others disagreed. The mean for the manipulative subscale, comprised of a four item Likert scale, indicated that agricultural education students preferred "hands-on" instruction to a greater degree than the comparison sample. They also indicated less preference to receive instruction through verbal or spatial activities (six items). A lower mean score on grouping preference (five items Likert scale) indicated that the agricultural education students preferred to learn in smaller groups than the national sample.

Table 3
Means and Standard Deviations for Orientations and Preferences to Study (Instructional Environment) for Agricultural Education Students and the National Sample

Instructional Subscales	Ag Ed Students n = 224 Mean	sd	National Sample n = 5,000 Mean	sd
Persistance	12.67	3.02	12.99	2.79
Verbal Risk	12.59	2.79	12.44	3.00
Manipulative	14.02	2.79	12.64	3.25
Verbal/Spatial	3.14	1.36	3.49	1.69
Grouping	14.84	2.55	17.71	2.36

Data in Table 4 reveal that agricultural education students were very similar to the national sample in study time preferences (ten items). Almost identical preferences were indicated by the two groups for early morning and afternoon times. However, agricultural education students did not favor the late morning or evening as a study time as strongly as the national group.

Table 4
Means and Standard Deviations for Study Time Preferences for Agricultural Education Students and the National Sample

Study Time Preferences	Ag Ed Students n = 224 Mean	sd	National Sample n = 5,000 Mean	sd
Early Morning	5.59	1.90	5.65	1.69
Late Morning	5.33	2.11	6.00	1.83
Afternoon	9.92	2.07	9.94	1.95
Evening	8.61	2.64	9.07	2.58

Conclusions and Implications

Based on the findings of this study, a profile of Pennsylvania agricultural education students emerged. When compared to the national sample, agricultural education students have substantially less-developed skills in four of the cognitive areas measured in this study--analytical, spatial, discriminating, and sequential skills. Cognitive skills dealing with memory were comparable to the national norm.

When asked to respond to a variety of information, agricultural education students were inclined to initially process information by hearing it (auditory perception) and reacting with feeling (emotive perception). Agricultural education students did not prefer visual methods of learning as much as the national sample. Overall, these two groups were similar in their preferences for perceptual responses.

When considering instructional environments, agricultural education students preferred to learn in smaller size groups than the norm group. They also indicated a much stronger preference for learning via "hands-on" instruction and were only slightly more willing to express opinions, even if others disagreed. However, agricultural education students were not as likely to persist in a difficult task until completed and were less likely to prefer instruction emphasizing a high level of verbal and/or spatial activities.

This study provides another profile of the cognitive, perceptual, and instructional preferences of agricultural education students. Previous research (Rollins, 1990; Cox, Sproles, & Sproles, 1988) has documented similarities in learning styles and thinking skills of agricultural education students. This research raises complex questions related to the cognitive performance of students and the instructional processes used in agricultural education. The questions have serious implications for classroom teachers and teacher educators:

> Are agricultural education students inherently less able to perform cognitive skills?
>
> Are agricultural education students being taught psychomotor skills at the expense of cognitive skills? Are they learning to do at the expense of learning to think?
>
> Is the agricultural education curriculum cognitively challenging?
>
> Is the profession failing to develop a comprehensive curriculum because the students are unable to handle it?

As we continue our dialogue on redesigning agricultural curriculum to reflect our scientific base, we should ask ourselves: Do these students have the basic thinking skills necessary to meet a science-based curriculum head-on?...Or Is that why they are in agricultural education in the first place?

Recommendations

This study provides insight into the cognitive, perceptual, and instructional preferences of students studying agricultural education and should be used to establish a benchmark for further investigation.

As more profiles of the learning styles of students enrolled in agricultural education become available, it is becoming increasingly evident that such students lack cognitive skills–the ability to think, solve problems, and effectively process information–when compared with the norm group. Hence, the following recommendations are offered for further investigation and implementation:

> Classroom intervention strategies and methods to promote cognitive development–critical thinking, problem solving, and decision making–are needed, especially if a science-based curriculum for agricultural education is to be implemented.
>
> Preservice education of teachers should include instruction in how to teach cognitive development–teaching students "how to think."
>
> Inservice education of classroom teachers should take advantage of proven methods and strategies of teaching thinking. Several models have been proven to increase the cognitive development of students.

Perhaps one key to better teaching is to make students better learners. Through the process of teaching thinking, we can teach students how to become better learners.

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