

## ATTITUDE FORMULATION OF ETHNIC MINORITY STUDENTS TOWARD THE FOOD AND AGRICULTURAL SCIENCES

Zelia Z. Wiley, Recruitment and Retention Associate  
University of Kentucky

Blannie E. Bowen, Professor  
Cathy F. Bowen, Assistant Professor  
Anne L. Heinsohn, Associate Professor  
The Pennsylvania State University

### Abstract

*Most solutions that have been implemented to eliminate the persistent under-representation of ethnic minority students in colleges of agricultural sciences have produced limited success. Many of these solutions ignore theories which suggest that education and substantive experiences must precede positive attitudes and resultant behaviors toward the food and agricultural sciences (FAS). Also, during high school, many minorities do not enroll in upper level science courses that FAS majors require. Given these scenarios, this research investigated the influence of an FAS pre-college workshop on the attitudes of participants. Forty-four academically talented high school minority students were selected for the one-week workshop taught by college faculty and 28 students participated. Objective #1 focused on the stability of the 28 participants' FAS attitudes. When the workshop began, the participants agreed that they (1) knew little about food and agricultural science careers and (2) associated the FAS with farms. However, they left the workshop with more positive attitudes that were maintained a year later. Objective #2 compared the attitudes of the 28 workshop participants and 16 comparable students who did not participate in the workshop. On six of 10 indicators, the participants had significantly more positive attitudes than nonparticipants. Recommendations for future pre-college programming are offered based on the findings.*

Undergraduates who pursue food and agricultural sciences (FAS) majors must be proficient in biology, botany, chemistry, physics, zoology, and related sciences. This academic necessity often presents unique challenges for ethnic minorities (i.e., African Americans, Hispanics/Latinos, and Native Americans). During high school, many minorities do not enroll in upper level science courses. Also, for historic and other reasons, the consumption of food is the primary contact that many minorities have with the food and agricultural sciences. Given these two scenarios, many minorities exhibit limited awareness of the science demands faced by students who want to prepare for professional careers in the food and agricultural sciences. Several researchers (Larke & Barr, 1987; Rawls & Thomas, 1994; Bowen, 1994)

have documented that low levels of minority involvement in the food and agricultural sciences begin during high school. Also, Scanlon, Yoder, and Hoover (1989) found that "negative images of agriculture" are overriding barriers to minority enrollment in secondary agricultural education programs. Images of agricultural education tend to project a profession that focuses excessively on vocational skill building, the FFA, and a profession for white males. Consequently, many minority students equate food and agricultural science careers with farming or ranching which leads to negative perceptions rather than positive dimensions of the science or business aspects of the agricultural sciences (Orthel, et al., 1989). In the same vein, Bowen and Jackson (1992) cited feeling rejected or unwelcome to participate in vocational

education as another barrier to high school students choosing agricultural education. To overcome these situations, more minority students must be exposed to the science dimensions of the food and agricultural sciences.

On the university level, most colleges of agricultural sciences have initiated minority recruitment efforts. However, low enrollment figures suggest that these efforts are having limited effect. For example, in fall 1995 minorities constituted approximately 2% of the undergraduate enrollment in The Pennsylvania State University's College of Agricultural Sciences. Although minority enrollments increased slightly in several universities, Penn State's total remained constant the past five years (Wiley, Bowen, & Bowen, 1995). This situation existed even though Penn State and many colleges created special programs to provide an understanding of the physical, biological, and social sciences that are important for FAS careers (Hopeke, 1990).

In many cases, high school students are not informed in a systematic way about the food and agricultural sciences because many high schools lack the physical and human resources to develop an awareness of and appreciation for science-related programs (Dolce, 1984). In addition, many educators, especially science teachers, have limited knowledge of the food and agricultural sciences. Also, many colleges tend to generalize their recruitment approaches based on a traditional recruitment pool (i.e., the majority or dominant group). Such approaches create limited perspectives of constructs that shape the recruitment needs of minority students (Fisher & Griggs, 1995). From a recruitment perspective, more effective programs are needed for college enrollments to increase and such programs should begin before the senior year in high school.

## Theoretical Framework

In theory, assumed relationships among knowledge, attitude, and behavior suggest that as a person becomes more knowledgeable of and experienced in an area such as the food and agricultural sciences that person will gradually begin to associate positive connotations to that area and eventually behave in a desired manner (Swanson, 1972). This theory is predicated on reasoning that knowledge and experiences are precursors to attitudinal changes that must occur before behavior can change (see Figure 1). In this study, a one-week food and agricultural sciences workshop was considered to be the educational component that provided the desired knowledge and experiences.

**Education→Knowledge→Attitudes→Behavior**  
s

Figure 1. Assumed Relationships Among Education, Knowledge, Attitude, and Behavior (Swanson, 1972)

Fishbein (1967) theorized that attitudes help individuals adjust to their surroundings and provide predictability in their behavior and understanding of others' behavior. Remmers (1954) viewed "opinions" as "expressed attitudes," and these terms can be interpreted as judgments stated in verbal terms (Murphy & Likert, 1954). Consequently, an attitude can be viewed as a preference that one may not necessarily be able to put into words or an orientation toward an issue or question.

Swanson (1972) and others suggest that temporary perceptions often become more permanent attitudes which subsequently govern behavior. However, several studies suggest that minority students are not securing the knowledge

and experiences on which to base their perceptions of the food and agricultural sciences. Anington and Price (1983) found that females and racial minorities were seriously under-represented among students who enrolled in Florida's vocational agriculture programs. In other states, most minority students do not enroll in food and agricultural sciences courses in secondary schools, thus, limiting their understanding of related disciplines and career opportunities (Rawls & Thomas, 1994).

In a related vein, other authors have documented a need for more minorities to become involved in the food and agricultural sciences (Bowman & Shepard, 1985; Bowen, 1987; Larke & Barr, 1987; Henson, 1988; Hunte, 1992; Bowen, 1994). These researchers recommended that programs be initiated at the elementary and secondary levels to increase the awareness that minorities have of FAS careers. They also recommended that food and agricultural sciences professionals develop better systems to provide minorities with relevant knowledge and experiences and the required B.S. degree preparation for FAS careers.

#### Purpose and Objectives

Penn State's College of Agricultural Sciences conducted a pre-college food and agricultural sciences workshop for academically talented minority high school students in summer 1994. This workshop consisted of five days of instruction taught by faculty to expose students to science-based curricula and career opportunities in the food and agricultural sciences. The workshop was developed based on Swanson's (1972) model wherein students received appropriate education and knowledge needed to form attitudes. This research examined the extent to which Swanson's (1972) theory applies to minorities who might be interested in the food and agricultural sciences. Given the exploratory nature of this research, two research questions were investigated:

1. To what extent does participation in a one-week FAS workshop result in stable, positive attitudes toward the food and agricultural sciences?
2. Do students who participate in an FAS one-week workshop exhibit more positive attitudes toward the food and agricultural sciences than similar students who do not participate?

#### Methods and Procedures

Two pre-experimental designs were used in this investigation involving academically talented minority high school students who plan to attend college. For research question #1, Tuckman's (1994) one-group pretest-posttest design was modified to include a delayed posttest that was administered to the participants one year after the workshop. Also, Tuckman's intact-group comparison design (posttest only) was used for question #2 wherein the attitudes of workshop participants (treatment) were compared with those of the nonparticipants (control). The exploratory nature of this research meant that true or quasi-experimental designs were inappropriate. Random assignment of the students to groups or the treatment to the groups was not possible (Borg & Gall, 1989). Also, generalizations beyond subjects included in the study are not possible because random sampling was not used. Also, the designs used in the study limit cause and effect inferences.

The population included 44 students selected to participate in the FAS workshop conducted at Penn State's main campus (University Park). The subjects were recruited using promotional materials mailed to 438 high school science teachers and guidance counselors in Pennsylvania's urban centers where most minorities live. All students selected for the workshop met four criteria: (1) they planned to attend college, (2) were interested in the biological or physical sciences, (3) had a 3.00 or higher grade point average, and (4) were

recommended by a science teacher or guidance counselor.

The treatment group consisted of the 28 students who participated in the one-week summer workshop. All except one student were in grades 10-12 during the 1995-96 academic year. This student graduated from high school in May 1995 and enrolled in agricultural business at Penn State on full scholarship. The participants included 21 African-Americans, two hispanic/Latinos, and five Asian-Americans. Most participants were females (17 of 28). Three freshmen, 11 sophomores, 13 juniors, and one senior participated in the workshop. The 16 students in the control group were also selected for the workshop, but they could not attend for various reasons, i.e., vacations, summer school, jobs, etc. In terms of gender, ethnicity, and grade level, the nonparticipants and participants were very similar.

### **Instrumentation**

Data to answer the two research questions were collected using a 10-item instrument the researchers developed to measure attitudes toward the FAS. A panel of agricultural and extension education faculty at Penn State reviewed the instrument for content and face validity. To secure data for question #1 regarding the stability of attitudes, a Likert-type instrument was administered to the participants three times: (1) on the first day of the workshop, (2) on the last day of the workshop, and (3) one year after the workshop. Usable data were received from all 28 participants. To collect data for question #2, the same instrument was mailed to the participants and nonparticipants. Because the researchers wanted to assess permanency (attitudes) rather than short term perceptions, the instrument was mailed to the 44 subjects one year after the workshop (July 7, 1995). The deadline for the instrument to be returned was July 21, 1995. Students who failed to return the instrument within two weeks were called the week of August 7- 11, 1995. With the telephone follow-ups, usable

responses were received from all 28 participants and 12 of 16 nonparticipants.

### **Data Analysis**

The Statistical Package for Social Sciences (SPSS) version 4.0 for Macintosh and SPSSr (Norusis, 1990) available through Penn State's Center for Academic Computing were used to analyze the data. To handle missing data, if a student did not respond to all items, the group mean was assigned for the item in question. The 10 item Likert-type instrument was interpreted as follows: 1.00-1.74=strongly disagree; 1.75-2.49=disagree; 2.50-3.24=agree; 3.25-4.00=strongly agree. Descriptive statistics including means, standard deviations, and frequencies were used to summarize the data. Question #1 addressed the stability of attitudes that were measured for the same subjects on three occasions. For question #1, the SPSSr MANOVA procedure was used to provide a repeated measures analysis appropriate to study phenomena over time. A repeated measures design is appropriate to reduce error variance especially when researchers are confronted with a scarcity of subjects (Kennedy & Bush, 1985). The independent t-test was used to analyze data for question #2 that compared the attitudes of participants and nonparticipants. For analysis purposes, the participants and nonparticipants were considered a "slice of life" sample of Pennsylvania's minority students (Oliver & Hinkle, 1981).

### **Findings**

Research question #1 focused on the stability of the participants' attitudes toward the food and agricultural sciences. The findings for five of the 10 items strongly suggest that the participants began the workshop with positive attitudes that were maintained a year later (Table 1). Stable, positive attitudes were found for items #2, #3, #4, #6, and #8. No significant differences ( $p > .05$ ) were detected between the pretest, posttest, and delayed

Table 1. Pre, Post, and Delayed Posttest Attitudes of FAS Workshop Participants (N=28)

Item	Pretest M/SD	Posttest M/Sd	Delayed M/SD	Exact F
1. I know very little about jobs or careers in the food and agricultural sciences.	2.88 (.75)	1.96 (-.68)	2.12 (-.59)	11.94**
2. Most careers in FAS involve outdoor work in fields.	2.30 (-.87)	2.00 (-.73)	1.92 (.74)	1.81
3. Courses in biology and chemistry are not needed for most careers in the FAS.	1.69 (.81)	1.37 (-.89)	1.61 (-.58)	2.92
4. Growing up on a farm is necessary for a career in the FAS.	1.55 (.85)	1.44 (-.89)	1.53 (-.58)	.02
5. I personally know someone who has a career in the FAS.	1.78 (1.01)	2.33 (1.17)	2.54 (.95)	3.64**
6. There are business in PA where I can have a professional career in the FAS.	2.10 (1.03)	1.63 (1.01)	2.10 (-.74)	1.00
7. When I hear the words FAS, I usually think of farms with crops and animals.	2.93 (.83)	2.18 (1.00)	2.23 (.77)	10.41**
8. When I hear the words FAS, I seldom think of laboratories and testing equipment.	2.52 (-.98)	2.00 (.76)	2.11 (.65)	2.25
9. Careers in the FAS touch the lives of people each day.	3.50 (.51)	3.85. .4 6	3.35 (-.56)	9.29**
10. The U.S. is very dependent on people who work in the FAS.	3.30 (-.67)	3.67.. ... (-.62)	3.31 (.55)	5.54**

\* Means based on 1=Strongly Disagree, 2=Disagree, 3=Agree, and 4=Strongly Agree Scale.  
 \*\* Significant difference ( $p < .05$ ) among 3 means based on Hotelling's trace criterion with 2,26 df.  
 \*\*\* Solid line denotes significant difference ( $p < .05$ ) between pretest and posttest mean; dotted line denotes difference ( $p < .05$ ) between posttest and delayed posttest mean.

posttest means. In addition to these five items, the Exact F detected significant differences ( $p < .05$ ) among the pretest, posttest, and delayed posttest means for item #5. However, the differences between pairs of means were too small to achieve significance ( $p > .05$ ). Thus, the participants were somewhat unstable in their attitude about personally knowing someone who has an FAS career.

For two other items, the workshop resulted in positive attitudinal shifts that were maintained on the delayed posttest. As indicated by the pretest means, when the workshop began the participants agreed that they knew little about FAS careers (item #1) and that they associated the food and agricultural sciences with farms that have crops and animals (item #7). At the end of the workshop, the posttest means indicated that they had changed their

perceptions and disagreed with both statements. As noted by the delayed posttest means (see Table 1), the positive shifts were maintained a year later. Finally, before the workshop began, the participants strongly agreed that FAS careers touch the lives of people each day (item #9) and that the U.S. is very dependent on people who work in the FAS (item # 10). At the end of the workshop, the participants held even stronger positive views about both items. However, a year later, the delayed posttest means indicate that their attitudes had regressed to the less positive levels observed on the pretest (see Table 1).

Attitudes of the treatment and control groups were addressed in research question #2. For six of the 10 items, the workshop participants held significantly ( $p < .05$ ) more positive attitudes than the nonparticipants (see Table 2). For example, the nonparticipants agreed that they knew little about FAS careers, but the participants disagreed with this statement (item #1). Also, the participants strongly disagreed that courses in biology and chemistry are not needed for most FAS careers while the nonparticipants disagreed with this statement (item #3). Similar positive significant differences ( $p < .05$ ) in favor of the participants were observed for items related to growing-up on a farm being necessary for FAS careers (item #4), knowing someone who has a career in the FAS (item #5), the FAS touching the lives of people each day (item #9), and the U.S. being dependent on people who work in the FAS (item #10). For the other four items where no significant differences ( $p > .05$ ) were observed, the participants and nonparticipants tended to have similar positive attitudes toward the food and agricultural sciences.

### **Discussion and Conclusions**

The findings tend to support previous research about summer pre-college recruitment programs that reported positive attitudinal gains (Bowman & Shepard, 1985; Bowman & Bowen, 1987; Gardner, 1991; Vaughn & Bowen, 1993). Compared with

nonparticipants, the participants held more positive attitudes toward the food and agricultural sciences. This occurred for six of 10 items even though only students who had favorable attitudes toward the biological and physical sciences were selected for the workshop. Further, the findings suggest that the participants came to the workshop with positive attitudes that were maintained a year later. Also, on two of 10 items, positive attitudinal shifts occurred even though both groups were at the high end of the four point scale used in the study. After the workshop, the participants felt that they knew more about FAS careers and that they had expanded their concepts of the food and agricultural sciences beyond farms with crops and animals. Three conclusions were reached based on the findings and methodology used in the study:

1. Even though both the participants and nonparticipants held positive attitudes toward the food and agricultural sciences, students who participated in the workshop held more positive attitudes.
2. Attitudes of the participants were stable and positive one year after the workshop. Also, on two items (#1 and #7), more positive attitudes resulted that were maintained after the workshop.
3. The two designs used in the study were effective to examine attitudinal differences between the participants and nonparticipants as well as the stability of the participants' attitudes.

### **Recommendations**

Three recommendations were made based on the findings of this investigation:

1. Swanson's (1972) theory or similar theories should be used when colleges design programs to change or enhance attitudes that

Table 2. Attitudes of Participants (n=28) and Nonparticipants (n=12) One Year After FAS Workshop

Attitudinal Statement	Mean*	SD	t-value
1. I know very little about jobs or careers in the FAS.			
Participants	2.12	.59	3.30'
Nonparticipants	2.75	.45	
2. Most FAS careers involve outdoor work in fields.			
Participants	1.92	.74	1.40
Nonparticipants	2.25	.45	
3. Biology and chemistry courses are not needed for most FAS careers.			
Participants	1.61	.57	3.43''
Nonparticipants	2.00	.00	
4. Growing up on a farm is necessary for FAS careers.			
Participants	1.53	.59	4.05'
Nonparticipants	2.00	.00	
5. I know someone who has a career in the FAS.			
Participants	2.54	.99	-2.23'
Nonparticipants	2.08	.29	
6. There are few businesses in Pennsylvania where I could have a professional career in the FAS.			
Participants	2.07	.74	.88
Nonparticipants	2.30	.48	
7. When I hear the words FAS, I usually think of farms with crops and animals.			
Participants	2.23	.77	1.10
Nonparticipants	2.50	.52	
8. When I hear the words FAS, I seldom think of laboratories with testing equipment.			
Participants	2.12	.65	1.79
Nonparticipants	2.50	.52	
9. FAS careers touch the lives of all people each day.			
Participants	3.35	.56	-3.11''
Nonparticipants	2.91	.29	
10. The U.S. is very dependent on people who work in the food and agricultural sciences.			
Participants	3.26	.53	-2.57''
Nonparticipants	3.00	.00	

\* Based on 1 = Strongly Disagree, 2 = Disagree, 3 = Agree and 4 = Strongly Agree Scale.

\*\* p < .05

minority students have about the food and agricultural sciences.

2. Colleges of agricultural sciences should create pre-college programs for ethnic minority students to deliver the desired knowledge and, if needed, change attitudes toward the food and agricultural sciences. Such programs should present the scientific nature of FAS careers so students become aware of the science courses needed to succeed in FAS majors. Also, such programs should occur early enough so students can complete the prerequisite courses during high school.
3. In addition to measuring attitudes, institutions conducting pre-college programs should track minority participants to determine if they pursue majors leading to FAS careers.

### References

Arrington, L.P. & Price, W.L. (1983). *Relationship of agricultural student satisfaction to selected student, school and program variables*. Gainesville, FL: University of Florida, Institute of Food and Agricultural Sciences, Department of Agricultural and Extension Education.

Borg, W.R. & Gall, M.D. (1989). *Educational research* (5th Ed.). White Plains, NY: Longman, Inc.

Bowen, B.E. (1987, December). A minority perspective on minorities in agriculture. *The Agricultural Education Magazine*, 60(6), 3-4.

Bowen, B.E. (1994, June). Reflections on the need for diversity: Desegregation vs. integration. *The Agricultural Education Magazine*, 66(12), 6-8.

Bowen, B.E. & Jackson, G.B. (1992). *Enhancing diversity in vocational education*. Columbus, OH: ERIC Clearinghouse on Adult, Career, and Vocational Education, Center on

Education and Training for Employment, The Ohio State University.

Bowman, M.L., & Bowen, B.E. (1987, August). Recruitment of minorities into natural resources at The Ohio State University. *Proceedings of the 1986 North American Association for Environmental Education Conference*, 15, 147-151 (J.M. Stone, Editor), Eugene, OR.

Bowman, M.L. & Shepard, C.L. (1985). Introducing minorities to natural resource career opportunities. *Ohio Journal of Science*, 85(1), 29-33.

Dolce, P.J. (1984). Attracting minority students to scientific careers. *CBE views*, 7(3), 15-18.

Fishbein, M. (1967). *Readings in attitude theory and measurement*. New York: John Wiley & Sons.

Fisher, T.S. & Griggs, M.B. (1995). Factors that influence the career development of African-American and Latino youth. *Journal of Vocational Education Research*, 20(2), 57-74.

Gardner, C.D. (1991). An early outreach initiative in agriculture. *NACTA Journal*, 25(2), 12-13.

Henson, W.L. (1988). Professional careers in agriculture: A harvest of opportunities. *The Black Collegian*, 46,47, 119, 120.

Hopeke, W.E. (1990). *Encyclopedia of careers and vocational guidance*. (Vol. 1 Industry Profiles, pp. 16-23). Chicago, IL: J.G. Ferguson Publishing Co.

Hunte, C.N. (1992). The African experience in agriculture. *Agriculture and Human Values*, 9(1), 11-14.

- Kennedy, J-J. & Bush, A.J. (1985). *An introduction to the design and analysis of experiments in behavioral research*. New York: University Press of America, Inc.
- Larke, Jr., A. & Barr, T.P. (1987, December). Promoting minority involvement in agriculture. *The Agricultural Education Magazine*, 60(6), 6-7.
- Murphy, G. & Likert, R. (1954). *Public opinion and the individual*, New York: Harper & Brothers.
- Norusis, M.J. (1990). *SPSSr Advanced Statistics Student Guide*. Chicago: SPSSr, Inc.
- Oliver, J.D. & Hinkle, D.E. (1981). Selecting procedures for agricultural education research. *Proceedings of the 8th Annual National Agricultural Education Research Meeting*, Atlanta, GA.
- Orthel, G.E., Sorensen, J.L., Lierman, S.R., & Riesenber, L.E. (1989). High school students' perceptions of agriculture and careers in agriculture. *Proceedings of the 16th National Agricultural Education Research Meeting*, 16, 149-155.
- Rawls, W.J. & Thomas, S. (1994). *Analysis of student educational levels on knowledge of and interest in clusters of work-traits related to selected food and agricultural science careers*. Summary of research series No. 3. Baton Rouge, LA: Southern University and A&M College, Department of Vocational Education.
- Remmers, H.H. (1954). *Introduction to opinion and attitude measurement*. New York: Harper and Brothers.
- Scanlon, D., Yoder, E., & Hoover, T. (1989). Enrollment trends in agricultural education programs and FFA membership. *Proceedings of the 16th Annual National Agricultural Education Research Meeting*, 16,335-342.
- Swanson, J.C. (1972). Beyond thoughts on knowledge and attitude effects upon behavior. *The Journal of School Health*, XIII (6), 363-365.
- Tuckman, B. W. (4th Ed.) (1994). *Conducting educational research*. Orlando, FL: Harcourt Brace Jovanovich, Inc.
- Vaughn, P.R. & Bowen, B.E. (1993). The Institute for Future Agricultural Leaders (IFAL), in B.E. Bowen (Ed.). *Enhancing Diversity in Agricultural Education*, University Park, PA: American Association for Agricultural Education, 38-42.
- Wiley, Z.Z., Bowen, C.F., & Bowen, B.E. (1995). Influence of a summer workshop on minority student knowledge of and attitude toward the food and agricultural sciences. *Proceedings of the 49th Eastern Agricultural Education Research Conference*, 49,46-53.