Attitudes of Mississippi Secondary Agricultural Science and Biology /Business Students Toward Information Technology

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Abstract

The purpose of this study was to determine the attitudes of secondary students enrolled in Agricultural and Environmental Science and Technology (AEST) programs and biology/business programs in Mississippi toward information technology. The population for the study consisted of 1,312 secondary students enrolled in Agricultural and Environmental Science and Technology (AEST) programs (N = 14) and Biology/Business programs (N = 14) from all geographical areas of Mississippi. Students had favorable attitudes toward information technologies. Information technology careers are exciting for everyone, including females and minorities. One does not need strong math skills or computer programming skills to be engaged in an IT career. Actively learning through the use of information technologies can help improve communication skills and develop marketable job skills. Females disagreed that IT jobs were only for males and individuals who possessed strong math skills. Caucasian students have an easier time completing their schoolwork because they have no problem accessing the Internet and feel comfortable using information technologies. Caucasian students enrolled in biology/business programs agreed that their parents think computers and information technologies are important subjects to learn. Teachers guiding AEST programs must be adequately prepared and skills in the use of information technologies if such programs are to be successful. Appropriate professional development opportunities should be provided to AEST teachers to keep them abreast of information technologies and their applications to agriculture. AEST programs should also develop career awareness opportunities for their students to promote information technology careers in agriculture.

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Introduction

Information Technology (IT) is a concept describing all aspects of managing and processing information. IT careers are based on computer technologies, the Internet, and networks concerned with creating, analyzing and accessing data for decision-making and problem solving. Information tools, such as personal computers and the Internet, are increasingly critical to economic success and personal advancement. The IT workforce is not just computer engineers and programmers, but individuals with a high skill level in information technologies. These careers require computer fluency--being able to interpret the information that technology makes available, understanding design concepts, and being a lifelong learner of technology that covers a wide range of subjects and careers other than computer science. Many IT workers design, develop, support and/or manage the IT systems found in careers related to agriculture. These applications range from record keeping, to making management decisions about fertilizer and pesticide applications, to determining livestock breeding programs, to using Global Positioning Systems (GPS) and Global Information Systems (GIS).

Individuals least likely access to technology is minorities living in rural communities. In Mississippi, twenty-five percent of the citizens live at or below the poverty level and nearly one in three children lives at or below the poverty level (US Census Bureau, 1998). However, Mississippi has the research and IT industry base, and public/private institutions to support information technology clusters (Mississippi Economic Council, 2000). Jackson, the state capital, has been recognized as a telecommunications hub for not only the state, but also the world (Doty, 2000). As a result, Mississippi can enhance the productivity of traditional industries and move toward a more competitive advantage within the region (Mississippi Economic Council, 2000). Such gains would be more attractive at the national level and could entice information technology businesses to locate in Mississippi, especially in rural areas. However, if Mississippi is to develop a competitive advantage in relation to IT, public school systems must educate and prepare students about information technologies.

Mississippi is a large, diverse state, with a vital agriculture industry making it a “major player” on the national and international scene. This fact, along with Mississippi’s information technology research and industry base, provided the impetus for the Mississippi State Department of Education to transform traditional “agriculture programs” into contemporary Agricultural and Environmental Science and Technology (AEST) programs with the latest agricultural science knowledge base and technological advancements during the late 1990s.

AEST introduces students to new technologies and instructional areas leading to careers in related industries. The curriculum is designed to start students with a broad knowledge base in agricultural production, food processing, plant genetics, environmental stewardship, and international trade. Subject matter areas are supported by a variety of information technologies required for accessing and analyzing information and solving problems. Emphasis is on an active learning environment enriched with technology and science based applications. The course serves as the entry-level course for the other courses in the AEST curriculum. The course consists of 13 units taught using computer modules and related activities. Students use the computers for obtaining instructional content, journaling, accessing World Wide Web sources, and submitting unit evaluations. Computers are used daily as an integral component of the

instructional program. Each unit explores current and emerging trends, technologies, and career opportunities associated with that unit. These programs are located in all areas of Mississippi, urban and rural, and have a significant percentage of females and minority students enrolled.

From an educational standpoint, information technologies have an effect on how people learn, what people know, and where people obtain knowledge and information (National Science Foundation, 2000). IT influences the creation of scientifically derived knowledge; how children learn in school; lifelong learning by adults; and the storage of a society's cumulative knowledge. IT can bring new information and types of instruction into the classroom; it can provide students with new tools for finding and manipulating information; and it can provide resources that are not available in a particular geographical area. All of this is dependent on the attitude individuals have toward information technologies and their impact on society.

Theoretical Framework

In the innovation-decision process individuals pass through a series of five stages when deciding whether or not to adopt a new product or innovation (Rogers, 1995). In the second stage individuals are to form an attitude toward the innovation. Fishbein and Ajzen (1975) refer to an attitude as a learned predisposition to respond in a consistently favorable or unfavorable manner with respect to a given object. An individual should already have knowledge and exposure to the innovation's existence. From that stage, individuals must be persuaded to form either a favorable or unfavorable attitude toward the innovation. In developing this attitude, individuals may mentally apply the new idea to their present or future situation before deciding whether or not to accept the innovation (Rogers, 1995). In this vicarious situation, individuals must think hypothetically and project the future to assist them with forward planning regarding the innovation. While the innovation may have a degree of uncertainty, individuals seeking to adopt a new innovation will want to know that their thinking is on the right track in comparison to their peers.

The main outcome should be the adoption or rejection of the innovation as long it is consistent with the attitude held (Rogers, 1995). This may not always be the case. While the formation of a favorable or unfavorable attitude may not lead to adoption or rejection respectively, the tendency is for attitudes and actions to become more consistent over time. Attitudes may also not be converted into action because communication channels used to help adopters make their decision are not utilized effectively.

Though the literature is void with respect of attitudes towards information technologies, numerous studies report attitudes towards computers and technology careers, which are a vital component of the information technology picture. Having an understanding of students' knowledge and attitudes are necessary and prerequisite to effective teaching about technology (Bame, Dugger, deVries, & McBee, 1993). However, it may be difficult for students to express their attitude towards technology because they may have neither an accurate nor a complete knowledge of such technology.

Secondary school students have mixed attitudes towards certain aspects of information technology. Houtz and Gubta (2001) found that 38 percent of Nebraska highs school students

had little or no interest in pursuing an information technology career. Sixty two percent had at least some interest in an IT career although only 9 percent indicated they were very interested. In a study by Bame, Dugger, deVries, and McBee (1993), 60 percent of males thought they would chose a technological profession while 66 percent of females said they would not seek a technological career.

Males are more interested in pursuing an IT or technology career than their female peers (Houtz & Gubta, 2001; Ratt & deVries, 1985) even though girls believe that technological fields are appropriate for both genders (Ratt & deVries, 1985). Furthermore, males also felt more confident in their ability to acquire the necessary technology skills (Houtz & Gubta, 2001). Brunner and Bennett (1987) and Ratt and deVries (1985) found that young women often feel they are not suited for technological careers because they are not whole-heartedly "for" technology.

Canada and Brusca (1991) discovered males expressed more interest in computers, less anxiety about mastering computers, a stronger belief that computer skills lead to respect from parents and peers, and a stronger belief that women cannot be as skilled with computers as men. Females with computer programming experience expressed similar levels of computer interest, self-confidence, and beliefs in gaining respect from computer mastery. Females also disagreed with the belief that women cannot be as skilled with computers as men. Attitudinal differences disappeared when both males and females had at least one class in computer programming.

Students who have enrolled in technology education programs and encountered a positive educational experience have developed favorable attitudes toward technology and the pursuit of technological careers (Ratt & deVries, 1985). Such results did occur in the Bosser, Palmer, and Daugherty (1998) for students who enrolled in a nine-week technology education course. It is hoped that AEST programs in Mississippi can have the same impact on the students who enroll in such courses to prepare individuals with the knowledge and skills to pursue careers in the information technology workforce.

In agricultural education, the literature is void of studies about the use and attitudes of computers by high school students. Numerous studies exist examining uses skills needed by and attitudes of computers at university settings by college students and faculty members or by secondary agriculture teachers. Monk, Davis, Peasley, Hillman, and Yarbrough (1996) recommended in their report that university students should be comfortable with computer and information technologies so they can develop new computer skills throughout their careers, implying computer skills and information technology skills are directly related to career success. A study by Kotrlik, Redmann, Harrison, and Handley (2000) focused on information technology professional development opportunities of Louisiana agriscience teachers and found that while teachers value information technology, they places less reliance on information technology training offered in university settings. Furthermore, these teachers, while having computers in their classrooms, really do not have all of the latest information technologies available, especially multimedia devices and electronic mail.

Purpose and Objectives

The purpose of this study was to determine the attitudes of secondary students enrolled in Agricultural and Environmental Science and Technology (AEST) programs and biology/business programs in Mississippi toward information technology. In addition, the study sought to determine the differences between selected student demographic characteristics and their attitudes toward information technology. Specifically, the objectives were:

1. To identify secondary students' level of agreement with statements regarding their attitudes toward information technology.
2. To determine relationships between selected demographic characteristics and secondary students' attitudes toward information technology.

Methods and Procedures

The population for the study consisted of 1,312 secondary students enrolled in either Agricultural and Environmental Science and Technology (AEST) programs (N = 14) or Biology/Business programs (N = 14) from all geographical areas of Mississippi. A census of all students from these 28 programs was used in the study.

During Spring Semester 2001, letters were sent to all 14 AEST teachers explaining the purpose of the study and outlining their duties related to the research project. Researchers visited each school and met with the teacher and administrator to discuss the project. The required procedures for the study were discussed and questions were answered. During this meeting AEST teachers and their administrators were asked to identify biology/business programs from a neighboring school district based on demographic characteristics, such as school size, ethnic makeup and school programs. Biology and business programs were used because the knowledge base and/or program content of these programs was similar to the knowledge base and program content of AEST programs. Biology/business teachers and administrators from these schools were contacted and asked to participate in the project. After meeting with the biology or business teachers and their administrators to explain the purpose of the study and outline their duties, all 14 biology/business programs agreed to participate in the study.

Data were collected through a questionnaire developed by the researchers. The questionnaire consisted of six parts. The part of the questionnaire used to collect data on students' attitudes toward information technology consisted of 23 statements. Students rated the 23 statements on a Likert-type scale as (1) Strongly Disagree, (2) Disagree, (3) Agree or (4) Strongly Agree to identify their attitude towards information technology. Students could also indicate they had no opinion towards each statement.

AEST and biology/business teachers agreeing to allow their classes to participate in the project checked the questionnaire for content validity. Teachers reviewed and edited the proposed instrument. Teachers also added and/or deleted items, recommended more appropriate wording, and suggested an appropriate instrument format. Final decisions were made by group consensus. Teachers also recommended procedures for data collection and suggested placing survey instruments on-line to expedite the data collection process. Face validity and reliability

of this part of the questionnaire were determined though a pilot test on state officer candidates attending the state FFA convention and re-administered at the state leadership conference. A test-retest reliability coefficient measuring .59 for this section of the instrument was calculated. Even though the reliability coefficient was low, such reliability coefficients are acceptable according to the recommendations by Nunnally and Bernstein (1994) for instruments that are developed and used for the first time.

Teachers were instructed to collect data between September 10 and September 21, 2001. Schools on block scheduling also collected data again in January 2002 for new students enrolling the respective AEST/biology/business courses. Seventeen of the 28 teachers utilized the online instruments and had their students complete the instruments on-line. The remaining 11 teachers were supplied with scanable instruments for data collection. AEST teachers surveyed all students enrolled in the Concepts of Agriscience Technology course while biology/business teachers surveyed introductory classes made up of 9th and 10th grade students.

Data were summarized using descriptive statistics. Frequencies, percentages, means, and standard deviations were used to describe demographic characteristics and attitudes towards information technology. The Chi square test for independence was used to determine if significant differences existed (alpha = .05) between selected demographic characteristics and attitudes toward information technology. Cramer's V was used to describe the magnitude of significant relationships.

Results

A census of 1,312 secondary students from 14 AEST programs and 14 biology/business programs in Mississippi were surveyed. From the population, 1,063 students completed the survey instrument, yielding an 81 percent response rate. Fifty two percent of those who responded to the instrument were male while 48 percent of the respondents were female. The research was designed to focus on students in the 9th and 10th grades. The majority of those who participated were 9th graders (53 percent) and 32 percent were 10th graders. Another 10 percent were in the 11th grade with only 5 percent in the 12th grade. Caucasians comprised 55 percent of the participants while African Americans comprised 42 percent. Hispanic Americans, Asian Americans, and individuals reporting to be of mixed ethnicity comprised the remaining 3 percent.

Attitudes Towards Information Technology

Respondents indicated how much they agreed or disagreed with a list of 23 Likert-type statements regarding their attitudes toward information technology. Their responses are presented in Table 1. Seventeen statements had a modal response category of "Agree." Three statements had a modal response category of "Strongly Disagree" while 2 statements had a modal response category of "Disagree." Once statement was bimodal, having equal responses on "Agree" and "Strongly Agree."

In this discussion, only statements with modes that included 50% or more of the responses will be discussed. Students agreed that "My information technology skills are

adequate for me to complete my schoolwork," (56%) and "As a result of using information technologies, my communication skills have gotten better" (50%). Students strongly disagreed with the statement " I think information technology careers are just for males" (59%).

Relationships By Gender

Significant relationships between gender and attitudes toward information technology, as determined by Chi square analyses, are reported in Table 2. All relationships were low (Cramer's V = .10 to .28) according to Davis' (1971) descriptors. Females indicated disagreement with the statements "I think information technology careers are just for males", "Information technology careers are only available to people with really good math skills", "I dislike working with information technologies", "An information technology career means only working with a computer" and "Information technology careers are boring".

Males and females tended to equally agree that "If more people used e-mail, our world could save valuable resources", "As a result of using information technologies, my communication skills have gotten better", "Careers in the information technology field sound exciting", "My parents think computers and information technologies are important subjects to learn", and "Using information technologies helps me develop marketable job skills".

Table 1
Mississippi High School Students' Attitudes Towards Information Technology (N = 1,063)

Statements Regarding Information Technology	Percentage				
	NO[a]	SD[a]	D[a]	A[a]	SA[a]
My information technology skills are adequate for me to complete my schoolwork.	13	3	8	56	20
I think information technology careers are just for males.	9	59	25	4	3
Completing my schoolwork with information technologies is easier than using paper and pencil.	10	6	16	43	25
Ethnic minorities could be very successful in an information technology career.	26	7	12	42	13
My community depends on information technology to conduct business daily.	17	7	16	45	15
I received enough instruction about the Internet before completing class assignments.	12	8	18	45	17
An information technology career means working only with a computer.	11	22	42	19	6
If more people used e-mail, our world could save valuable resources.	19	10	21	34	16
Information technology careers are boring.	16	27	36	15	6
I have no trouble accessing the Internet from my home.	12	11	14	32	31
Information technology careers are only available to people with really good math skills.	11	36	33	14	6
As a result of using information technologies, my communication skills have gotten better.	13	7	14	50	16
I have no trouble using e-mail programs.	8	10	12	35	35
Careers in the information technology field sound exciting.	14	7	18	44	17
I have no trouble accessing the Internet from my school.	9	8	17	40	26
I would like to find a job that allows me to use information technology on a daily basis.	17	9	21	36	17
My parents think computers and information technologies are important subjects to learn.	15	7	13	39	26
Information technology jobs do not mean you have to be a computer programmer.	13	7	12	47	21
Using information technologies helps me develop marketable job skills.	16	7	15	46	16
Learning with information technologies is more enjoyable than learning through traditional classroom instruction.	15	8	15	38	24
I am comfortable when using information technologies.	11	6	15	45	23
I dislike working with information technologies.	15	34	29	16	6
Females should look for information technology jobs.	25	10	11	34	20

[a] *NO = No Opinion, SD = Strongly Disagree, D = Disagree, A = Agree, SA = Strongly Agree*

Table 2
Relationship Between Gender[1] and Attitudes Toward Information Technology

Statement	Coefficient	Strength
I think information technology careers are just for males.	.28	Low
An information technology career means working only with a computer.	.17	Low
If more people used e-mail, our world could save valuable resources.	.11	Low
Information technology careers are boring.	.19	Low
Information technology careers are only available to people with really good math skills.	.18	Low
As a result of using information technologies, my communication skills have gotten better.	.10	Low
Careers in the information technology field sound exciting.	.10	Low
My parents think computers and information technologies are important subjects to learn.	.10	Low
Using information technologies helps me develop marketable job skills.	.10	Low
I dislike working with information technologies.	.14	Low

[1] *1 = Male, 2 = Female*

Differences By Ethnicity

Significant relationships between ethnicity and attitudes towards information technology, as determined by Chi square analyses, are reported in Table 3. All relationships were low (Cramer's V = .10 to .16) according to Davis' (1971) descriptors. Caucasians indicated agreement with the statements "Completing my schoolwork with information technologies is easier than using paper and pencil", "If more people used e-mail, our world could save valuable resources", "Careers in the information technology field sound exciting", "I would like to find a job that allows me to use information technology on a daily basis", "My parents think computers and information technologies are important subjects to learn", "I am comfortable when using information technologies", and "Females should look for information technology jobs", "I have no trouble accessing the Internet from my home", and "I have no trouble using e-mail programs". Caucasians indicated disagreement with the statement "Information technology careers are only available to people with really good math skills".

Table 3
Relationship Between Ethnicity and Attitudes Towards Information Technology

Statement	Coefficient	Strength
Completing my schoolwork with information technologies is easier than using paper and pencil.	.10	Low
If more people used e-mail, our world could save valuable resources.	.12	Low
I have no trouble accessing the Internet from my home.	.13	Low
Information technology careers are only available to people with really good math skills.	.10	Low
I have no trouble using e-mail programs.	.16	Low
Careers in the information technology field sound exciting.	.11	Low
My parents think computers and information technologies are important subjects to learn.	.14	Low
I am comfortable when using information technologies.	.11	Low
Females should look for information technology jobs.	.14	Low

[1]*1 = Caucasian, 2 = Minority*

Differences By Program Type

Significant relationships between program and attitudes towards information technology, as determined by Chi square analyses, are reported in Table 4. All relationships were low (Cramer's V = .10 to .13) according to Davis' (1971) descriptors. Students enrolled in biology/business programs indicated disagreement with the statements "I think information technology careers are just for males", "Information technology careers are only available to people with really good math skills", "I dislike working with information technologies", and "An information technology career means working only with a computer". Biology/business students indicated agreement with the statement "Information technology jobs do not mean that you have to be a computer programmer". Both groups indicated equal agreement on the statements "As a result of using information technologies, my communication skills have gotten better", "My parents think computers and information technologies are important subjects to learn", "I am comfortable when using information technologies", and "Females should look for information technology jobs".

Table 4
Relationship Between Program Type and Attitudes Towards Information Technology

Statements	Coefficient	Strength
I think information technology careers are just for males.	.16	Low
An information technology career means working only with a computer.	.11	Low
Information technology careers are only available to people with really good math skills.	.13	Low
As a result of using information technologies, my communication skills have gotten better.	.11	Low
My parents think computers and information technologies are important subjects to learn.	.11	Low
Information technology jobs do not mean you have to be a computer programmer.	.10	Low
I am comfortable when using information technologies.	.10	Low
I dislike working with information technologies.	.10	Low
Females should look for information technology jobs.	.10	Low

[1]*1 = AEST Program, 2 = Biology/Business Program*

Conclusions and Recommendations

Overall, students agree with a majority of the statements regarding their attitudes toward information technologies. Students agree that it was easier to complete their schoolwork using information technologies, that minorities and females should look for and can be successful in information technology careers, and that their communication skills have gotten better through the use of information technologies. Students have no problem securing Internet access, either at home or at school, and have no problem using e-mail programs. While students are comfortable in using information technologies, they believe IT careers are exciting and not boring, are not solely for males, and are not only for people with good math skills or computer programming skills. Students would like to find a job that requires the use of information technologies.

Findings from this study are congruent with those from Canada and Brusca (1991) and Ratt and deVries (1985) that females believe they can be just as skilled and successful as males in information technology careers. While Canada and Brusca (1991) found that males had more interest in and less anxiety about computers, this study found that females disagree that information technology careers are only for males. However, even though females agreed with that statement and believe such careers are exciting, the researchers cannot determine from this study if females would seek such a career. Further research is needed to determine if females would seek information technology careers.

While Houtz and Gubta (2001) found that high school students had little or no interest in pursing an information technology career, this study found that students agree that they wish to find a job that allows them to use information technologies on a daily basis. Furthermore, students in this study believed females should seek information technology jobs, a difference of opinion in what Bame, et. al. found when females said they would not seek information technology careers. AEST teachers should identify businesses within their communities that

require the use of information technologies on a daily basis and plan instructional activities geared at preparing students for job opportunities within the local community.

With data in this study being collected at the beginning of a course and/or semester, it is difficult to ascertain if enrolling in the AEST program helped students develop a favorable attitude towards information technologies and agricultural careers employing the use of information technologies like the AEST program is designed to do. Biology/business students having stronger levels of agreement or disagreement with statements regarding information technology evidence this. Data collected at the end of the course and/or semester will be a better indicator of whether or not the AEST program is reaching the goals it established.

Remembering what Bame, Dugger, deVries, and McBee (1993) say about understanding the attitudes of students as a prerequisite to effective teaching, what can agricultural educational professionals do to further promote IT careers in agriculture? Secondary agriculture teachers must be comfortable with the use of information technologies, as stated by Kotrlik, et. al. (2000). These teachers will be the individuals who will help secondary school students develop basic information technology skills needed to progress in agricultural careers, supporting the research by Monk, et. al. (1996) that students need to be comfortable with computer and information technology skills. Research should be conducted to determine teachers' skill levels and comfort with using information technologies and appropriate professional development opportunities should be developed to equip these teachers with the requisite skills needed to use and demonstrate information technologies with their students.

Parental and community input should be utilized when planning educational experiences for students to help them gain exposure to IT careers and the technologies available within the community. This can mean developing career awareness opportunities though career days or job shadowing experiences through a student's supervised agricultural experience program. Particularly, females and minorities employed in IT careers should be involved in such projects as we try to increase the number of females and minorities employed in the information technology workforce.

To lay the foundation for preparing students with favorable attitudes toward information technology, the agricultural education profession needs to understand the impact of information technology in agriculture. Research should be conducted to determine specific applications of information technology in agriculture. Furthermore, once these applications are identified, professional development workshops should be conducted for agricultural education teachers to help them understand and practice information technology applications in Mississippi.

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