The Digital Divide: Gender and Racial Differences in Information Technology Education

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The purpose of this study was to examine gender and racial differences in access to and participation in information technology education among undergraduate students. A sample of 310 students completed a background questionnaire, Computer Self-Efficacy Scale, and Sources of Computer Self-Efficacy Scale. Significant differences were found in the completion of information technology courses at the secondary and postsecondary education levels. In the present study, men reported a higher level of computer self-efficacy for beginning and file/software management skills than women did. Women reported receiving less encouragement (social persuasion) and having more computer anxiety (affective states) than men did. White students reported more confidence in their beginning and file/software management skills than did African American students. A significant race difference did not exist for the perceived importance of information technology to education or career.

One of the most widely publicized dilemmas of the Information Age is the perceived gap between the information haves and have-nots, knowers and know-nots, doers and do-nots—often referred to as the digital divide (Compaine, 2001; Tapscott, 1998). Acquisition of fundamental information management tools and skills are essential to participate fully in the digital workforce (Tapscott, 1996, 1998). Limited opportunities and low perceived efficacy in information technology activities decreases interest in acquiring information technology competencies needed for success in technology-oriented education and work environments.

Although information technology has become an integral part of education and work arenas, women and minorities remain underrepresented in higher status, technological occupations. In 1986, McInerney and Park identified the following barriers to women's participation in information technology that may still be prevalent today: sex role socialization, lack of adequate role models, teachers' assumption that girls are not interested in information technology, and the perception of information technology as being a *male* subject. The cultural bias that information technology is a male domain is still prevalent (Butler, 2000; Lage, 1991). According to the 1998 American Association of University Women (AAUW) Educational Foundation report entitled "Gender Gap: Where Schools Still Fail Our Children," technology is the new "boys club" in our nation's public schools. The report also stated that boys program and problem solve with computers while girls use computers for word processing, the 1990's version of typing (American Institutes for Research, 1998).

Minority groups share similar barriers to information technology use, such as the lack of role models, unconscious stereotyping, false perceptions of interest, and limited access to computers (Edwards, 1991; Malveaux, 2000; McInerney & Park, 1986; Resta, 1992; Sadker, 1999). The 2000 U.S. Commerce Department's National Telecommunications and Information Administration report entitled "Falling through the Net IV: Toward Digital Inclusion" found that White households are more likely (55.7%) to own a computer in comparison to African American (32.6%) households. The gap in computer ownership between Whites and African Americans had not changed since the 1998

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"Falling Through the Net II" study. White households (46.1%) are twice as likely to have Internet access in comparison to African American (23.5%) households. According to the 2000 study, the Internet access gap has widened, up 15% from the 1998 study.

A U.S. Census Bureau report prepared by E. C. Newburger, issued in September 2001 entitled, "Home Computers and Internet Use in the United States: August 2000" reported that an average of 51% of all American households had one or more computers and 41.5% of the households that had computers had at least one member using the Internet. According to the report, only 37% of African American households reported computer ownership compared to 57.7% of White households and only 20.5% of African-American households reported having Internet access at home in comparison to 39.5% of White households.

In contrast to prior studies, Compaine (2001) suggested that the gender and racial differences in ownership, access, and use of information technologies, known as the digital divide, is disappearing. According to a 2001 U.S. Census Bureau report, computer usage among students between the ages of 6 and 17 is nearly equal across different income, race, or ethnic groups (Newburger, 2001). Although the education environment appears to contribute to equitable availability of computers, several pertinent questions remain unanswered. One major question is whether or not access to and participation in information technology education is equal among undergraduate students.

Purpose of Study

Due to the conflicting reports about the digital divide, this study sought to confirm the pervasiveness of the digital divide among undergraduate students. The purpose of the study was to examine gender and racial differences in access to and participation in information technology courses at the secondary and postsecondary levels of education. The study also sought to determine the perceived importance of information technology to education and career endeavors. Finally, the study was designed to extend research on gender and racial differences in computer self-efficacy beliefs. Information obtained from this study will help educators identify information technology inequities. Using an undergraduate student population, this study sought answers to the following research questions:

1. Is there a gender difference in the number of information technology courses taken at the secondary education level?
2. Is there a racial difference in the number of information technology courses taken at the secondary education level?
3. Is there a gender difference in the number of information technology courses taken at the postsecondary education level?
4. Is there a racial difference in the number of information technology courses taken at the postsecondary education level?
5. Is there a gender difference in the perceived importance of information technology to a) education and b) career?
6. Is there a racial difference in the perceived importance of information technology to a) education and b) career?
7. Is there a gender difference in computer self-efficacy beliefs?
8. Is there a racial difference in computer self-efficacy beliefs?

Review of Literature

The literature review is composed of three sections. The first section highlights studies that have focused on gender differences in the use of information technology. The second section is an overview of studies that have examined racial differences in the use of information technology. The third section details studies related to computer self-efficacy perceptions.

Gender Differences

Young (2000) used five factors associated with computer attitudes—confidence, perception of computers as a male domain, positive and negative teacher attitudes, and perceived usefulness of computers—to measure gender

differences among 462 middle and high school students. Men reported more confidence with computer technology and the perception that computer technology is a male domain. Women in the study rejected the perception that technology was a male domain. Women reported receiving more encouragement from teachers than men; however, encouragement from teachers did not lead to more confidence or a greater sense of the importance of computer technology to their future.

Ray, Sormunen, and Harris (1999) used an attitudes inventory to assess gender differences in a) the value of technology productivity, b) the impact of technology on people and work environments, and c) the comfort level when using computer technology. The study found that women possessed a more positive attitude toward the value of computers to productivity. Women were more positive about the impact of computers on people and their work environment and displayed a greater level of comfort with technology than men.

Harrison, Rainer, and Hochwarter (1997) examined gender differences in computer-related activities among salaried personnel of a large university. Men had significantly more computer experience, less computer anxiety, and significantly higher computer self-efficacy than women. Men reported more successful computer-related outcomes than women in all organizational occupations except clerical. The findings suggest the differences between women and men may be due to sex-role socialization.

At the end of an undergraduate computer course, Busch (1995) found no gender differences in perceived self-efficacy regarding completion of word processing and spreadsheet software programs. No gender differences were found in computer attitudes or self-efficacy regarding simple computer tasks. Men, however, reported receiving more encouragement to master computer skills through social persuasion than women.

Racial Differences

Hoffman, Novak, and Schlosser (2001) conducted an extensive research study that analyzed several demographic patterns of computer ownership and Internet access. A large amount of demographic data compiled between 1997 and 1998 was compared at three different times. Analysis of data collected during the last collection period in the spring of 1998 showed that among students without a home computer, 78.76% of the White students in comparison to 61.90% of the African American students had current access to the Internet. Among students with a home computer, 95.30% of the White students had current Internet access in contrast to 86.19% of the African American students. One of the most interesting findings was the difference between computer ownership among college graduates. Only 43.60% of African American college graduates owned a computer in comparison to 70.21% of White college graduates. There was also a dramatic difference in Internet access and usage between White and African American college graduates; while 75.78% of Whites reported current Internet access, only 58.34% of the African Americans reported current access. Only 53.49% of the African American college graduates in contrast to 70.18% of the White college graduates had used the Internet.

Hawkins and Paris (1997) examined differences in the use of and familiarity with information technology between African American and White undergraduate students. The major findings were that African American students entered college with fewer information technology skills, African American students were less familiar with computers, differences in computer usage and familiarity were not minimized by exposure while in college, and institutional factors possibly contributed to the differences.

Computer Self-efficacy

Computer self-efficacy refers to a judgment of one's capability to use a computer. Computer self-efficacy is an important personal trait that influences an individual's decision to use computers (Compeau & Higgins, 1995). Computer competence gained through enactive mastery experiences contributes to an individual's judgment of self-efficacy for computer related tasks. Exposure to computers alleviates anxiety,

possibly increasing interest and confidence. Experience alone will not heighten computer self-efficacy (Campbell & Williams, 1990); the four sources of self-efficacy, vicarious experiences, social persuasion, and physiological/affective states interact with enactive mastery experiences to modify computer self-efficacy beliefs.

Zhang and Espinoza (1998) examined the relationships among computer self-efficacy, attitudes toward computers, and desirability of learning computing skills among undergraduate students. Their findings revealed computer self-efficacy could be predicted by affective states. Attitudes toward computers, specifically the students' affective states, were correlated with computer self-efficacy. Computer self-efficacy was a significant predictor of desirability to learn computer skills. Zhang and Espinoza concluded that a lower sense of self-efficacy with advanced computer skills leads to increased motivation to learn information technology.

METHOD

This section discusses the participant demographics, study instruments, the research procedures, and data analysis.

PARTICIPANTS

The participants were 310 (153 women and 157 men) undergraduate students at a large Midwest university. Students ranged in age from 18 to 26 with a median age of 19.14. The racial composition was 65.5% (n=203) White and 34.5% (n=107) African American. The largest number of the students were 140 sophomores (45.2%), followed by 89 freshmen (28.7%), 45 juniors (14.5%), 33 seniors (10.6%), and 3 non-responses (1%). A majority of the students, 65.8% (n=204), had taken an information technology course in high school.

INSTRUMENTS

A two-page background questionnaire measured demographic characteristics (gender, age, race, and grade classification). The background questionnaire also included seven questions about computer education (access), ownership, usage, and the importance of information technology. Students responded to two questions regarding information technology courses completed at the secondary and postsecondary level. Three questions were asked in reference to course availability, computer ownership, and time spent using a computer. Students responded to two questions about the importance of information technology to their education and career.

To assess computer self-efficacy, this study used Torkzadeh and Koufteros' (1994) Computer Self-Efficacy Scale (CSES). The 30-item CSES measures self-perception of information technology skills and knowledge. Each item on the scale was preceded by "I feel confident" and was rated on a 5-point Likert-type response format (1=strongly disagree and 5=strongly agree). High scores indicated a high degree of confidence in one's ability to use computers. Torkzadeh and Koufteros produced a four-factor scale to measure beginning computer skills, mainframe computer skills, advanced computer skills, and file management and software skills. The alpha reliabilities for the four empirically derived factors were .94, .96, .90, and .91, respectively. In the present study, Cronbach alpha reliabilities were .96, .96, .91, and .93, respectively for the four scale factors. Confirmatory factor analysis produced factor loadings of .50 or above for all the items in the scales, demonstrating discriminant validity.

The perceived sources of computer self-efficacy were assessed with a 37-item measure. The instrument, originally developed by Lent, Lopez, and Bieschke (1991) and designed to measure mathematics self-efficacy sources, was modified by the investigator substituting information technology terminology for mathematics terminology. The Sources of Computer Self-Efficacy Scale (SCSE) consisted of four subscales corresponding to the four sources of self-efficacy (mastery experiences, vicarious learning, social persuasion, and affective states) described by Bandura (1986, 1995, 1997). The mastery experiences, vicarious learning, and social persuasion subscales consisted of 9 items, and the affective states subscales consisted of 10 items. Sample items included "I got a high grade

in my last computer class (Mastery Experiences Scale), "Many of the adults I admire use computers" (Vicarious Learning Scale), "My parents have encouraged me to take information technology courses" (Social Persuasion Scale), and "I'm nervous when using a computer" (Affective States Scale). Students responded by indicating their level of agreement with each statement on a 5-point Likert scale ranging from strongly disagree (1) to strongly agree (5). This study produced a Cronbach alpha of .89 for the Mastery subscale, .75 for the Vicarious Learning subscale, .86 for the Social Persuasion subscale, and .90 for the Affective States subscale. Confirmatory factor analysis produced factor loadings of .40 or above on all the items in the scale, showing discriminant validity.

Data from the background questionnaire were used to analyze research questions one through six. Research questions one through four required students to use a "yes" or "no" response format to answer "Did you take an information technology course in high school?" and "Have you taken an information technology course while in college?" Students were also asked to indicate the number of courses taken at the secondary and postsecondary level. A list of course titles was provided and students were instructed to check all the courses they had taken at each level. Research questions five and six required students to use a 10-point Likert scale response format to answer "How important is information technology to your a) education and b) career?" The Computer Self-Efficacy Scale and the Sources of Computer Self-Efficacy Scale were used to analyze questions seven and eight.

PROCEDURE

Pilot Study. A sample of 90 students (35 women and 55 men) enrolled in two sections of an introductory information technology course during the spring 2000 semester at a Midwest university constituted the pilot study. They were predominantly White (88%), African Americans (8%), Hispanic American (2%), Asian American (1%), and others (1%) made up the remaining portion of the sample. Based on confirmatory factor analysis of the Sources of Computer Self-Efficacy Scale, three items were dropped from the scale. Pilot study results revealed a significant difference between White and Non-white students in the number of information technology courses taken at the secondary and postsecondary education level.

Data Collection. The survey data were collected in 2001 at a large Midwest university. All students completed a research packet that consisted of the following: an introduction letter detailing the study purpose and instructions, a consent form, a background questionnaire, the Computer Self-Efficacy Scale, and the Sources of Computer Self-Efficacy Scale. Research packets were sent to 1,000 students who resided on a university campus with a 95% White and 5% African American student population. In an effort to obtain a racially balanced sample, I requested the names and on-campus addresses of 500 White and 500 African American students from the registrar's office after internal review board approval. Members of other underrepresented groups were not included in the study due to the negligible percent of on-campus students. The students were divided equally by grade classification (freshmen, sophomores, juniors, and seniors); from each grade classification, 125 White and 125 African Americans were randomly selected for participation. After one follow-up postcard, 40.6% (n=203) of the White students and 21.4% (n=107) of the African American students returned useable research packets.

DATA ANALYSIS

Data collected from the background questionnaire about course availability, computer ownership, and usage were analyzed. No statistically significant difference between the White and African American students was found for access to computer courses. Ninety-six percent of the students stated that information technology courses were offered at the secondary level. A statistically significant difference was found for computer ownership. Seventy-one percent of the White students owned a computer in comparison to 42% of the African American students. A statistically significant difference was found in the

number of hours spent each week working on a computer. Over 54% of the White students spend two to four hours each week working on a computer compared to only 31% of African American students.

RESULTS

To determine if gender and racial differences existed in information technology education at the secondary level, a chi-square analysis was conducted for the first and second research questions. The chi-square analysis for the first research question showed a significant gender difference at the .01 level with a Pearson chi-square of 6.62. Over 72% of the men took an information technology course in high school in comparison to 58.1% of the women. The chi-square analysis for the second research question resulted in a significant racial difference at the .001 level with a Pearson chi-square of 41.42. Findings revealed that 73.1% of the White students in comparison to only 39.4% of the African-American students had taken an information technology course in high school.

An examination of gender differences by race in information technology courses taken at the secondary level revealed that a significant difference existed for women ($X^2=35.59$, df=1, p=.000). Only 30.8% of African American women took an information technology course in high school in comparison to 79.5% of the White women students. At the .05 level, a significant difference existed for men ($X^2=3.66$, df=1, p=.05). In contrast to 58.6% of the African American men, 76.3% of the White men took an information technology course in high school. See Table 1.

A chi-square analysis was conducted to determine if gender and racial differences existed in information technology education at the postsecondary level. The chi-square analysis for the third research question showed a significant gender difference at the .01 level with a Pearson chi-square of 6.65. Over half (59.2%) of the women and 76.9% of the men had taken an information technology course at the postsecondary level. The chi-square analysis for the fourth research question resulted in a significant racial difference at the .001 level with a Pearson chi-square of 40.63. Findings revealed that 78.1% of the White students in comparison to 46.8% of the African American students had taken an information technology course at the postsecondary level.

An examination of gender differences by race in information technology courses taken at the postsecondary level was performed. At the .001 level of significance, a significant difference existed for women ($X^2=29.69$, df=1, p=.000). Only 38.5% of African American women had taken an information technology course at the postsecondary level in comparison to 75.9% of the White women students. At the .05 level, a significant difference existed for men ($X^2=2.54$, df=1, p=.05). In contrast to 65.5% of the African American men, 79.7% of the White men had taken an information technology course at the postsecondary level.

The fifth research question asked if there were gender differences in the perceptions of information technology importance to education and career. An independent *t*-test for means revealed that the mean score for perceived importance to education for women ($M=8.72$,

Table 1. Information Technology Course Taken at the Secondary Level for Gender by Race

Gender		Race		Total	X^2 (1)
		African American	White		
Women	Yes	20 30.8%	66 79.5%	86 58.1%	.000**
	No	45 69.2%	17 20.5%	62 41.9%	
Total		65 100.0%	83 100.0%	148 100.0%	
Men	Yes	17 58.6%	90 76.3%	107 72.8%	.05*
	No	12 41.4%	28 23.7%	40 27.2%	
Total		29 100.0%	118 100.0%	147 100.0%	

* $p < .05$ ** $p < .01$

Table 2. Information Technology Course Taken at the Postsecondary Level for Gender by Race

Gender		Race		Total	X^2 (1)
		African American	White		
Women	Yes	25 38.5%	63 75.9%	88 59.5%	.000**
	No	40 61.5%	20 24.1%	60 40.5%	
Total		65 100.0%	83 100.0%	148 100.0%	
Men	Yes	19 65.5%	94 79.7%	113 76.9%	.05*
	No	10 34.5%	24 20.3%	34 23.1%	
Total		29 100.0%	118 100.0%	147 100.0%	

* p < .05 ** p < .01

SD=.82) was significantly higher than the mean score for men (*M*=8.41, *SD*=1.19), *t*(308)=2.67, (*p*<.01). Similar results were indicated for perceived importance to career; women (*M*=8.68, *SD*=.89) indicated a higher mean score than men (*M*=8.34, *SD*=1.22), *t*(308)=2.80, (*p*<.01).

The sixth research question asked if there were racial differences in the perceived importance of information technology to education and career. A significant racial difference did not exist for perceived importance to education or career.

To examine gender differences in computer self-efficacy among undergraduate students, an independent *t*-test was performed to test the seventh research question. Analysis of the Computer Self-Efficacy subscales revealed significant gender differences for beginning and file/software management skills. For beginning skills, men reported a higher mean score than women, *t*(296)=2.09, (*p*<.05). Men indicated a higher mean score for file/software management skills than women, *t*(295)=2.54, (*p*<.01). A significant gender difference existed for two of the Sources of Computer Self-Efficacy subscales. Men reported a higher mean score for social persuasion, *t*(308)=2.33, (*p*<.05), while women indicated a higher mean score for affective states, *t*(308)=2.08, (*p*<.05).

For the eighth research question an independent *t*-test was performed to test racial differences in computer self-efficacy. Table 6 provides the results of the independent *t*-test from the Computer Self-Efficacy subscales that indicated a significant difference for beginning and file/software management skills. For beginning skills, Whites reported a higher mean score than African Americans, *t*(297)=5.04, (*p*<.01). White students indicated a higher mean score for file/software management skills than African Americans *t*(296)=2.99, (*p*<.01). The analysis also revealed a significant difference for three of four Sources of Computer Self-Efficacy subscales. At the .01 level, the mastery experiences, vicarious learning, and social persuasion variables resulted in significant racial differences. White students indicated a higher mean score for mastery experiences,

Table 3. Independent t-Tests for Gender Differences in Information Technology Importance

	Women		Men		
Variable	M	SD	M	SD	t(308)
Important to Education	8.72	.82	8.41	1.19	2.67**
Important to Career	8.68	.89	8.34	1.22	2.80**

Note: 153 Women and 157 Men
* p<.05 **p<.01

Table 4. Independent t-Tests for Racial Differences in Information Technology Importance

	African American		White		
Variable	M	SD	M	SD	t(308)
Important to Education	8.62	1.03	8.54	1.04	.66*
Important to Career	8.55	1.16	8.50	1.04	.33

Note: 107 African American and 203 White
* p<.05

Table 5. Independent t-Test for Computer Self-Efficacy by Gender

	Women			Men					
	M	SD	n	M	SD	n	t	df	p
Computer Self-Efficacy Scale									
Beginning Skills	4.18	1.02	146	4.39	.66	152	-2.09	296	.04*
File/Software Management Skills	3.13	1.22	145	3.46	1.01	152	-2.54	295	.01*
Advanced Skills	3.13	.95	145	3.27	.89	151	-1.28	294	.20
Mainframe Skills	3.09	1.29	145	3.11	1.20	150	-.11	293	.91
Sources of Computer Self-Efficacy Scale									
Mastery Experiences	3.47	.81	153	3.57	.68	157	-1.20	308	.23
Vicarious Learning	3.56	.59	153	3.57	.56	156	-.22	307	.82
Social Persuasion	3.13	.79	153	3.32	.69	157	-2.33	308	.02*
Affective States	2.13	.89	153	1.95	.67	157	2.08	308	.04*

Note: Comparison value for each t-test was zero.
* p<=.05

$t(308)=4.08$, ($p<.01$), vicarious learning, $t(307)=3.77$, ($p<.01$), and social persuasion, $t(308)=4.49$, ($p<.01$). African American students reported a higher mean score for affective states, $t(308)=2.03$, ($p<.05$).

Discussion

This study offers divergent, yet interesting, findings. Based on computer ownership and usage among undergraduate students, the present study provides support for prior studies (Hawkins & Paris, 1997; Hoffman et al., 2001) and for the existence of the digital divide. A majority of the White students own a computer and use a computer several hours each week, while less than half of the African American students own a personal computer and use a computer several hours each week.

While the present study found no differences in access to information technology courses, findings did indicate gender and racial differences in the number of information technology courses taken at the secondary and postsecondary level. The findings from research questions one through four suggest that White men take information technology courses at the secondary and postsecondary education level more than women and African Americans. The findings from this study are closely linked to prior studies that found men had more computer experience (Harrison et al., 1997) and that African American students enroll in college with fewer computer skills (Hawkins & Paris, 1997). The findings suggest

Table 6. Independent t-Test for Computer Self-Efficacy by Race

	African American			White					
	M	SD	n	M	SD	n	t	df	p
Computer Self-Efficacy Scale									
Beginning Skills	3.93	1.15	105	4.47	.63	194	-5.04	297	.00**
File/Software Management Skills	3.01	1.26	104	3.44	1.04	194	-2.99	296	.00**
Advanced Skills	3.09	1.01	103	3.26	.87	194	-1.45	295	.15
Mainframe Skills	3.32	1.35	103	3.02	1.19	193	1.94	294	.53
Sources of Computer Self-Efficacy Scale									
Mastery Experiences	3.27	.90	109	3.64	.62	201	-4.08	308	.00**
Vicarious Learning	3.39	.62	108	3.65	.52	201	-3.77	307	.00**
Social Persuasion	2.96	.91	109	3.36	.60	201	-4.49	308	.00**
Affective States	2.17	.97	109	1.97	.69	201	2.03	308	.04*

Note: Comparison value for each t-test was zero.
* p<=.05 ** p<=.01

that due to the educational system's ability to provide access to computer and information technology courses, the technology access component is contributing to an alleviation of the digital divide. The present study found that the technology gap is still apparent when ownership, usage, and skill acquisition are considered.

Although women took fewer information technology courses at the secondary and postsecondary levels, they perceived information technology courses to be more important to their education and careers than men. Based on the fifth research question, the higher mean score reported by women suggests that women are aware that information technology skill acquisition is an indispensable part of their education and careers. This finding indicates that although they enroll in fewer information technology courses than men, women recognize the value of possessing technology skills (Ray, Sormunen, & Harris, 1999).

The low percentage (30.8%) of African American women who enrolled in information technology courses is a special concern. The 1998 American Association of University Women Educational Foundation study found African American girls are assertive and outgoing when they enter school, but they grow more passive and quiet through the school years. Gender bias compounded by cultural bias creates an unfriendly environment that may explain the limited number of African American women who have taken an information technology course.

In the present study, men possessed higher computer self-efficacy for beginning skills, such as saving a document or moving a mouse, than women did. Perception of confidence in file/software management skills, such as organizing and managing files, was higher for men than women. Gender differences were not substantial for the advanced and mainframe skills subscales. Consistent with prior results (Busch, 1995), women in the present study reported receiving less social persuasion (encouragement) to master computer skills. This finding contradicts the study by Young (2000) that found women received more encouragement from teachers than men did. The age differences of the students in the present study and the Young study may explain the different findings. Prior findings indicate that men possess a lower level of computer anxiety than women (Harrison et al., 1997); men also reported less computer anxiety than women in the present study.

White students reported more confidence in their beginning and file/software management skills than did African American students. Lower mastery experiences reported by African Americans suggest that they are not engaged in enough information technology skills acquisition activities that increased their confidence with computers. This finding is similar to the 1997 Hawkins and Paris study in which African American students entered college with less information technology experience. In addition to fewer mastery experiences, African Americans reported having less interaction with individuals who possess technology skills and knowledge (vicarious learning) and receive less verbal support (social persuasion) while participating in information technology activities. African Americans also indicated higher anxiety (affective states) when working with information technologies.

RECOMMENDATIONS

Information technology skill acquisition is an important factor in academic and career progress. Personal empowerment and economic security necessary for success will rely heavily on the use of information management tools. The 21st century workplace requires women and minorities to compete in a technology-oriented labor market. Lack of exposure or disbelief in their ability to use information technology will relegate women and minorities into low-paying, non-technical occupations. Because of the importance of information technology to the education and career development of women and minorities, it has become imperative to analyze individual differences in information technology skill acquisition and computer self-efficacy beliefs of high school and undergraduate students.

Future research is needed to determine if women and African American students are self-electing not to enroll in information technology courses during high school and college. Further

research is also needed to determine if course enrollment is a reflection of academic advising and/or course structure. Qualitative research in conjunction with quantitative research is needed to determine whether gender and racial differences are due to access, interest, or ability.

Future research is needed that evaluates information technology course offerings within various school districts across several geographic locations. The results from this study are limited by data collected from a geographic area that has not previously required students to take an information technology course for high school graduation. A broader study population will help determine if access to and participation in information technology activities is a matter of choice or chance.

A study is needed that examines the differences in technology infrastructure between various types of secondary and postsecondary institutions. The differences in the ages, and number of computers and types of technology available on traditionally white, historically black, Hispanic-serving, and tribal institutions deserve examination. In addition, the differences in course structure and the use of next-generation Internet across numerous secondary and postsecondary institutions should be examined.

Further study of computer self-efficacy beliefs is also warranted. This research may provide information about previous experiences, the influence of others, and emotional status that may have positive or negative impacts on students. Only through changes in perceived efficacy does experience with information technology lead to the actualization of equity in computer adaptation (Hoffman et al., 2001). Therefore, it is necessary for educators to be aware of possible gender and racial differences in computer self-efficacy beliefs, particularly if the differences may affect future academic or career accomplishments.

Conclusion

Issues regarding gender and race equity in technology have been a central theme in information technology literature for many years. Educational institutions must ensure that one of the most influential pedagogical tools, the computer, is available and used on an equitable basis. Educators should purposefully implement information technology pedagogy that equalizes learning opportunities. Unbiased computer-enriched learning environments should be an integral part of the academic experience for all students. Information technology courses cannot be taken by chance (as an elective). A variety of information technology courses must be available at the secondary and postsecondary levels. Enrollment in at least one course should be mandated for high school and college graduation.

Instructional strategies that eliminate gender and racial bias, especially among African American women, are a crucial factor in the achievement of equity in information technology education and careers. The issue of inclusion is a critical element in the information technology curriculum that will assist in the closure of the digital divide.

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