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The Impact of Computer Efficacy on the Success of Nontraditional Community College Students

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The Impact of Computer Efficacy on the Nontraditional Community College Student

Background

Computers and Internet technologies have penetrated and transformed nearly every facet of modern society. In fact, in many work, educational, and social situations, people are expected to have a certain level of computer skills and Internet access. Colleges and universities and the students who attend them are no exception to this transformation. Computer skills are assumed in higher education as students are often required to write papers and perform homework using word processing software, retrieve assignments and grades, register for classes, and communicate with the instructor and other students while online.

As a result, computer skills for higher education are almost necessary *before* entering college. According to Helium.com, one of the most commonly reported skills necessary for college is proficiency with computers. For most colleges, the majority of campus information is published online and prospective students are directed toward web sites for degree plans, course schedules, and online applications. Consequently, pre-existing skills and computer access are often expected as individuals proceed through the admissions process to obtain campus information and enroll for classes. Ironically, some university administrators feel that students obtain such a high level of computer literacy between kindergarten and high school that teaching computer skill courses in college is no longer considered necessary.[1] Since today's traditional college students have matured during the digital age and its proliferation of information technology, college officials believe that students will arrive at college technologically ready for the demands of higher education. However, one of the fastest growing segments of the student body may not be considered in this scenario: the group often referred to as the nontraditional student.

Typically, nontraditional students are classified as those over the age of 24 who enroll in college after several years away from education. However, the Department of Education, Institute of Education Sciences, extends the definition of nontraditional students. Delayed enrollment beyond high school graduation, family responsibilities, financial independence, and employment are considered in addition to age. The extent to which a student is nontraditional is determined by the number of these characteristics that a student possesses. If he has only one or two characteristics, he is minimally nontraditional; if she has many characteristics, she is highly nontraditional. Traditional students possess none of these characteristics. Research indicates that nontraditional attributes may be considered risk factors that can reduce the likelihood that a student will persist to graduation. According to a 2002 study by the National Center for Education Statistics (NCES), almost three quarters of all undergraduates meet at least one of these characteristics. Therefore, only one fourth of all undergraduates are completely traditional. A 2008 report by the Western Interstate Commission for Higher Education (WICHE) in conjunction with ACT and CollegeBoard raises another concern about how nontraditional students will impact higher education. According to that study, the number of high school graduates will decline between the years of 2008 and 2015, suggesting that the number of traditional college students will further decline during those years. [2] Similarly, the U.S. Department of Education predicts that college enrollment among traditionally-aged students between 18 and 24 will increase a mere 12% between 2008 and 2019. [3] However, enrollment among 25 to 34 year old students will increase 28% and enrollment among students over the age of 34 will increase 22%. Clearly, if this trend is realized, nontraditional students will represent increasing percentages of total college enrollment. In fact, nontraditional students are actually becoming the majority, or in effect, the traditional student. This group of students will have a significant impact on higher education, graduation rates, and the job market. It therefore becomes critical for administrators in higher education to understand and accommodate the specific needs of this student population.[4] If we consider that the 34 and older age group was either well into or beyond compulsory education during this shift in technology, one of these needs may well be skill development with information technology.

While the current job shortage continues and unemployment rates remain high, some paradoxically predict that labor shortages may eventually dominate. Historically, when recessions end, the economy expands significantly and new jobs are abundant. As the baby boomer population reaches retirement age, the U.S. will experience a shift in the age population. Census Bureau data predictions indicate that between 2015 and 2030, the increase in individuals aged 55 and over will be over twice the increase of individuals between 20 and 54. If older people retire at the same rate as they have in the past, labor shortages will proliferate as a result of reduced participation in the labor force and there won't be enough workers to meet employment demands. [5] However, many Americans now work beyond retirement age. With increasing lifespans, some choose to remain active by working longer, while others work out of necessity because of poor health care options or insufficient retirement funds.

A study conducted by the Georgetown University Center on Education and the Workforce indicates that 46.8 million job openings will exist in 2018. Of these, 63% will require workers with at least some post-secondary education. Over one-third will require a minimal of a Bachelor's degree. A significant factor in this demand for higher education is the growth of the computer technology industry. While the delayed retirement of baby boomers seems promising for labor shortages, the primary problem facing the labor force is a lack of the skills necessary to perform available jobs.

Ironically, even as many people lost jobs during the most recent recession, thousands of high salary technical jobs were unfilled due to a lack of available talent. These vacant positions create a double-edged sword; in addition to lost income for unemployed, these high-tech jobs typically create the innovative products that are necessary for a growing economy. The skill deficiencies are in the areas of science, technology, engineering, and mathematics (STEM). Projections indicate that approximately 800,000 new engineers will be needed by 2018; however, the U.S. currently graduates only one-fourth of that number. Women and minorities are potential prospects for meeting this need because they are projected to fill approximately 70 percent of the job market at that time. However, they currently compose only 20 percent of the existing STEM related job market. Consequently, it is critical for the American higher education system to provide sufficient training to fill technical skills gaps in all students, particularly those within the growing populations of minority and older workers.[6]

Nontraditional students often lack the most basic computer skills. With older students, computers may not have existed during their high school years or the skills that they did obtain have become outdated. Unlike younger peers, they lack the advantages that childhood familiarity with technology brings. Perhaps they gained computer skills in previous employment, but often those skills are specific to a particular position or industry. While they may have become quite proficient with specific job responsibilities, they are unable to generalize those skills toward competently and comfortably performing other computer-related tasks. In any case, this group of students often enters the college environment unprepared for the demands of the new technological environment.

In addition to older students, younger students who are financially disadvantaged may lack sufficient computer skills. Computer technology changes rapidly; therefore, people who cannot afford updated equipment and broadband Internet services as well as new technologocial devices often have less proficiency because of limited access. If regular and personal access to such devices correlates to computer skills, those who cannot afford them may be academically disadvantaged.

A significant factor related to task completion is self-efficacy. “Self-efficacy” refers to a person’s confidence in his or her ability to perform a specific act. Consequently, a student’s personal belief in his or her ability to complete computer-related tasks may affect results. Individuals with low self-efficacy are more likely to abandon a task after less effort; those with high self-efficacy are more likely to persist until completion. Strong beliefs in personal abilities create the expectation that they can accomplish their goals; therefore, they are more likely to exert extra effort toward them. The term “computer efficacy” refers to a person’s belief in his or her computer skills. If low self-efficacy negatively impacts persistence, then low computer efficacy among college students may cause them to avoid higher-level technical courses or abandon college before earning a degree or accomplishing other educational goals. Older students who lack early experiences with technology may be less efficacious regarding the use of computers and the Internet. If this is the case, they may be less likely to pursue computer-related courses and more likely to withdraw or fail such courses. With the increase in computer expectations in all classes, even courses such as history, math, science, and English will likely become frustrating for those with insufficient computer skills.

Previous studies suggest two factors: 1) that a lack of computer skills decreases the level of computer efficacy in individuals and 2) that instructors and administrators in higher education have increased expectations regarding computer usage in college classes. Since nontraditional college students typically don’t have the same level of skills as younger, traditionally-aged students who matured using the technology, they may be less efficacious regarding their skills and ability to use computer related technology. Consequently, these students may be significantly disadvantaged when they return to college. This problem may be intensified if predicted enrollment trends prove to be true and nontraditional students become a significant percentage of the total student population. Larger numbers of students may have more difficulty in successfully completing college level work and consequently, may be less inclined to persist. Without adequate technical skills or a college degree, these adult learners may not realize their employment goals.

Typically, nontraditional students enter college with discernibly lower levels of computer skills than their younger, traditional classmates. While the lack of skills alone may decrease the chance for success in college, a negative perception of one's computer skills (computer efficacy) may further increase the likelihood of academic failure. The purpose of this study is to determine the extent that college success, as measured by successful course completion and cumulative grade point average (GPA), is affected by a student's computer efficacy, computer skills, and computer and Internet access. If relationships exist between these factors, it may be necessary for higher education to make an effort to remediate computer skills early in the college experience. If skills, and consequently, computer efficacy are improved, students may have greater persistence in college and success in future employment.

The research questions examined in this study are:

- Do factors such as age, computer experience, computer access, and amount of computer use affect success in college?
- Does a student's level of computer efficacy affect his or her success in college?

Methodology

A survey instrument evaluating technical skills and computer efficacy was used to collect data for the analysis of this study. It was administered at the beginning of the fall 2012 semester to 339 students in various classes at two Midwestern community colleges. Printed surveys were administered in 13 traditional classrooms to avoid the potential for bias among students with low skills. However, online surveys were administered to four online classes. In addition to demographic information, the survey included questions that assess the individual's access and use of Internet technologies and computer related devices as well as their perceived level of skills and aptitude (computer efficacy). At the end of the semester, course grades, completion rates, and cumulative grade point averages (GPA) of participating students were gathered.

A combination of multiple regression, bivariate correlation analyses, and independent-samples t-tests using SPSS version 20 determined the level of correlation between various dependent and independent variables. Initially, Pearson correlation coefficients were calculated for each variable to determine the strength and the direction of the individual relationships to the dependent variables. These results indicated if the correlations were statistically significant. SPSS output included the correlation coefficient (R), which measured the strength of the relationship between the combined variables and the dependent variable, as well as the coefficient of determination (R^2). The coefficient of determination explained how much of the variance could be predicted by the combination of the variables. Both values were examined, with greater emphasis on the R^2 value. When this value is higher, there is less likelihood that other variables affect the dependent variable. Additionally, a level of significance (p value) of less than .05 was used. Thus, there was no more than a five percent chance that differences between the participants in the study were due to reasons other than computer literacy.

Results

A series of survey questions asked students to report the percentage of college courses that required the use of 1) email, 2) an online course portal (such as Blackboard or Moodle), 3) the Internet, 4) word processing, or 5) specialized software (such as accounting, software applications, or programs). Results were averaged for each technology and the mean values are indicted in Table 1. Such outcomes indicate that computer related technology is being used quite extensively in the community college classroom.

Table 1: Percentage of Courses Requiring Technology		
Technology	**Mean**	**Std. Deviation**
Email	82%	28.360
Course Portal	80%	28.471
Internet	64%	34.137
Word Processing	38%	31.184
Specialized Software	26%	26.997

Additionally, regression analyses indicated that students who reported higher levels of computer use in the classroom had increased computer efficacy. An aggregate computer efficacy score for each student was calculated by averaging his or her responses to a series of Likert survey responses ranging from strongly agree to strongly disagree. The combined effect of these five technologies upon computer efficacy was: $R^2 = .077$, $F\ (5,245) = 4.076$, $p = .001$.

Individually, correlations between each item and the computer efficacy variable can be found in Table 2. With the exception of Email, the remaining technologies indicate that a significant difference exists between computer efficacy among students who take classes requiring extensive use of technology and those who don't.

Table 2: Computer Efficacy Correlates to Increased Classroom Use		
Technology	**Correlation Coefficient**	**P value (Significance)**
Course Portal	.114	.035
Internet	.191	.001
Word Processing	.157	.006
Specialized Software	.185	.002

The relatively low R^2 values (Correlation Coefficients) demonstrate that other factors are involved in an individual's level of computer efficacy. One of two implications (or both) is indicated: Students with increased efficacy pursue courses with more technology, and/or students who complete these computer-enabled courses have increased efficacy as a result.

Further research indicates that computer efficacy is increased by the completion of an Introductory Computer course (at the high school or college level). $R^2 = .109$, $F\ (3,122.965) = 12.489$, $p = .000$.

The independent correlations are displayed in Table 3.

Table 3: Factors that Significantly Increase Computer Efficacy		
Factor	**Correlation Coefficient**	**P value (Significance)**
Introductory Computer Class Completed	.182	.001
Amount of Computer Use in High School	.287	.000

Although computer experience gained in high school indicates a slightly stronger relationship to computer efficacy as compared to introductory computer courses, the introductory course should not be ignored because of the significant numbers of nontraditional students who gained limited or no computer experience in high school. A simple cross-tabulation analysis that compared age of students to a dichotomous response regarding computer use in high school, revealed that students aged 35 to 45 (n=38) had fewer positive responses to high school computer use than negative. Students over the age of 45 (n=19) reported no computer use in high school. Out of 339 surveyed, a total of 53 students (nearly 16%) reported no computer use in high school.

Additional correlational analyses depicted the strengths of relationships between computer efficacy variables and those students who used any amount of computers in high school as well as students who used computers extensively in high school. Clearly, as students gained more experience in high school by taking more technology classes, their skills and efficacy levels continued to increase (Table 4).

Table 4: High School Computer Use Improves Efficacy and Skills (p<.01)		
	Students who used computers in high school	**Extent of computer use in high school**
Variables	**R^2**	**R^2**
Computer efficacy	.220	.376
Computer skills	.289	.442
Comfort using computers	.233	.356
Believe they have adequate skills for college	.160	.221
Are not intimidated by online classes	.109*	.172

*p< .05

This is a critical factor because most students between the ages of 25 and 35 reported computer exposure in high school; however, that exposure was limited compared to more recent high school graduates. While any use in high school is better than no use, even the younger nontraditionally aged students are affected by decreased computer efficacy.

Additional comparisons between traditional (aged 24 and below) and nontraditional students (over 24 years) reveal the extent of lower computer efficacy. In an independent-samples t-test, nontraditional students consistently revealed a lack of computer skills (Table 5).

Table 5: Nontraditional Students' Report Fewer Computer-related Abilities (p=<.01)				
	Traditional		**Nontraditional**	
	M	**SD**	**M**	**SD**
Perceived computer skills	3.71	.735	3.42	.784
Comfort using computers	3.20	.710	2.93	.842
Word processing skills	4.25	.794	3.80	.927
Presentations skills	3.97	.963	3.03	1.18
Graphics skills	3.04	1.29	2.63	1.30
Organizing folders/files	3.70	1.157	3.34	1.190
Creating folders/files	4.04	1.058	3.61	1.051
Searching on Internet	4.43	.731	4.15	.759

The manner in which nontraditional students gain their computer experience is also revealing. While 62% of traditionally-aged students report learning on their own, only 45% of nontraditional students learned independently. Forty-seven percent of nontraditional students indicated that they gained most of their computer experience either on the job or in a formal classroom environment. Students with low efficacy were less inclined to experiment with new devices and techniques by trial and error and were more comfortable with external instruction.

The most significant component of this study involved the effects of computer access on academia. Computer access encompasses physical access to modern computer-related devices as well as Internet access. In addition to survey questions regarding home Internet access, students were asked about the types of computer-related devices that they own. The specific devices included cell phone, smart phone, desktop computer, laptop computer, tablet, and electronic reader. Results indicated that significantly greater numbers of traditionally aged students owned smart phones and laptops.

To determine academic success, an additional variable was introduced: "Successful Course Completion". Successful completion was determined by students who earned final grades of A, B, C, or D. Results that led to unsuccessful completion were students who withdrew from the class or failed. Table 6 displays results from a multiple regression correlation matrix relating to the number and type of devices owned by students and their effects on efficacy and academics.

Table 6: Factors that Correlate Significantly to Access to Computer-related Devices		
Factor	**Correlation Coefficient**	**P value (Significance)**
Adequate Computer Skills	.222	.000
Comfort with Using Computers	.253	.000
Internet Access at Home	.177	.001
Successful Course Completion	.159	.002
Grade Point Average (GPA)	.144	.008

Perhaps the most alarming result is that which depicts a relationship between computer device ownership and successful completion of courses and grade point average. While many factors contribute to failed and withdrawn courses, clearly these results indicate that a connection does exist between the two variables. Computer ownership is not only an age-related issue; perhaps more significantly is the connection between ownership and socioeconomic status. Technological devices are expensive and become outdated very quickly in today's society. Individuals who cannot afford state-of-the-art equipment may be at a greater disadvantage than previously considered.

A Pearson correlational analysis was conducted to examine significant relationships between various computer-related variables and successful course completion. Computer efficacy, computer skills, home Internet access, belief in adequate computer skills, number of devices owned, and the percentage of college classes that required the use of a computer revealed significant correlations with successful course completion. Results are displayed in Table 7.

Table 7: Factors that Affect Successful Course Completion ($p < .05$)

	R^2
Computer efficacy	.105
Computer skills	.124
Internet access at home	.106
Belief in adequate computer skills	.107
Number of devices owned	.168
Percentage of classes requiring computer use	.149

Although the correlation coefficients are low, consideration must be given to the fact that many variables comprise academic achievement, including individual motivation, prior education, family support, family obligations, employment, income, etc. Clearly, relationships exist between computer access and skills, efficacy, traditional/nontraditional status, and college success. It is critical for leaders in higher education to consider these student traits when developing curricula.

False assumptions about the technological skill level of college students may be detrimental to a rapidly growing nontraditional population. Today's 40 year old college student had very limited, if any, access to computers in high school. However, these adult students will be needed to fill skilled positions for the next twenty years as the pool of younger workers declines. Perhaps one day all students will enter the halls of higher learning with sufficient technology skills, but until then, all factors that contribute to computer efficacy and successful college completion should be addressed.

1. Kieffer, L. M. (1995). Establishing a Computer Literacy Requirement for all Students. *National Education Computing Conference* (pp. 276-278). Baltimore: Educational Resources Information Center.

2. Western Interstate Commission for Higher Education (WICHE). (2008). *Knocking at the College Door: Projections of High School Graduates by State and Race/Ethnicity1992-2022.* Retrieved from http://www.wiche.edu/info/publications/knocking_complete_book.pdf

3. U.S. Department of Education, Institute of Education Sciences. (2011). *Projections of Education Statistics to 2019 . Section 5. Enrollment in Postsecondary Degree-Granting Institutions: Enrollment by Selected Characteristics and Control of Institution.* Retrieved from http://nces.ed.gov/programs/projections/projections2019/sec5c.asp

4. Copper, B. (2009, February 27). Changing Demographics: Why Nontraditional Students Should Matter to Enrollment Managers and What They Can Do to Attract Them. Retrieved from *AACRAO Consulting*: http://consulting.aacrao.org/publications_events/publications/ changing-demographics-why-nontraditional-students-should-matter-to-enrollment-managers-and-what-they-can-do-to-attract-them/

5. Bluestone, B. & Melnik, M. (2010). After the recovery: Help needed. Retrieved from *Research on Encore Careers* website: http://www.encore.org/files/research/JobsBluestonePaper3-5-10.pdf

6. Elias, H. (2011). Do Americans have 21st century job skills? Retrieved from: http://www.forbes.com/sites/ciocentral/2011/12/12/do-americans-have-21st-century-job-skills/