Analyzing Traditional Factors for Success in an Introductory End-User Technologies Course

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Research indicates that various factors can affect student success in courses. Some of these factors are the experiences that students bring into a class. Other research focuses on ability, gender, motivation, and access. This research examined these types of factors to see if they affect the ability of a student to be successful in an introductory computer end-user technologies class. None of the analyzed student experience factors were found to have an impact on the success of students in the class. Gender and major also did not affect student performance. Academic ability, as measured by cumulative GPA and the most recently completed term GPA, was found to be correlated to the total points earned in the course. Regression analysis found cumulative GPA to be the best predictor of student performance.

Although research has been conducted to determine factors for success in numerous academic disciplines, there is little evidence of research aimed at courses concerned with computer end-user technologies within a curriculum similar to the Organization and End-User Information Systems Model Curriculum described by the Organizational Systems Research Association (1996, 2004). In particular, significant research has been published in the areas of economics education, computer science education, and engineering education. This study attempted to determine whether factors which have been investigated as predictors of academic performance in other disciplines are also predictors in a computer end-user technologies course. Also, with the continued concern about attracting and retaining women in fields of computing, research is needed to shed light on issues related to gender in programs that are computer-related, but have a different focus than more traditional computer science programs. This research provides a baseline of data, which improves the understanding of factors influencing student performance in courses associated with end-user information systems.

Literature Review

The literature on factors affecting academic performance includes numerous models for predicting success. Durr (1999) researched performance in macroeconomics courses using the model Grade = f(Motivation, Ability, Gender, Effort) ($r^2 = .2613$, $F = 4.174$, $p < .01$). Choudhury (2002) explored the relationship of Performance = f(Ability, Major) ($r^2 = .59$, $F = 222.1$, $p < 0.01$) in environmental control systems courses. A model of success = f(initial endowments, economic awareness, attitudes towards economics, student characteristics, mode of delivery) ($r^2 = .62$, $F = 9.71$, $p < 0.01$) was investigated by Myers and Nelson (2003) for an online economics course. Additional models exist with similar independent variables (Olivares, 2002; Yamamura, Martin, Campbell, Campbell, & Frakes, 2000).

Several researchers have examined the relationship between students' prior experiences and their performance in specific courses. In an analysis of factors affecting academic achievement in an introductory information systems course, Chen (2002) explored the effect of student prior experience and software use on achievement in both the lecture and hands-on lab components of the course. Student prior experience was not a significant factor in achievement for the lecture component ($t = -.899$, $p = .370$) or the lab

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component ($t=.802$, $p=.424$). Interestingly, prior use of similar software used in the course was a significant factor affecting achievement in the lecture component ($t=5.105$, $p<.001$) but not in the lab component ($t=-894$, $p=.372$). For the lecture component, Chen found that prior use of software similar to that used in the course was the most significant factor with peer learning and effort regulation also being factors. Williamson (1992) analyzed prior construction experience as a predictor for student performance in a construction graphics course. Williamson used prior experience as an estimator of prior knowledge and found a correlation between experience and performance ($r=.49$, $p=.00009$).

Literature also suggests that mental or academic ability is a significant factor in predicting performance. In early research on educational attainment, academic performance, and occupational attainment, Sewell, Haller, and Ohlendorf (1970) presented a model that indicates that mental ability is the best predictor of academic performance. Ellis, Durden, and Gaynor (1998) reported that a student's probability of earning an A or a B in an economics course significantly increased for students with a higher high school GPA or a higher SAT score ($p<.01$). The inverse was also discovered in that a student's probability of earning a D or F decreased based on a higher GPA ($p<.01$). In a study attempting to predict college performance, Garton, Dyer, and King (2001) found high school GPA and ACT scores to account for 39% of the variance in college GPAs. Sinclair Community College (2002) reported, from a study of 31,261 students enrolled in distance education courses, that cumulative GPA was the best predictor of success ($r=.656$). Additional studies in undergraduate business programs showed a correlation between cumulative GPA and performance (Bibbins & Fogelberg, 2002; Sullivan & Behrends, 1999; Yamamura et al., 2000).

The issue of attracting and retaining women in computer-related fields has been discussed in both academic journals and the popular press. The lack of women in computing fields is not necessarily related to the ability of women to achieve academically in the field. In fact, Fan, Li, and Niess (1999) found that females performed better than males in computer science courses. However, as described by Wilson (2002), there is concern that the limited number of females majoring in computing fields makes it difficult to conduct scientific analysis of gender as a predictor of academic performance. Studies on gender related to academic achievement have been conducted in other fields with various results. Felder, Felder, Mauney, Hamrin, and Dietz (1995) found that males majoring in chemical engineering earned higher grades and completed the major more often than females. Ellis et al. (1998) found that there was no correlation between gender and the likelihood of earning an A or B in an economics course, but the chance of earning a D or F was higher for females. Dancer (2002), in an Australian study, found that females performed significantly better than males in an introductory economics class, but the reverse was true in an econometrics class ($p<.05$).

Whether students majoring in a subject most closely tied to a specific course perform better than their counterparts has also been investigated. Dancer (2002) found that a student's selected major influenced performance and surmised that major may be related to course motivation. The students in her study majoring in commerce performed worse in an economics course than did students majoring in agricultural economics, who, in turn, performed worse than students majoring in economics. Bibbins and Fogelberg (2002) also found a student's selected major to be predictive of performance. Students majoring in accounting or finance performed better than other majors in a finance course ($p<.10$). Choudhury (2002) reported that students majoring in the subject for which a course was designed often performed better than non-major students. His interpretation is based on regression analysis using GPA and major as predictors of final grade in a construction science course where major was determined to be a significant factor ($p<.01$). Other reports have reached similar conclusions (Marsh, 1980, 1982).

Course Description

The Computer End-User Technologies class introduces the fundamental technical aspects of personal computers. It is the first course in a curriculum that is moderately aligned with the

Organizational and End-User Information Systems Model Curriculum published by the Organizational Systems Research Association (1996, 2004). Although the course was officially only available to students with a major from the College of Business, students from other majors were allowed in the course. Students majoring in Computer End-User Technologies and students majoring in Business Education were required to successfully complete the course for graduation. Students completing the Computer End-User Technologies degree earn a Bachelor of Business Administration, while those in Business Education earn a Bachelor of Science in Education. Most students in these majors complete the course during their junior year. The syllabus for the course listed three key student objectives:

1) Students will be able to identify and describe, at a technical level, the function of the major components of a personal computer.
2) Students will understand troubleshooting techniques and be able to diagnose hardware problems, including improper configuration and device failure.
3) Students will understand how a modern operating system interacts with the personal computer, be able to install operating systems, and use operating system software to configure and troubleshoot the personal computer.

Student performance in the course was measured through exams (45%), labs (20%), quizzes (10%), papers (15%), and a journal (10%).

Purpose and Research Questions

The purpose of this research was to determine if the factors of academic ability, prior knowledge, gender, major, and computer access affected student performance in an introductory computer end-user technologies class. Five research questions were investigated:

1. Is academic ability, as indicated by cumulative GPA and most recent term GPA, correlated with performance?
2. Does prior knowledge, as indicated by experience with hardware and software installations, impact performance?
3. Does gender influence performance?
4. Does the student's selected major impact performance?
5. Does computer access, as evidenced by computer ownership, impact performance?

The first four research questions were derived from a review of the literature on factors affecting academic performance in courses at the post-secondary level. The final question was added based on feedback from students in previous semesters.

Methodology

Sample

The sample population for this study consisted of all students enrolled in all four sections of an introductory computer end-user technologies course during Fall 2002. All students in attendance the first week completed and returned the survey (N=119). The four sections of the course were taught by the same instructor and contained the same content and assessments.

Survey and Data

The survey consisted of three demographic items—name, major, and grade level—and eight content questions:

1. Do you own a computer?
2. Have you ever installed a hard drive?
3. Have you ever installed a floppy drive?
4. Have you ever installed memory?
5. Have you ever installed a CD or DVD drive?
6. Have you ever installed a printer?
7. Have you ever installed application software?
8. Have you ever installed a new operating system?

In addition to this information, for each student in the sample, transcripts were accessed to retrieve the cumulative GPA as calculated at the end of the most recent term, and the most recent term GPA. Gender and total points earned in the course were coded as variables from instructor records.

STATISTICAL ANALYSIS

For the statistical analysis, the total points scored in the course for each student was used as the dependent variable for all tests. Independent samples t-tests were used for determining the statistical significance of each of the content survey questions. In the t-tests, the answers to the content survey questions were used as independent variables. Significance was assumed at the .05 level. Differences based on gender, as an independent variable, were also tested via an independent samples t-test. Cumulative GPA and most recent term GPA were tested for correlation with total points scored by deriving a Pearson's correlation coefficient for each. Scatter plots were used to further analyze the correlations between the GPA variables and total points scored. Regression analysis was performed to determine which independent variables best predicted performance. Table 1 depicts the descriptive statistics for cumulative GPA and most recent term GPA.

Table 1: Descriptive Statistics for Cumulative GPA and Most Recent Term GPA

	N	Mean	Std. Deviation
Cumulative GPA	103	3.026	0.413
Most Recent Term GPA	103	3.049	0.542

The descriptive statistics for all other independent variables are included in Table 2. The table shows the number of students recorded for each category, as well as the mean, standard deviation, and standard error of the mean for the total points earned in the course for each category.

LIMITATIONS

This study was limited to students enrolled in multiple sections of a computer end-user technologies course at a single institution. Additional studies are needed to determine whether the findings are generalizable to similar classes.

FINDINGS AND DISCUSSIONS

The five research questions were divided into six hypotheses. The question related to prior knowledge was investigated with two hypotheses, each focusing on either software or hardware experience. The testing of each of the hypotheses is described in this section, followed by conclusions and recommendations.

HYPOTHESIS 1

The total points earned by students will not be related to their demonstration of academic ability.

The null hypothesis was rejected. The hypothesis was tested for both overall academic ability via the cumulative GPA and recent demonstration of academic ability via the most recent term GPA. Both tests involved calculating the Pearson correlation coefficient. Cumulative GPA and total points earned were correlated with a Pearson correlation coefficient of 0.582 ($p < .001$). The most recent term GPA and total points earned were correlated at 0.478 ($p < .001$). Figures 1 and 2 are scatter plots depicting the positive relationship between points and cumulative GPA and most recent term GPA, respectively. The vertical axis indicates the total number of points earned in the course. The horizontal axis displays the appropriate GPA. A closer look at Figure 2 and the underlying data indicates that one student had a most recent term GPA of 1.333. When this student is removed from the correlation analysis, most recent term GPA and total points earned are correlated at 0.500 ($p < .001$).

HYPOTHESIS 2

There will be no significant difference in the total points earned by students who have chosen Computer End-User Technologies as a major and those who have not.

The null hypothesis was accepted. The hypothesis was tested by using an independent samples t-test comparing the final scores of Computer End-User Technologies majors against the scores of all other majors in the course. Although the mean point score for Computer End-User Technologies majors was higher, the difference was not significant ($t = 1.452$, $df = 106$, $p > .10$).

Table 2: Descriptive Statistics of Points Earned for All Independent Variables

Major	N	Mean	Std. Deviation	Std. Error Mean
CEUT	77	82.752	10.502	1.197
Other	31	79.473	10.892	1.956
Hard Drive Installation				
Experienced	40	83.080	11.167	1.766
Not Experienced	67	81.221	10.372	1.267
Floppy Drive Installation				
Experienced	46	82.320	11.268	1.661
Not Experienced	61	81.612	10.266	1.314
CD-ROM Installation				
Experienced	57	82.624	10.746	1.423
Not Experienced	50	81.109	10.616	1.501
Memory Installation				
Experienced	61	83.398	10.497	1.344
Not Experienced	46	79.951	10.675	1.574
Application Installation				
Experienced	97	82.314	10.371	1.053
Not Experienced	10	78.058	13.170	4.165
Operating System Installation				
Experienced	58	82.730	11.509	1.511
Not Experienced	49	80.952	9.591	1.370
Gender				
Male	80	82.585	10.130	1.133
Female	31	79.844	11.649	2.092
Own a Computer				
Yes	99	82.368	10.535	1.059
No	11	76.286	10.297	3.105

HYPOTHESIS 3

There will be no significant difference in the total points earned by students who have experience installing hardware and those who have not.

The null hypothesis was accepted. On the survey, students were asked to indicate whether they had installed a hard drive, floppy drive, CD-ROM drive, or memory. In all cases, students who indicated they had installed a particular device earned higher mean total points than students who had not installed that device. Independent samples t-tests using hard drive installation ($t=.871$, $df=105$, $p>.10$), floppy drive installation ($t=.339$, $df=105$, $p>.10$), CD-ROM drive installation ($t=.732$, $df=105$, $p>.10$), and memory installation ($t=1.669$, $df=105$, $p>.05$) found no significant difference in the total points earned.

Perhaps as important, of the 12 students that dropped or did not complete the final exam, only one had installed a hard drive, none had installed a floppy drive, none had installed a CD-ROM drive, and none had installed memory. These 12 students had a mean cumulative GPA of 2.872.

HYPOTHESIS 4

There will be no significant difference in the total points earned by students who have installed software or operating systems and those that have not.

The null hypothesis was accepted. The mean point total for students that reported prior experience installing application software was higher than those that reported no experience. The same was true for students reporting their prior operating system installation experience. The difference was not significant for installation experience with either

Figure 1: Scatter Plot of Cumulative GPA vs. Total Points

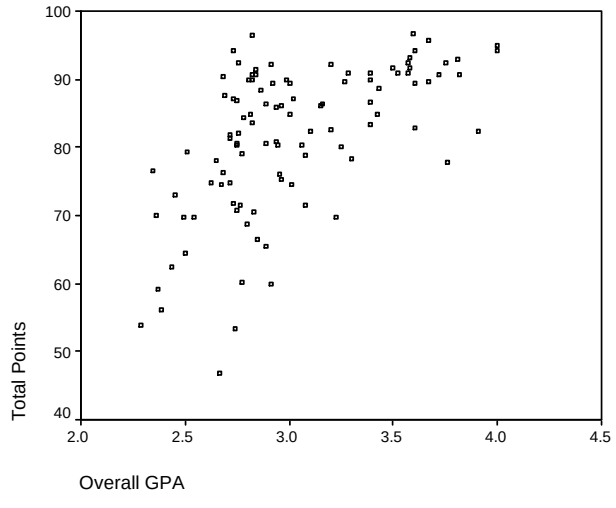
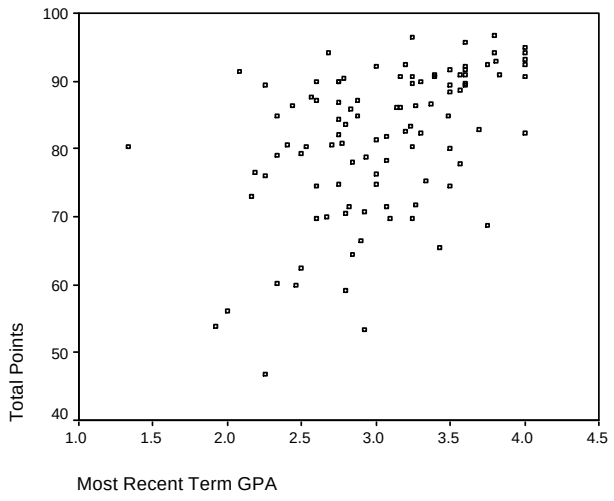


Figure 2: Scatter Plot of Most Recent Term GPA vs. Total Points



application software (t=1.204, df=105, p>.10) or operating systems (t=.858, df=105, p>.10).

HYPOTHESIS 5

There will be no significant difference in the total points earned by male students and female students.

The null hypothesis was accepted. Males did earn on average a higher point total than females. Independent samples t-tests indicated that this difference was not significant (t=1.226, df=109, p>.10). However, further research found that a disproportionate number of the students that dropped or did not take the final exam were females (47.37%). Only 31% of the students enrolled in the class were female. Additionally, if success in the class is measured as completing the class with a D or above, over 52% of the unsuccessful students were female.

HYPOTHESIS 6

There will be no significant difference in the total points earned by students who own computers and those who do not.

The null hypothesis was accepted. Although students who owned a computer scored on average higher than those who did not, the difference was found to be statistically insignificant (t=1.820, df=108, p>.05) by an independent samples t-test.

PREDICTIVE MODEL

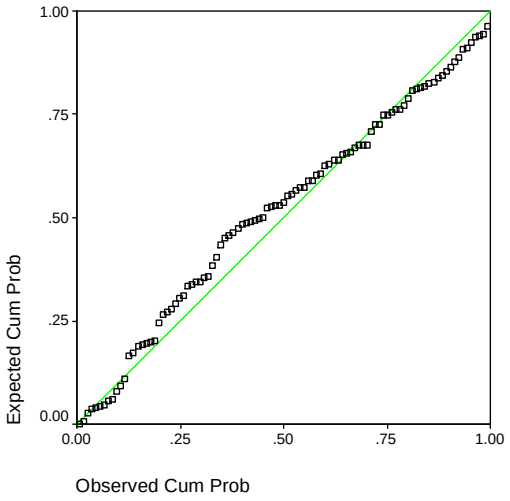
After all of the hypotheses were tested, a regression analysis was performed to determine if the model PERFORMANCE=f(MAJOR, ABILITY, PRIOR KNOWLEDGE, GENDER, ACCESS) was accurate. The PERFORMANCE variable was the total points scored in the course. MAJOR was coded as a 1 if the student was a Computer End-User Technologies major and 0 if the student was a non-major. ABILITY was tested with both cumulative GPA and term GPA. PRIOR KNOWLEDGE variables included all of the experience variables. GENDER was coded as a 1 for male and 0 for female. Access, as indicated by computer ownership, was coded as a 1 for owners and a 0 for non-owners.

The analysis of the model using linear regression with all independent variables (Table 3) resulted in an adjusted R^2 of .344. Analysis of variance found statistical significance (p<.001) F(11, 87) of 5.670. Only cumulative GPA was found to be a significant predictor (p<.001). Figure 3 displays a normal probability plot of the

Table 3: Regression Analysis with Total Points Earned as Dependent Variable

	Unstandardized Coefficients		Standardized Coefficients		
Variables	*B*	Std. Error	*B*	*t* value	Sig.
Intercept	24.345	7.788		3.127	.002
Cumulative GPA	15.538	3.593	.600	4.325	.000
Term GPA	.605	2.879	.030	.210	.834
Gender	2.462	2.399	.105	1.026	.308
Major of CEUT	.133	2.119	.006	.063	.950
Software Experience	5.239	3.551	.146	1.475	.144
OS Experience	-2.485	2.720	-.114	-.913	.364
CD Experience	1.390	2.76	.064	.504	.616
Memory Experience	3.259	2.640	.149	1.234	.220
Floppy Drive Experience	1.297	3.152	.059	.412	.682
Hard Drive Experience	-2.127	3.671	-.095	-.579	.564
Ownership	.976	4.020	.025	.243	.809

Figure 3: Normal Probability Plot of Regression Standardized Residuals—All Independent Variables



regression standardized residuals. The diagonal line depicts the location of a normal distribution of subjects. A large number of the measured values occur some distance from the diagonal and, thus, the regression model does not meet the assumption of normality.

Due to concerns about collinearity, a stepwise regression analysis was performed. The stepwise regression (Table 4) resulted in an adjusted R^2 of .372. Analysis of variance found statistical significance ($p < .001$) F(2,96) of 29.996. The stepwise regression model removed all independent variables except cumulative GPA and software installation experience.

Figure 4 displays a normal probability plot of the regression standardized residuals. Although the plot of the stepwise regression appears to have fewer departures from the diagonal line, there still exists a question about the assumption of normality in the model.

CONCLUSIONS AND RECOMMENDATIONS

Student access to computers was not found to be a determining factor of student performance in the introductory end-user technologies class. Also, none of the experience factors were found to predict performance. Major and gender also were insignificant predictors of performance. Cumulative GPA and most recent term GPA, while significantly correlated with performance, were not found to be correlated at as high a level as those found in the literature of other types of classes (e.g., distance education and accounting information systems).

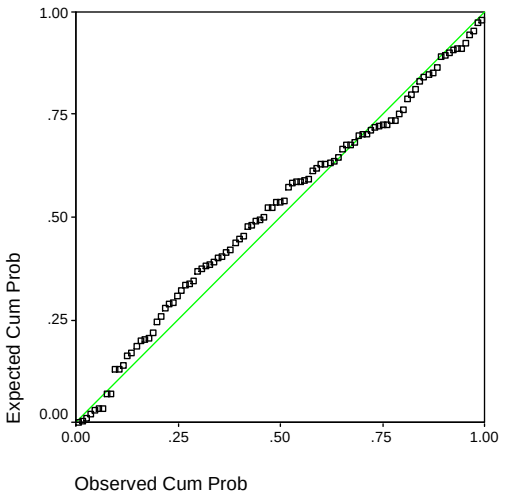
Prior knowledge, as indicated by experience with hardware and software installations, did not predict improvements in performance. For each category, but one, at least 25% of the respondents indicated that they had experience. Only a small number of students (9.35%) lacked experience installing application software. This lack of prediction power for experience was surprising. Although only 15% of the grade was based on assignments that appear to have direct relevance to these hands-on experiences, it was expected that students with these experiences would also have some prior knowledge related to key terms and concepts from the course and the experience would have benefited them to a greater extent. Also, instructors from previous semesters reported that the confidence level of students who had significant experiences with computer installations appeared much higher than that of other students. It is possible, that for this course, self-reporting of prior experience is not a valid indicator of prior knowledge.

As has been shown in numerous studies (Bibbins & Fogelberg, 2002; Sinclair Community College, 2002; Sullivan & Behrends, 1999; Yamamura et al., 2000), academic ability is a high predictor of performance. In this study, academic ability, as measured by cumulative GPA and most recent term GPA, was found to correlate to student performance. Through linear regression, cumulative GPA was determined to be the single largest factor in predicting the total points earned in the course.

Table 4: Stepwise Regression Analysis with Total Points Earned as Dependent Variable

	Unstandardized Coefficients		Standardized Coefficients		
Variables	*B*	Std. Error	*B*	*t* value	Sig.
Intercept	27.139	7.218		3. 76	.000
Cumulative GPA	15.944	2.092	.615	7.621	.000
Software Experience	6.881	2.905	.191	2.368	.020

Figure 4: Normal Probability Plot of Regression Standardized Residuals—Stepwise Regression (Cumulative GPA and Software Installation Experience)



Contrary to other research related to computer courses (Fan et al., 1999), gender was not found to be a predictor of performance in the class. With the ongoing concern in academia for the success of both genders in computer-related fields, the researcher feels that this finding is at least as significant as any other finding from this study. Unfortunately, further research did find a disproportionate number of females dropping the course. Additional research is needed to determine if there is a gender issue related to retention even if there is not a gender issue in performance.

As measured by the reported major of the student, major was not found to be a predictor of success. The feedback from students who see the course as related to their major is much more positive than that from students required to take this class but who see little practical value in the course. This feedback led the researcher to believe that they would find a difference. Although the mean scores did differ for these two groups, the difference was not significant. Although Dancer (2002) surmised that a student major was an indicator of motivation, in this study major is either not a motivator or, if it is, it has little effect on student performance. In future studies, additional measurements of motivation should be used to help determine the effect of motivation on performance in this type of class.

Access was discovered to be a non-issue related to student performance. This was likely due to the fact that all but 10% of the survey population reported that they owned a computer. Unlike traditional introductory computer science courses, the computer end-user technologies course does not appear to require significantly higher levels of access than other courses. Access to computers that are more easily reconfigured with hardware removal and installation may be a more significant predictor of success than just ownership.

Concerns about the assumption of normality relative to the linear regressions cast some question on the results of the predictive model indicating cumulative GPA as the best predictor of achievement. However, results of correlation analysis for the same variable add some credence to the model. Further research with larger sample sizes and greater heterogeneity of the respondents is needed.

This study may serve as a benchmark for studies at other institutions. It may provide some impetus for institutions with similar courses and curriculum to determine if issues, such as gender, major, ability, access, and prior knowledge, are important factors related to student performance. The research also adds to the current literature related to the analysis of variables that affect student performance.

REFERENCES

Bibbins, W. J., & Fogelberg, L. M. (2002). Determinants of performance in principles of finance [Electronic Version]. *Troy State University System-Wide Business Symposium: 2003 Business Paradigms in Transition.*

Chen, C. S. (2002). Self-regulated learning strategies and achievement in an introduction to information systems course [Electronic Version]. *Information Technology, Learning, and Performance Journal, 20*(1), 11-25.

Choudhury, I. (2002). Predicting student performance using multiple regression [Electronic Version]. *International Conference on Engineering and Technology Education.*

Dancer, D. (2002). Factors influencing performance in first year economics and econometrics courses

[Electronic Version]. *Proceedings of the Econometric Society Australasian Meeting.*

Durr, C. J. (1999). Factors affecting student performance in principles of macroeconomics courses [Electronic Version]. *Issues in Political Economy, 8.*

Ellis, L. V., Durden, G. C., & Gaynor, P. E. (1998). Evidence on factors that influence the probability of a good performance in the principles of economics course. *B>Quest (Business Quest).* Retrieved August 23, 2003 from: http://www.westga.edu/~bquest/1998/perform.html

Fan, T., Li, Y., & Niess, M. L. (1999). Predicting academic achievement in college computer science majors. *Journal of Research on Computing in Education, 31*(2), 155-172.

Felder, R., Felder, G., Mauney, M., Hamrin, C., & Dietz, J. (1995). A longitudinal study of engineering student performance and retention: Gender differences in student performance and attitudes. *Journal of Engineering Education, 84,* 151-163.

Garton, B., Dyer, J., & King, B. (2001) Factors associated with the academic performance and retention of college students. *NACTA Journal, 45*(1), 2-27.

Marsh, H. W. (1980). The influence of student, course, and instructor characteristics in evaluations of university teaching. *American Educational Research Journal, 17*(1), 219-237.

Marsh, H. W. (1982). SEEQ: A reliable, valid, and useful instrument for collecting students' evaluations of university teaching. *British Journal of Educational Psychology, 52,* 77-95.

Myers, S. C. & Nelson, M. A. (2003). Teaching ecomonics on the web—A study of student success. *American Economic Association Meetings.* Retrieved August 23, 2003 from: http://gozips.uakron.edu/~myers/online/ASSA2003/ASSA_Paper_January_2003.pdf

Olivares, O. J. (2002). An analysis of the study time-grade association. *Radical Pedagogy, 4*(1). Retrieved August 23, 2003 from: http://radicalpedagogy.icaap.org/content/issue4_1/06_Olivares.html

Organizational Systems Research Association. (1996). *Organizational End-User Information Systems Curriculum Model.* Retrieved August 23, 2003 from http://pages.nyu.edu/~bno1/osra/model_curriculum/

Organizational Systems Research Association. (2004). *Organizational End-User Information Systems Curriculum Model.* Retrieved March 1, 2004 from http://www.osra.org/curriculum2004.pdf

Sewell, W., Haller, A., & Ohlendorf, G. (1970). The education and early occupational status attain process: Replication and revision. *American Journal of Sociology, 35*(6), 1014-1039.

Sinclair Community College. (2002). *Distance learning performance/completion rates: Are there any predictors?* Retrieved August 23, 2003 from Sinclair Community College, Institutional Planning and Research web site: http://www.sinclair.edu/departments/ipr/pub/survey_reports/s_distance_learning01.pdf

Sullivan, T. S., & Behrends, H. C. (1999). *Student performance in business statistics: The role of prior mathematics and statistics courses.* (Working Paper 99-0103). Edwardsville, IL: Southern Illinois University, Department of Economics and Finance.

Williamson, K. (1992). Years of construction work experience as a predictor of success in construction graphics course work. *Associated Schools of Construction: Proceedings of the 28th Annual Conference.* 137-140.

Wilson, B. C. (2002). A study of factors promoting success in computer science including gender differences. *Computer Science Education, 12*(1-2), 141-164.

Yamamura, J. H., Martin, R. M., Campbell II, W. M., Campbell, S. N., & Frakes, A. H. (2000). Performance in auditing: The effect of the accounting information systems course. *The Cal Poly Pomona Journal of Interdisciplinary Studies, 13,* 43-56.