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CONTENTS

Greetings EERA Colleagues:

Welcome to this special section of the *Journal of Research in Education* highlighting research in higher education. This special section is a celebration for the new EERA Division 16: Higher Education. The Division was elevated from Special Interest Group status last year in an effort to more fully recognize the value of the postsecondary community within the broader framework of the Association. As the SIG, Issues in Higher Education, there was a growing interest by members to discuss issues related to teaching, administration, and students. The move to divisional status was well supported by former Division 9 Chair, Jack Campbell. Special credit for this elevation is particularly directed to Dr. Glenn Nelson of the University of Pittsburgh who has been a guiding force for the SIG and is now the Chair of the Division.

The following eight articles represent the quality and diversity of research presented annually related to higher education at the EERA conference. Three articles deal with technology related issues, administration, teaching, faculty, and student issues. The methodology used to frame these studies is also broad, including survey research, structured interviews, and mixed methods.

The three articles related to technology are embedded in a variety of issues important to the postsecondary community. John Fraas, Susan Bon, and Cathy Pugh look at the implementation of computer technologies on high school instruction, while Nataliya Ivankova and Sheldon Stick look at how technology can be used to work with advanced doctoral students and the impact of that technology on persistence. Susan Ramlo does an excellent job of looking at the formalization of study and teaching about technology as she uses a unique methodology to examine faculty perspectives related to the creation of a school of technology.

One of the most consistently discussed areas at EERA meetings has been college students and the relationships of various activities on student learning. These types of issues are represented in this volume by authors such as Patricia Van Leuvan who looks at female students in high school who will one day be future college students. Connie Monroe and Barbara Martin Palmer explore preservice teacher attitudes about teaching careers, and Joseph Ferrari and Monica Kapoor look at first-year students and how they view a religious university's mission statement. Also related to students, Thomas Westbrook, Keith Greiner, and Kevin Sanders study student expectations and actual experiences related to instructional quality at one college. And finally, Glenn Nelson and I look at how administrative turnover occurs in higher education institutions and how this turnover might be prompted.

Those of us working with the new Division are excited about the upcoming conference in Hilton Head this spring, and we believe that we will have a very strong track of programs. We thank all of you who have worked so hard to bring this SIG to Divisional status, and we hope to continue to see the research of higher education presented in *JRE* for many years to come! On behalf of the *JRE* editor, Darla Twale, we hope you enjoy this special issue.

Sincerely,
Michael T. Miller, Special Higher Education Issue Coordinator
University of Arkansas

# FACTORS RELATED TO TEACHER IMPLEMENTATION OF COMPUTER TECHNOLOGY IN MIDDLE AND JUNIOR HIGH SCHOOL INSTRUCTION

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*This study investigated whether professional development, technical support, computer availability, and teaching experience were related to the degree of implementation of computer technology to (a) support standards-based instruction, (b) use presentation software in instruction, and (c) use curriculum software. The data were obtained from 8,497 teachers who responded to the BETA Survey and who taught in Ohio middle and junior high schools that contained Grades 6 through 8. Since the degree of implementation for each criterion variable was dichotomized into infrequent and frequent users of computer technology, logistic regression models were used to identify statistically significant predictor variables. Based on the findings contained in this study, administrators who wish to increase the likelihood of the integration of computer technology into instructional practices may need to consider the levels of technical support and computer-related professional development given to their faculty.*

Federal and state mandates have placed increased pressure on schools to show improvement. Only recently are studies beginning to emerge on the impact of educational technology on student achievement (Schacter & Fagnano, 1999). Based on the number of school districts that have supplied their schools with computers and computer software, it is important to attempt to understand what factors are related to the implementation of this technology into instructional activities.

Computer technologies were introduced to education in the 1980s. The intervening years have not resulted in widespread use of these technologies in instructional practices (Clark, 2000; Cuban, 1986). It appears that simply providing more computers in the classroom does not

guarantee a change in instructional practice. According to Cuban, Kirkpatrick, and Peck (2001), teachers who reported that they used computers used them primarily for word processing, drill, and practice.

Over a 7-month period, Cuban et al. (2001) studied two high-tech schools, Flatland High School and Las Montanas High School. These schools were located in Northern California's Silicon Valley, the computer industry's epicenter, in a setting "where technology was abundant and strongly advocated by public officials, educators, and parents" (Cuban et al., p. 817). In an effort to gain a more complete picture of these two high-tech schools with high access to technology, the study included surveys, direct observations, interviews, and statistical data collected at school sites. The results, which were unexpected, indicated that exceptional access to technology did not result in more teacher and student use of computers or in a change in instructional practices. Thus, the quantity of available computer technology may not be a key factor in increasing the likelihood that teachers will integrate the technology into instructional practices.

When schools failed to move quickly to use technology to motivate students and to enhance teaching and learning, blame fell on the teachers (Cuban, 2001; Ross, McGraw, & Burdette, 2001) because they are primarily responsible for the implementation of any new innovation at the classroom level (Bitner & Bitner, 2002; Cuban, 1986; Fullan & Hargreaves, 1996). Just as teachers avoided using films in the classroom because they did not know how to thread the projector, teachers now avoid using computers for the same lack of knowledge (Fisher & Dove, 1999). Lack of knowledge is a major constraint to the implementation of technology (Reiser, 2001). For technology to be integrated into instructional practices, and thus impact student achievement, ongoing professional development and technical support must be provided (Barnett, 2000; Brown & Zellner, 2001; Denton & Manus, 1995; Dexter, Anderson, & Ronnkvist, 2002; Reichstetter, 2000; Reiser, 2001-2002; Ross et al., 2001; Swan et al., 2002).

This study investigated whether professional development, technical support, computer availability, and teaching experience were related to the degree of implementation of computer technology in order to (a) support standards-based instruction, (b) use presentation software in instruction, and (c) use curriculum software. The results of this study may assist school administrators and teachers in determining what factors should be addressed if they want to increase the likelihood that computer technology will be integrated into instructional practices.

## Methodology

### *Research Participants*

At the request of the Ohio Legislature, the Ohio SchoolNet Commission developed an instrument, the Biennial Education Technology Assessment (BETA), to gather and report the access and use of technology in Ohio's K-12 public schools for the 2001-2002 school year. This assessment included three separate surveys. One of the surveys explored the use of technology by teachers and students. Another survey requested information about the availability of technology resources in K-12 school buildings. The third survey collected information concerning technology policies and staffing at the district level.

The Elementary and Secondary Education Act (ESEA), known as No Child Left Behind (NCLB), requires all students to become technology literate by eighth grade. In December 2003, Ohio adopted technology standards that complied with NCLB. The National Education Technology Plan, currently in development, and the Ohio Education Technology Standards support the effective use of technology to improve the students' academic achievement. Middle schools are a launching pad for high schools to prepare students for the new high stakes Ohio Graduation Test to be administered to $10^{th}$ grade students beginning March 2005. Thus, we restricted our investigation to the 2002 BETA data obtained from 320 middle and junior high schools that include Grades 6, 7, and 8.

Some of the 320 middle and junior high schools initially included in the study were eliminated due to various reasons. Forty schools either did not respond to the survey or submitted insufficient data. In addition, information listed on the survey did not correspond with the *Ohio Education Directory* for 18 schools. At the completion of our data review process, the data from a total of 262 schools were used in this study. In these 262 schools, 8,497 teachers responded to the teacher survey.

### *Criterion Variables*

The degree of implementation of computer technology into each of three instructional practices served as the criterion variables. These specific instructional practices and the symbols used to represent them in the data analysis were (a) the use of computer technology to support standards-based instruction, $Y_1$; (b) the use of presentation computer software in instruction, $Y_2$; and (c) the use of curriculum computer software, $Y_3$. The survey respondents classified their use

of computer technology and software into one of three categories (a) *seldom/never*, (b) *occasionally*, and (c) *daily*. It should be noted that the term *seldom* was not defined on the survey, but *occasionally* was defined as weekly or at least three times per month. Since *seldom* and *never* formed one classification, we combined the responses of *occasionally* and *daily* to form two distinct groups of users. Thus, the two possible classifications for each of the three criterion variables were labeled *seldom/never* and *occasionally/daily*. Teacher responses of *seldom/never* were assigned values of zero, while *occasionally/daily* responses were assigned values of one. See Table 1 for a list of the criterion variables.

Table 1

*Criterion and Predictor Variables*

| Variables and Symbols | Variable Description |
|---|---|
| Technology to Support Standards-Based Instruction | |
| $Y_1$ | Use technology to support standards-based instruction (0=use with students seldom or never, 1=use with students occasionally daily) |
| Technology to Support Presentation Software | |
| $Y_2$ | Use presentation software in instruction, such as PowerPoint or HyperStudio in instruction (0=use with students seldom or never, 1=use with students occasionally or daily) |
| Technology to Support Curriculum Software | |
| $Y_3$ | Use curriculum software, that is, content specific programs/games for learning (0=use with students seldom or never, 1=use with students occasionally or daily) |

*(table continues)*

| Variable Symbol | Variable Description |
|---|---|
| Hours of Professional Development | |
| $X_1$ | No educational technology professional development hours (no = 0; yes = 1) |
| $X_2$ | Less than 5 hours of educational technology professional development (no = 0; yes = 1) |
| $X_3$ | 5 to 10 hours of educational technology professional development (no = 0; yes = 1) |
| $X_4$ | 11 to 15 hours of educational technology professional development (no = 0; yes = 1) |
| $X_5$ | More than 15 hours of educational technology professional development (no = 0; yes = 1) |
| Professional Development In Computer Use | |
| $X_6$ | Professional development in general computer use (no = 0; yes =1) |
| Professional Development in Software Application | |
| $X_7$ | Professional development in software applications (no = 0; yes =1) |
| Professional Development in Integrating Technology | |
| $X_8$ | Professional development in integrating technology in instruction (no = 0; yes=1 |

*(table continues)*

| Variable Symbol | Variable Description |
|---|---|
| Professional Development in Multimedia Peripherals | |
| $X_9$ | Professional development in multimedia peripherals (no = 0; yes 1) |
| Technical Support | |
| $X_{10}$ | No technical support is available (no=0; yes=1) |
| $X_{11}$ | Technical support received within 1 working day (no = 0; yes = 1) |
| $X_{12}$ | Technical support received in 2-5 days (no = 0; yes = 1) |
| $X_{13}$ | Technical support takes more than 5 working days (no = 0; yes =1) |
| $X_{14}$ | Teacher provides own support (no = 0; yes = 1) |
| Students per Computer | |
| $X_{15}$ | Low Ratio -- Less than 4 students per computer (no=0; yes=1) |
| $X_{16}$ | Moderate Ratio -- 4 to 6 students per computer (no = 0; yes = 1) |
| $X_{17}$ | High Ratio -- More than 6 students per computer (no = 0; yes = 1) |
| Proportion of Computers In Classrooms | |
| $X_{18}$ | Low Proportion -- Proportion of computers in classroom is <.50 (no=0; yes=1)<br>Moderate Proportion -- Proportion of computers in classroom is .50 ≤ .75 (no = 0; yes = 1)<br>High Proportion -- Proportion of computers in classroom is >.75 (no = 0; yes = 1) |

*(table continues)*

| Variable Symbol | Variable Description |
|---|---|
| Years of Teaching Experience | |
| $X_{21}$ | Teaching experience 1 year or less (no = 0; yes = 1) |
| $X_{22}$ | Teaching experience 2 to 5 year (no = 0; yes = 1) |
| $X_{23}$ | Teaching experience 6 to 12 years (no = 0; yes = 1) |
| $X_{24}$ | Teaching experience 13 to 20 years (no = 0; yes = 1) |
| $X_{25}$ | Teaching experience 21 or more years (no = 0; yes = 1) |

*Predictor Variables*

Predictor variables were generated to represent a number of what we believed could be key factors in determining whether teachers would be frequent users of computer technology in instructional practices. Specifically, predictor variables were formed to represent (a) the number of hours of computer professional development completed by the teachers; (b) whether the teachers received professional development training in general computer use; (c) whether the teachers received professional development training in software application; (d) whether the teachers received professional development training in the integrating of technology and instruction; (e) whether the teachers received professional development training in multimedia peripherals; (f) the type of technical support provided to the teachers; (g) the average number of students per computer, which was determined by dividing the number of students in the building by the total number of computers in classrooms, the media center, and computer labs that were available to students for instructional purposes; (h) the proportion of computers located in classrooms; and (i) the number of years of teaching experience reported by the teachers. See Table 1 for a description of the predictor variables designed to represent these nine factors. A review of this table reveals that each predictor variable is a dichotomous variable. Some factors were represented by one predictor variable, while other factors were represented by a series of predictor variables.

*Logistic Regression Model*

Since each of the three criteria variables consisted of teacher responses that were classified into two categories--infrequent and frequent users--three logistic regression models were designed and analyzed. As noted by Peng, Lee, and Ingersoll (2002), logistic regression is ideal for handling educational research problems that call for the analysis and prediction of a dichotomous criterion variable. Peng and So (2002) noted two advantageous characteristics of logistic regression analysis. First, a logistic regression model constrains the predicted values of probability to the logical range of 0 to 1. Second, a logistic regression model does not require the data to be drawn from a multivariate normal distribution with equal variances and covariances for all the variables. The logistic regression models were estimated and tested using the SPSS® Version 11.5 computer software program.

The factors and predictor variables included in the three logistic regression models are listed in Table 2. Models 1 and 3, which were used to analyze criterion variables $Y_1$, use of computer technology to support standards-based instruction, and $Y_3$, the use of curriculum software, contain the same eight factors. Model 2, which was designed to analyze $Y_2$, the degree of implementation of computer presentation software, contains six factors.

Table 2

*Logistic Regression Analysis*

| Variables and Symbols | Model 1 [a] Coefficient | Delta-*p* Value | Model 2 [a] Coefficient | Delta-*p* Value | Model 3 [a] Coefficient | Delta-*p* Value |
|---|---|---|---|---|---|---|
| Hours of Professional Development | 85.48 [b] ** | | 147.71 [b] ** | | 80.78 [b] ** | |
| $X_2$ | .17 | .03 | .34 ** | .08 | .31 ** | .08 |
| $X_3$ | .56 ** | .10 | 61** | .15 | .61 ** | .1 |

*(table continues)*

| Variables and Symbols | Model 1 [a] Coefficient | Delta-*p* Value | Model 2 [a] Coefficient | Delta-*p* Value | Model 3 [a] Coefficient | Delta-*p* Value |
|---|---|---|---|---|---|---|
| $X_4$ | .54 ** | .10 | .78 ** | 19 | .62 ** | .15 |
| $X_5$ | .86 ** | .14 | 1.10 ** | .27 | .74 ** | .17 |
| Professional Development in Computer Use | | | | | | |
| $X_6$ | -.12 | --- | -.25 | --- | -.05 | --- |
| Professional Development in Software Application | | | | | | |
| $X_7$ | .29 ** | .06 | NA | NA | .36 ** | .09 |
| Professional Development in Integrating Technology | | | | | | |
| $X_8$ | .41** | .08 | .31** | .08 | .13 | --- |
| Professional Development in Multimedia Peripherals | | | | | | |
| $X_9$ | --- | --- | .59 ** | .15 | --- | --- |
| Technical Support | 151.67 [b] ** | | 76.25 [b] ** | | 102.33 [b] ** | |
| $X_{11}$ | 1.73 ** | .22 | 1.56 ** | .36 | 1.58 ** | .31 |
| $X_{12}$ | 1.62 ** | .22 | 1.42 ** | .33 | 1.59 ** | .31 |
| $X_{13}$ | 1.45 ** | .20 | 1.35 ** | .33 | 1.51 ** | .30 |
| $X_{14}$ | 1.27 ** | .19 | 1.62 ** | .37 | 1.35 ** | .28 |
| Students per Computer | 8.52 [b] | | NA | NA | 5.08 [b] | |
| $X_{15}$ | .19 | --- | NA | NA | .14 | --- |

*(table continues)*

| Variables and Symbols | Model 1 [a] | | Model 2 [a] | | Model 3 [a] | |
|---|---|---|---|---|---|---|
| | Coefficient | Delta-$p$ Value | Coefficient | Delta-$p$ Value | Coefficient | Delta-$p$ Value |
| $X_{16}$ | .04 | --- | NA | NA | .09 | --- |
| Proportion of Computers in Classrooms | 13.00 [b] ** | | NA | NA | 3.68 [b] | |
| $X_{19}$ | .01 | <.01 | NA | NA | .07 | --- |
| $X_{20}$ | .22 ** | .04 | NA | NA | .12 | --- |
| Years of Teaching Experience | 6.50 [b] | | 13.50 [b] ** | | 10.26 [b] | |
| $X_{21}$ | -.08 | --- | .06 | .01 | -.23 | --- |
| $X_{22}$ | .15 | --- | .23 ** | .06 | -.03 | --- |
| $X_{23}$ | .08 | --- | .15 ** | .04 | .09 | --- |
| $X_{24}$ | .02 | --- | .12 ** | .03 | .07 | --- |
| Constant | -1.47 ** | --- | -2.68 ** | --- | -2.14 ** | --- |

[a] The criterion variables for Models 1, 2, and 3 were the use of technology to support standards-based instruction, the use of presentation software, and the use of curriculum software, respectively. The mean values for the criterion variables for Models 1, 2, and 3, which served as the initial probabilities for the Delta-$p$ calculations, were .71, .40, and .54, respectively.

[b] This value is the decrease in the log likelihood value multiplied by minus 2 when the series of predictor variables used to represent this factor were added to the model.

** $p$ <.01

A number of points should be noted regarding these three logistic regression models. First, the sample sizes for both Models 1 and 3 were 8,497, while the sample size for Model 2 was 8,495. Second, since some of the factors were represented by a series of dichotomous predictor variables and the variables in the series were linearly dependent, one of the predictor variables was not included in the model. The predictor variable not included in the model served

as the reference group for the coefficients that were estimated for the other dichotomous variables in the series.

Third, coefficients for the factors represented by a single dichotomous variable were statistically tested with Wald test values. A Wald test value for a given coefficient was equal to the square of the coefficient divided by its standard error. Chi-square test values were used to statistically test the factors represented by a series of dichotomous variables. Each of the chi-square values statistically tested the decrease in the log-likelihood value--specifically, the decrease in the log likelihood value multiplied by minus 2--when the series of dichotomous variables was added to the model.

Fourth, since logistic regression predicts the log odds that an observation belongs to the group assigned a value of 1, each one-unit of change in a predictor variable is associated with a change in log odds of being a frequent user of computer technology that is equal to the coefficient of that predictor variable. Such coefficients are difficult to use when attempting to assess the magnitude of the relationship between a given predictor variable and the criterion variable in a manner that would be useful to practitioners. To assist in gauging the magnitude of each *statistically significant factor*, Delta-*p* values were calculated for those factors (Fraas & Drushal, 2004; Petersen, 1985). In this study a Delta-*p* value measures the change in the initial probability, which is set equal to the mean of the dichotomous criterion variable, that a teacher will be a frequent user of computer technology for a one unit change in the given predictor variable.

Fifth, the alpha level for the statistical test of each factor was set at the .01 level to control for inflated Type I error rates due to the multiple statistical tests. Because of the large sample, an alpha level of .01 had negligible effects on the power levels of the statistical tests. In addition, for each statistically significant factor that contained a series of predictor variables, follow-up pair-wise tests of the coefficients were conducted at the .005 level.

Sixth, the coefficient for each factor represented by one dichotomous predictor variable was hypothesized to be positive. Thus, the statistical tests of the coefficients of those factors were conducted as directional tests (i.e., one-tailed tests).

*Results*

Three logistic regression models were estimated and tested to determine what factors were significantly related to the implementation of computer technology to support (a) standards-based instruction, (b) presentation software, and (c) curriculum software. The results of the analyses are listed in Table 2.

*Results for Model 1*

The statistical tests of the eight factors included in Model 1 indicated that five factors were statistically significant. These factors included (a) Hours of Professional Development, $p<.001$; (b) Technical Support, $p<.001$; (c) Proportion of Computers in Classrooms, $p=.002$; (d) Professional Development in Software Application, $p<.001$; and (e) Professional Development in Integrating Technology, $p<.001$. Additional insight into the importance of these variables was obtained by conducting pair-wise tests of the coefficients for each statistically significant series of predictor variables and by calculating the Delta-*p* values for the statistically significant factors. With respect to the Delta-*p* values, the initial probability was set equal to .71, which was the mean of the criterion variable, $Y_1$.

Further statistical analysis of the coefficients for the Hours of Professional Development factor indicated that teachers with 5 or more hours of professional development were more likely to be frequent users of technology to support standards-based instruction. When compared to teachers with no professional development hours, the Delta-*p* values indicated that the probabilities of being frequent users of technology to support standards-based instruction increased from .10 to .14 for teachers, in the upper three groups, who had at least 5 hours of professional development.

Additional statistical analysis of the coefficients of the groups of teachers represented in the Technical Support factor revealed that receiving some type of support was associated with an increased likelihood that a teacher would be a frequent user of technology to aid standards-based instruction. When compared to teachers who received no technical support, the Delta-*p* values showed that the probabilities of being frequent users of technology to support standards-based instruction increased from .19 to .22 for teachers who received some type of technical assistance.

Further statistical analysis of the coefficients for the three levels of the Proportion of Computers in the Classrooms indicated that the coefficient for the High Proportion Group was significantly higher than the coefficients for the other two groups. The Delta-*p* values indicated

that the probabilities of being frequent users of technology to support standards-based instruction in buildings where more than .75 of the computers were in classrooms increased by only .04.

A review of the statistically significant coefficients and Delta-*p* values for the Professional Development in Software Application factor (*b*=.282, Delta-*p* value=.06), and Professional Development in Integrating Technology factor (*b*=.412, Delta-*p* value=.08) indicated that teachers with these types of training were more likely to be frequent users of technology to support standards-based instruction.

*Results for Model 2*

A review of the statistical tests of the six factors included in Model 2 reveals that five factors were statistically significant. These factors included (a) Hours of Professional Development, $p<.001$; (b) Technical Support, $p<.001$; (c) Teaching Experience, $p=.009$; (d) Training in Integrating Technology, $p<.001$; and (e) Training in Multimedia Peripherals, $p<.001$. As was the case for the analysis of Model 1, additional insight into the importance of these variables in Model 2 was obtained by conducting pair-wise tests of the coefficients for each statistically significant series of predictor variables and by calculating the Delta-*p* values for the statistically significant factors. With respect to the Delta-*p* values, the initial probability was set equal to .40, which was the mean of the criterion variable, $Y_2$.

Further statistical analysis of the coefficients generated for the Hours of Professional Development factor indicated that, in general, as professional development hours increased, so did the likelihood that a teacher would be a frequent user of presentation software in instruction. When compared to teachers who received no professional development in educational technology, the Delta-*p* values indicated that the probabilities of being frequent users of presentation software increased from .08 to .27 for teachers who received some level of professional development.

Additional statistical analysis of the coefficients estimated for the Technical Support factor indicated that receiving some type of support was associated with an increased likelihood that a teacher would be a frequent user of presentation software. When compared to teachers who did not receive technical support, the Delta-*p* values for the various groups, which were substantial, revealed that the probabilities of being frequent users of presentation software increased from .32 to .37 for teachers who received some type of technical support.

Further statistical analysis of the coefficients generated for the Years of Teaching Experience factor revealed a general lack of significant differences among the coefficients. In addition, the relatively low Delta-*p* values for these groups, which ranged from .01 to .06, indicated that increases in the teachers' probabilities of being a frequent user of presentation software were not substantial as the years of teaching experience changed.

A review of the statistically significant coefficients and Delta-*p* values for the Professional Development in Integrating Technology factor (*b*=.313, Delta-*p* value=.08), and the Professional Development in Multimedia Peripherals factor (*b*=.593, Delta-*p* value=.15) indicated that teachers with these types of training were more likely to be frequent users of technology to support standards-based instruction.

*Results for Model 3*

A review of the statistical tests of the eight factors included in Model 3 reveals that three factors were statistically significant. These factors were (a) Hours of Professional Development, $p<.001$; (b) Technical Support, $p<.001$; and (c) Training in Software Application, $p<.001$. Once again, additional insight into the importance of these variables in Model 3 was obtained by conducting pair-wise tests of the coefficients for each statistically significant series of predictor variables and by calculating the Delta-*p* values for the statistically significant factors. With respect to the Delta-*p* values, the initial probability was set equal to .54, which was the mean of the criterion variable, $Y_3$.

Additional statistical analysis of the coefficients and Delta-*p* values of the coefficients generated for the Hours of Professional Development factor indicated that teachers with some professional development hours were more likely to be frequent users of curriculum software. When compared to teachers who received no professional development in educational technology, the Delta-*p* values for this factor indicated that the probabilities of being frequent users of curriculum software increased from .08 to .17 for teachers, in the upper three groups, who had 5 or more hours of professional development.

Further statistical analysis of the coefficients and the Delta-*p* values of the coefficients estimated for the Technical Support factor indicated that receiving some type of support was associated with a substantial increase in the likelihood that a teacher would be a frequent user of curriculum software. When compared to the teachers who received no technical support, the Delta-*p* values ranged from .28 to .31. These values revealed that the probabilities of being

frequent users of curriculum software increased by at least .28 for teachers who received some type of technical support.

A review of the statistically significant coefficient and Delta-*p* value for the Professional Development in Software Application factor (*b*=.356, Delta-*p* value=.09) indicated that teachers with these types of training were more likely to be frequent users of technology to support standards-based instruction.

## Summary and Implications

When reviewing the results produced by this study it is important to keep in mind its key limitations. First, we were not able to manipulate any of the independent variables. Thus, one must be careful to not assume that the relationships revealed in this study necessarily infer causation. Second, teacher use of computer technology and software was self reported. Third, the generalizability of the results is restricted by the exclusion of survey non-respondents and respondents whose responses were insufficient. Fourth, the variables included in the study were restricted to ones for which data were available in the 2002 BETA data set.

In general, the logistic regression analyses indicate that the training of teachers and the type of technical support provided to teachers were significantly related to each of the three criterion variables. Specifically, increases in the teachers' likelihood of being frequent users of computer technology to support standards-based instruction are associated with teachers who (a) completed more than 5 hours of professional development, (b) received some type of technical support, (c) taught in a building in which more than 75% of the computers are located in classrooms, and (d) were trained in software application and integrating technology. With respect to the use of presentation software in instruction, increases in the teachers' likelihood of being frequent users of such software are associated with teachers who (a) completed some hours of professional development, (b) received some type of technical support, and (c) were trained in integrating technology and multimedia peripherals. Increases in the teachers' likelihood of being frequent users of computer curriculum software are associated with teachers who (a) completed some hours of professional development (b) received some type of technical support, and (c) were trained in software application.

These findings suggest that for school administrators to increase the use of technology in instruction, they must provide opportunities for teachers to receive training, technical support, and adequate access to computers in the classroom. In addition, past studies have revealed there

is a positive relationship between teacher attitude toward computers and computer usage in the classroom (Burns, 2002; Dusick, 1998; Moallem & Micallef, 1997; Newhouse, 2001; Norton, McRobbie, & Cooper, 2000). Thus, school administrators are encouraged to follow the guidelines identified below when providing professional development and technical support for teachers:

1. Professional development should focus on changing teacher attitudes and beliefs about teaching and learning (Burns, 2002).
2. Professional development should clearly show teachers how to use computers to augment curricular standards (Burns).
3. Professional development should provide teachers with concrete skills and knowledge about how to integrate technology into the curriculum (DeMoulin, Kendall-Melton, & McBride, 2001-2002).
4. Technical support should be comprehensive and include a timely response to technical problems and instructional support (Ronnkvist, Dexter, & Anderson, 2000).

Once these opportunities are provided to teachers, administrators will be able to assess the extent to which technology actually impacts student learning. This will then provide administrators with critical information about the wisdom of increased spending on technology.

The results of this study reveal that professional development and technical support are significant factors that influenced teachers' likelihood of being frequent users of technology. Although these results neither confirm nor disconfirm the impact of technology use in the classroom on student learning, the results still have legitimate implications for school leaders. If school leaders plan to continue investing heavily in technology, they should provide necessary assistance in the form of professional development and technical support if they want teachers to integrate technology into instructional practices. Additionally, school leaders should consider how they can influence successful technology use in schools.

In a recent study, Anderson and Dexter (2005) examined technology leadership characteristics in an attempt to determine how these characteristics influenced technology use in schools. They concluded that "support services and other processes generally associated with technology leadership" (p. 75) are more important than technology infrastructure. Accordingly, they suggested that future research should examine how leadership, particularly from the

principal, influences technology implementation given the existing school infrastructure and other school characteristics.

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# DOES A NEW BROOM SWEEP CLEAN? THE NEW PROVOST AND ADMINISTRATIVE TURNOVER

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*Colleges and universities are reliant on academic administrators to implement the policy and practice necessary to successfully deliver education in a timely and appropriate manner. Increasingly, commercial aspects of higher education have contributed to the reduction in the length of time senior academic administrators hold their positions and the result is often a ripple effect, impacting the employment of those directly supervised. This exploratory study provides an overview of the pressures new senior academic administrative professionals face upon their entry into their new positions. Interview data collected from 14 provosts revealed that senior academic affairs officers are often used by others, such as presidents or bodies such as boards of trustees, to implement change.*

Colleges and universities rely on bureaucratic structures to assign and execute the various work that must be accomplished. These structures vary based on institutional missions and purposes (Heuer, 2003), but typically rely on a singular leader, termed chancellor or president with the two used almost interchangeably. As the primary face of the institution, this leadership role has evolved dramatically during the past 20 years, changing from a position of academic leadership to one of institutional advancement and development with an increased concern for the business operations of institutions (Sibley, 1998).

Sibley (1998) noted that these leaders are typically in their positions, on average, for 5 years before they move to another institution or position, revert to faculty appointments, or are discharged for a variety of reasons. A difficulty associated with such a short period of time in a professional position is that those hired by the president or chancellor are often left without a mentoring or supervisory support system or individual.

This is particularly difficult for those in academic affairs, as the teaching and research faculty and graduate assistants account for the greatest portion of institutional budgets and employ the majority of those on campus. Sibley went on to note that the vice president for academic affairs, or also termed and interchangeable with provost, holds the position for a national average of 7 years, correlated largely with the transition of the college's president.

Reporting to college provosts are academic deans, and cascading from the deans are department chairs or heads and program coordinators, all administrators coordinating the academic program work of the institution. Sibley (1998) has also noted that academic deans' average length of service is correlated to that of the provost, and that when the provost position is vacated and a new one hired, the academic deans tend to turn over in their positions as well.

Anecdotal evidence supports Sibley's (1998) contention, whether documented in autobiographical essays (Campbell, 2000; Duderstadt, 2000; Kennedy, 1997) or in the *Chronicle of Higher Education*. One example has been at the California State University campus in San Jose, where a new provost's hiring spurred the changing of five academic deans (a complete listing of administrative turnover at that institution is available through http://www.sjsu.edu). Such changes are not limited to academic affairs, either, as similar employee turnover can be evidenced in such areas as coaching for intercollegiate athletics and various administrative units. The purpose for conducting the current study was to describe how provosts go about making personnel changes within their areas of authority, both formalizing much of the anecdotal conversation about administrative transition within academic affairs and identifying what prompts such turnover. As a descriptive study, qualitative research methods were employed.

## Power and Control in Higher Education

Colleges and universities draw and discharge their responsibilities and authority through charters, whether commissioned from a state agency or from a private entity. These charters typically provide formal authority to trustees who delegate to institutional employees, who then rely on a cascading scaffold of offices and personnel to execute policy and implement the activities of the institution. Despite a bureaucratic appearance, many institutions rely on informal networks and cultures to operate in what has become

an increasingly commercial enterprise (Birnbaum, 1991). As institutions have changed some of their basic operations to be more efficient and to maintain compliance with state and federal authorities, the characteristics and desirable experiences of academic leaders have changed. Additional complexities changing academic leadership are decreased institutional loyalty, enhanced performance expectations, a growing number of external constituents, and a growing decentralization of internal decision making (Gaither, 2002).

Leadership training for higher education has expanded greatly in recent years, but typically focuses on administrative leadership behaviors, rather than on academic leadership or training faculty to assume academic leadership positions (Bisbee, 2005). Academic leadership, in a position such as the provost, is particularly challenging because the nature of academic work relies on a combination of entrepreneurial skills, creativity, and individual motivation. So training programs that address budgets, personnel management, diversity and legal issues, and technology are all increasingly commonplace (Montez, Wolverton, & Gmelch, 2002); whereas, those that focus on academic-centered issues are rare (Bisbee, 2005; Heuer, 2003).

As academic leaders have historically had no formal training, there has been a propensity for them to learn on the job and through trial and error (Gmelch, 2004). In many instances, new academic deans or provosts have assumed positions for which they were unprepared, and learned how to execute their duties only through experimentation and in some instances professional mentoring. The provost has direct responsibility for the academic matters of a college or university, and subsequently must ensure quality through delegation to academic deans. Additionally, priorities that might be considered important to a provost, such as percentage of diversity reflected in the student or faculty population, the amount of dollars awarded through competitive grants or contracts, the number of books or articles written, ensuring teaching quality, and so forth are all directly tied to how well the deans perform. Therefore, provosts are entirely invested in the quality of deans and their ability to influence the behavior desired by the provost of the faculty and students in an academic unit. This issue of administrative control by the provost over academic units is largely the impetus for the current study, attempting to identify how provosts work with the situation they are given upon their arrival in their

position, and how they determine which changes to make and how to go about establishing their own agendas as provost.

## Method

As the current study was designed to be descriptive in nature, a grounded theory approach to data collection and analysis was selected as appropriate. Grounded theory allows researchers to gather and interpret data without predetermining results or allowing bias to enter into expected outcomes. The process is particularly appropriate for initial descriptions of phenomena that have not been studied before (Creswell, 2002, 2003) and those that can prove to be especially sensitive and in need of complete anonymity.

Semi-structured interview questions were developed in consultation with an expert panel of academic administrators. The six structured questions focused on the aspirations and process of becoming a provost and the transition into the provost position. The interview questions were field tested with 2 provosts who had over 15 years in their positions and the questions were adapted based on their feedback.

A total of 14 provosts were selected for inclusion in the study and were interviewed in the summer and fall of 2004. The provosts all had been in their position a minimum of 2 years but less than 5 years, thus allowing for potentially easier or more recent recall of the transition process. The sample included 8 male provosts and 6 female provosts, employed by comprehensive or doctoral granting universities in the middle-west or southeastern United States. All members of the sample held terminal degrees, and had held faculty positions at some point in their academic careers. There was a combination of titles used, including exclusively provost or vice president or chancellor for academic affairs, while some of the participants held both a provost and vice president title.

All interviews were completed in person at the participant's office, and were tape recorded. Transcripts of recordings were returned to the participant for verification of accuracy and intent. Notes were also taken throughout each interview and used in the data analysis.

As a cautionary note, initially 25 provosts were identified for possible inclusion in the study; however 11 of them declined an offer to participate. The 14 participants who were interviewed may possess some unique characteristics or attributes, reinforcing the

notion that this was an exploratory, descriptive study that lent itself to continued study. As a result of the selection process and results used, there may be some bias present in findings related to unique institutional characteristics or events.

## Findings

The provosts who agreed to be interviewed for the study were open and willing to engage in conversations about their experiences and their transitions into their new work environments. The sample of provosts had been in their current positions an average of 19 months and had an average salary of $145,000. Nearly all of the provosts (10) held terminal degrees from the humanities, with the most popular area for doctoral work being political science (4). The remaining 4 provosts held doctoral degrees in the hard sciences, with two of these being in chemistry.

Interview lengths were initially scheduled for 1 hour, consistent with the recommendation of Creswell (2002) who warned of the deterioration of interview accuracy in time periods longer than that. In each interview instance, however, the sessions were longer than the originally scheduled hour due to the conversational style of the interviews and the openness displayed by the provosts who were interviewed. On average, each interview lasted 1 hour and 24 minutes.

The transcripts and notes from each interview were used in analysis by the investigators who looked for word strings, themes, or concepts that were consistent among the participants. The result was the emergence of three distinct processes that provosts utilized in their transition to power: institutional fit, interpretative-reflective timing, and trustee micromanagement.

### *Institutional Fit*

Provosts identified a key to their appointment as either their ability to "fit into the college," meaning that their "cultural values, ethics, and beliefs" were consistent with the environment already present on the college's campus. This notion of fit was also identified in relation to college leaders, namely the president or chancellor of a college, looking for a provost who "fit" with the needs of the position. These needs were not always based on strengths and weaknesses that complement each other, and in five instances the president hired a provost for the specific purpose of making changes among the administrative staff, including the academic deans. One male provost stated,

> When I came in, there was some real deadwood among the deans. I mean we have seven deans, and at least four of them were over 60 years old, you know, just a different generation and they were largely sitting around waiting for retirement, and my job, very specifically, was to get those colleges into the 21st century, and those deans weren't going to get the job done...so when I came in [to the college] the president said he wanted a change and that I should start by looking at the deans. And he fully supported me and backed me as I took them on, and some of them didn't go quietly!

Another provost indicated that her president was very forthright about changing the academic leadership of the colleges, giving her names of who should be terminated immediately and who he thought should be kept, including professionals on the provost's immediate staff. This provost commented "I don't know why he just didn't terminate them before I came in; it would have made my job a lot easier. But then, I suppose it would have changed his image with a lot of people."

Another provost talked about a more collaborative, if presidential-driven change process:

> A large part of the university's decision to hire me was that I am a change agent – I have a vision and I know how to get things done. Once I got here, it didn't take long to see who was underperforming, and [the president] and I sat down and compared notes, and made some difficult personnel changes. I think the reason it worked was first, he fully supported my decisions on who should stay or go, and second, he had some pretty strong ideas about who should be kept on or not, and we agreed on them very quickly.

A provost concluded her comments by noting that the success or failure of a provost is really tied to whether or not the individual fits in with the supervisor, and to some extent, the board of trustees. She commented, "I really believe there has to be a tight fit between the provost and president, and I think you typically end up with your first assignment [as provost] executing the president's agenda."

*Interpretative-Reflective Timing*

A consistent theme identified throughout the interviews was the ability of a new provost to begin a position and to take time to figure out how various individuals interacted, how they collaborated, and how effective they can be. In a sense, the new provost takes time to reflect and interpret a campus's landscape to understand interactions, strengths, and weaknesses. One provost said:

> I spent my first year figuring the campus out and then got to work moving things in the direction I believed it should go in. Now I had a lot of input, of course, but I wanted to put in place a team that I could believe in and that I really thought could make the changes I saw as necessary.

Another provost was more specific about how she assessed the strengths and weaknesses of the team of academic leaders she inherited.

> I put together I think five different committees made up of the academic directors [deans] and the assistant and associate provosts. I gave them about 6 months to work on these projects, and I watched how they got along and who did the work. Kind of like how you might watch a group assignment in a class. That process really tipped me off, then, about who were the workhorses and who was coasting. I didn't use that as a criteria [sic] for making personnel changes, but it alerted me to who I should be watching.

At least 2 provosts also identified that it was not solely about work performance, but related to what types of agendas the deans had and what kind of trust was built between the provost and those reporting to the position. One provost commented that her predecessor had been terminated and that she suspected the vice provost played a role in that. Once she figured out his motivation, a desire to hold the position she had just assumed, she decided that he was not to be trusted and had him reassigned to his faculty role. For the most part, however, comments focused on the relationship and the work agenda that the provost saw as important and what the deans saw as important. She commented,

> I was very upfront. We needed to start growing enrollment and raising external money. I made that clear to all the deans and to my own staff. And, I told them that if they didn't want to do that, then they should start looking for jobs. Now nobody came up to me after the meeting and said I quit, but within 3 or 4 months, they got the message and I had maybe four resignations. Those that stayed got onboard and are making a difference on this campus every day that they are here.

One provost highlighted this theme by saying simply that he did not know anyone when he arrived on campus, and that he "just had to get to know the people here and what they were about." Personnel changes and institutional priorities were his to learn, and ultimately, he commented "I had to get one dean to retire and had to replace my own staff in the vice president's office – they just wanted to do different things than what I was hired to do."

*Trustee Micromanagement*

A third theme that arose was related to the board of directors (or trustees) who were somehow involved in making personnel changes. This might mean that the board actually was involved in deciding who should stay and who should be terminated, or that the provost might have requested board involvement. Four provosts made different comments in this regard, ranging from the chair of the board making open statements about wanting some administrators removed from their positions to private telephone calls between board chair and provost.

In the first instance, a provost who had just arrived on campus recounted how at his first board meeting, the chair of the board made repeated comments about the dean of the college of business administration. The provost recounted, "The comments seemed entirely out of place. But, the president wants the board to be happy or he doesn't have a job, so he had me terminate the business dean."

Two other provosts noted that there was "pressure from the board" to change the "strategic direction of several colleges." This pressure was manifest in the sending of email messages and telephone calls suggesting that administrative changes needed to be made in the near future. In both cases, the provosts made personnel changes at the prompting of the board.

The fourth provost commented on his approach to inheriting a group of vice provosts and deans, and speculated on how the transition might take place. Having never been a provost before, he commented:

> I thought the president might say something, but he didn't. I had a call from one of the board members who said he was calling on behalf of the group that wanted some people removed. I generally agreed, but I don't think I would have made the same changes as quickly if it weren't from the board. That same board pressure, though, is also the biggest reason that I want to leave this institution. I don't think that it's right for them to have that level of involvement, but if I ignore it, I'm gone!

These comments suggested that boards of trustees have a vested interest in who assumes the provost position. The comments also suggested that provosts have interactions with trustees on a much more informal level than many have speculated and documentation of this is an important area for further study.

*Secondary Theme*

A secondary theme related to the personal ambitions of provosts also emerged and was related to how quickly provosts wanted to implement changes or their own personal ideas. Those with greater ambitions for a presidency or chancellor position consistently indicated a need to move quickly in making changes and advancing their personal agendas for the institution and for the position. Comments by approximately half of the respondents focused on an urgency to get things done, which could largely be a desirable attribute for a professional at this senior level. One provost, however, commented on the need to be assertive in preparation for his next career move saying,

> I've pretty consistently taken on jobs where there's a lot of work to do, and I've made the hard decisions and changes, and I've moved on. Kind of like this position. I care for the institution and the programs here, and I'm willing to spend the rest of my career making these things happen, but I also think about becoming a president within the next 4 or 5 years, and I need to have the demonstrated track record to get the position. I've got to get the work done to show that I can.

Within 6 months of the provost having said the above comment, he was identified as a finalist for a presidency at one of the other institutions in the state where he served as provost.

## Discussion

The academic vice presidency (provost) is a vital position to the success of a college or university and with the increasing attention to fund raising and external relations by college presidents, the provost has assumed a greater importance in institutional management (Sibley, 1998). As the provost assumes a more visible role in institutional leadership, research about the position and the individuals holding these positions should focus on how they go about establishing and executing agendas, how they are trained, and how they transition into their new work environments. The current study initiates this conversation by highlighting how provosts begin their position and how they making staffing decisions.

Implied in the study findings under the theme dealing with institutional fit, the provost's decision-making style and process are a reflection of the institutional culture and have tremendous impact on the human resources of the institution. Unilateral and quick decisions that reflect intolerance, for example, can be dangerous signals to the college community about loyalty and longevity. Conversely, an inability to take any action can send the opposite message, one of dis-concern about performance or ability. The provost, then, has a delicate balancing act of pursuing the best interests of an institution in a manner that does not isolate or devalue individuals.

The themes identified also imply that training for provosts should include attention to the decision-making process and how data can be collected and inform the process. Training modules whether offered by institutions or by professional associations should include elements of performance appraisal interviews, data based decision making, and other tools that will allow for accurate determinations of individual strengths and weaknesses, and the matching of those strengths to appropriate positions. Similarly, attention should be provided on how to handle the transition to a position of substantial power and influence.

The process of provost selection is also important in the data collection and analysis. A fundamental key to success in finding a provost that matches institutional

needs is that there is a consistency between the institutional values and those of the individuals. To find out about this before hiring a provost, more behavioral interviewing, for example, might be appropriate as would different recruitment and employment strategies that focus more on getting to know how an individual would fit into an institution and what that individual values rather than continuing with the existing fashion of mostly validating past experiences.

Provosts were open and willing to talk about their experiences and seemed almost anxious to spend time reflecting on the position as opposed to dwelling on their daily stressors. This suggests that the provost position is well situated for further study, and that the current research was successful in establishing a beginning to the conversation about internal campus leadership.

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# WHAT IS SUCCESSFUL TEACHING? A COMPARISON OF THE PERCEPTIONS OF COLLEGE SOPHOMORES AND COLLEGE SENIORS

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*Teacher education programs strive to prepare teachers by providing knowledge, skills, and dispositions matched to their concept of successful teaching. This study investigates whether teacher candidates' views on teaching shift over a period of time by comparing the responses of college sophomores to those of seniors when asked to describe "successful teaching." Teacher candidates were asked this open-ended question in group interviews. Constant comparative analysis was applied to group responses into categories based on the Interstate New Teacher Assessment and Support Consortium (INTASC). Two additional categories emerged as well related to teacher characteristics and student achievement. The results did demonstrate differences between the response patterns of the sophomores and the seniors showing a change in depth and focus. This information may provide insight into the development of teacher candidates and into their understanding of successful teaching.*

Colleges and departments of teacher education aspire to graduate men and women who will succeed in the classroom. Each institution defines conceptually its understanding of successful teaching by melding theory and practice with high quality standards. An understanding of how teacher candidates view successful teaching serves colleges and departments well as a congruence indicator.

Hammerness (1999) describes teacher vision as images of what teachers hope for in their classroom, a conscious possibility involving both emotion and cognition. She suggests that such vision shapes teachers' learning and decision making. As a vision, successful teaching may serve as the ideal to which teacher candidates aspire and which influences their expectations. Insight into their thought process allows for improved programming tailored more specifically to the developmental needs of the teacher candidate. In this way, an understanding of possible changes in perceptions of successful teaching may directly benefit teacher candidates.

This topic is relevant not only to teacher candidate needs but also to teacher education programs. The last decade has seen impassioned debates over the value of teacher certification and teacher education programs. While authors such as Kanstoroom and Finn (1999) and Walsch (2002) argue that teacher certification and teacher education programs are unnecessary, authors such as Darling-Hammond and colleagues (2001, 2002), Monk (1994), and Wise (2000-2001) present contrary evidence. Goldhaber and Brewer (2000) reported a correlation between teacher certification status and teacher effectiveness. In fact, Darling-Hammond, Berry, and Thorenson (2001) have demonstrated that greater student gains are associated with teachers who are certified than with those who are not certified. In spite of these data, teacher education programs are increasingly asked to demonstrate a value-added approach in order to justify their existence. Examining changes between teacher candidates' early attitudes and later attitudes may serve as one way to investigate program outcomes.

Previous research has examined preservice teachers' analogies regarding teaching, concerns, and attitudes toward various educational philosophies (Bright & Vacc, 1994; Buhendwa, 1996; Fuller & Brown, 1975; Graker, 1995; Kagan, 1992). While useful and enlightening, these approaches do not address the teacher candidates' perceptions of successful teaching. An exploration of this topic may provide information helpful to understanding the emerging beliefs of teacher candidates. This study investigates whether teacher candidates' views on teaching shift over a period of time by comparing the responses of college sophomores to the responses of seniors when asked to describe "successful teaching." Specifically, this study seeks to determine if the perceptions of college seniors regarding "successful teaching" differ from those of college sophomores.

## Theoretical Context

This study is informed by several areas of theory and research. These include teacher development, stages of concern, and teacher beliefs. Together, they offer an understanding of how teacher thought and beliefs develop. What is often less clear is the role that teacher preparation programs play in this process.

Teacher development models (Fessler & Christensen, 1992; Huberman, 1995; Ryan et al., 1979) explain the cumulative nature of teachers' learning. Novice teachers

think and act differently than experienced teachers, a finding supported by developmental psychology. In Perry's (1970) seminal study of intellectual development during the college years, male students passed through a sequence of positions or stances: basic dualism, multiplicity, relativism subordinate and full relativism. For the novice teacher there is a comparable progression of thought and competence.

A similar progression is seen in the theory and research related to stages of concern. Fuller (1969; Fuller & Brown, 1975) surveyed teacher candidates and inferred that they exhibited four distinct stages of concerns. In the first stage, candidates identified more closely with pupils than with the teacher role. This evolved into concerns for survival (e.g., class control, mastery of content) in the second stage, concerns about teaching performance in the third stage, and concerns about pupils' learning and well-being in stage four. More recent research in this area (Buhendwa, 1996; Marso & Pigge, 1994; Watzke, 2002) confirmed the basic structure of Fuller's theory with only minor modifications. Although this model specifically addressed stages of teacher concerns, its progressively changing focus from self to task to impact has been applied to other areas of professional development (Buhendwa, 1996). This suggests that the stages of concern model may have relevance to other aspects of teacher development.

The ability of programs to shape beliefs about teaching and education is less clear as many feel that teacher beliefs can be difficult to change (Graker, 1995; Richardson, 1996). Teacher thinking as a construct refers to teachers' knowledge and beliefs about teaching and learning as well as their knowledge and beliefs about teacher and learner roles. Teacher thinking is influenced by a number of different factors. Feldman (2000) posits that systems of beliefs (or personal practical theories) derive from personal and professional experience, the stories of others, and reflection. Beliefs shape how teachers interpret classroom events and influence teacher decision making (Feldman, 2000; Fullan, 1991; Fullan & Hargreaves, 1996). Consequently, changes in beliefs may be tied to evolution in teaching practice (Fullan).

The research on teacher candidates' beliefs and perceptions is similarly inconclusive. Grossman's (1990) case studies of new teachers who enter the field with and without teacher education suggest that learning from professional education affects participants variably to include teacher motivation, ideas about teaching, and teaching

goals. In a meta-analysis of 40 learning-to-teach studies Kagan (1992) concluded that preservice teachers' preexisting beliefs about teaching generally remained unchanged by the curriculum. It is direct classroom teaching experiences that cause preservice teachers to confront and alter prior beliefs. When prospective elementary teachers, enrolled in an introductory education course, were asked to define good teaching they did so by focusing on affective traits of teachers (Weinstein, 1989). Bright and Vacc (1994) found changes in teacher candidates' beliefs as they tracked changing constructivist orientations toward math instruction over a period of time through a teacher education program. In another study examining how teacher education influenced the beliefs of teacher interns, Minor, Onwuegbuzie, and Witcher (2000) found varying degrees of application of the pedagogical knowledge from coursework. They examined preservice teachers' perceptions of effective teachers but did not find year of study (e.g., freshman) to be a significant factor in ranking characteristics. Currently, it remains unclear to what extent teacher education programs influence the beliefs of teacher candidates. Thus, we sought to understand how our teacher candidates' beliefs regarding successful teaching may change or develop through the course of their program.

## Method

Teacher candidates at a small, private college were asked to participate in group admission interviews at the end of their sophomore year to demonstrate their knowledge, skills, and motivation to teach as part of the admission gateway into the teacher education program. Interviewers asked candidates to work together in groups to develop a description of successful teaching which they recorded on a poster. Informal review of the results demonstrated that many of the students' descriptions had limited linkage to their classroom learning. This led to speculation regarding whether seniors would respond differently after additional coursework and internship experiences in Professional Development Schools (DPS). In these PDS partnerships, public schools and institutions of higher education work collaboratively to improve academic achievement and provide greater opportunities for professional development.

### *Participants*

Participants in this study were full-time students majoring in elementary education or in a content area with secondary education as a minor. All were returning

students in a small Catholic liberal arts college in an Eastern state (i.e., fewer than 1,400 undergraduate students). The college attracts students from northeastern and mid-Atlantic states principally. At the time of this study, 87% of the students were Caucasian, 7% were African-American, and 6% were other minority and international students. The majority of students resided on campus, though there was a small percentage (13%) that commuted. Sixty-seven percent of students reported their religious preference as Catholic. They came to the college from both public high schools (54%) and private high schools (46%). The average SAT score of incoming freshmen was 1080.

There were 44 sophomore participants; all were traditional aged students (19-20). Thirty-eight of the students were female and 6 were male. Teacher candidates pursuing elementary education typically had completed 12 credit hours in education with accompanying field experience while those pursuing secondary programs had completed six credit hours in education with field work. They were in the process of applying for acceptance into the teacher certification program.

An admission requirement of the education department was successful performance in a structured group interview. Teacher candidates selected the time of their interview. There were 13 groups and groups ranged in size from 3-6 candidates. Given the size of the college and program, it is likely that an individual group member would know most if not all of the other group members. The interview began with introductions of teacher candidates as well as reviewers (e.g., education and arts and sciences faculty, local education agency personnel). While the interviewers varied, they used the same protocol. There were four interview questions which centered on teacher candidates' prior experiences with children, motivation to pursue teaching, and personal strengths. The fourth question provided the data source for this study. Candidates were encouraged to consult their portfolios as needed when responding to questions. Every attempt was made to ensure a comfortable, non-threatening environment such that elementary and secondary education students worked together (see Appendix for Interview Questions).

There were 46 senior participants. Those pursuing elementary certification had completed 33 credit hours in education with accompanying field experiences. They had also completed approximately 40 days of internship. The secondary candidates had completed 21 credit hours, field experiences, and approximately 30 days of internship.

All were beginning the second semester of internship in a Professional Development School, and all were enrolled in Professional Seminar, a 3-credit course. There were two sections of Professional Seminar for elementary education and one section for secondary education. In a regularly scheduled class period during Week 2 of the semester, one of the researchers asked the students to form groups of three to four students. There were 13 groups—11 elementary and 2 secondary. Four of the seniors were male and 42 were female. This group did include 4 non-traditional students in addition to those of traditional age.

*Procedure*

The final interview item for sophomore teacher candidates asked the group to develop a response to the prompt "We'd like you to work together to develop a description of successful teaching." They were provided chart paper and markers. At the end of 10 minutes the teams shared their description(s) with the evaluation team. Senior teacher candidates completed the same task as a course activity though there was no sharing of results. Poster data were transformed into word processed lists to facilitate analysis. Care was taken to preserve the organizational structure and spellings of the original works. Lists were identified by year in college (i.e., sophomore or senior) and assigned a group number such as Sophomore #1. No names were used.

*Data Analysis*

Sophomore lists were read by both researchers. Since the Interstate New Teacher Assessment and Support Consortium (INTASC, 1992) principles serve as the standards of the department, we decided to categorize the lists on that basis. For convenience, we extracted key concepts from the INTASC principles and indicators resulting in 10 categories. Researchers independently read and coded one item at a time and then compared their codes. Disagreements were resolved on the spot through discussion and review of the INTASC indicators and previously coded similar items. Each item was assigned the number of the corresponding INTASC principle. This process continued until all sophomore lists were coded. Items that did not represent INTASC were put aside for later consideration. These procedures were repeated for the senior data. When the coding was completed, the researchers reread the uncoded items in each data set and devised three additional categories: teacher traits, learner outcomes, and uncodable.

Interrater reliability was 98.25%. Table 1 provides a list of the categories used. The researchers decided not to apply statistical analysis because of several factors including the sample size, the open-ended nature of the question, and the exploratory nature of the study.

Table 1

*Coding Categories*

| |
|---|
| 1: Making content meaningful |
| 2: Human development and learning |
| 3: Learning styles and diversity |
| 4: Variety of instructional strategies and problem solving |
| 5: Learning environment, motivation, and management |
| 6: Interactive learning and communication |
| 7: Instructional planning |
| 8: Assessment |
| 9: Professional development and reflection |
| 10: Collaboration, ethics, and relationships |
| 11: Teacher traits |
| 12: Learner outcomes |
| 13: Uncodable data |

## Results

The results of our analysis of data demonstrated a clear difference in the perceptions of successful teaching between the sophomores and the seniors. This was true of both the range and pattern of distribution within the categories used for coding. The discussion of results first addressed the categories representative of INTASC and then those categories which emerged during coding.

The sophomore responses fell heavily into five of the INTASC–related categories. The senior responses were much more evenly distributed among all INTASC-related categories. The seniors showed greater attention to 7 of the 10 INTASC categories. The

only category which showed a noticeable decrease in senior responses was Category 1, which focused on making content meaningful.

Table 2

*Distribution of Responses*

| Category | Sophomore responses | Senior responses |
|---|---|---|
| 1. Making content meaningful | 13.23% | 7.74% |
| 2. Human development and learning | 7.41% | 7.1% |
| 3. Learning styles and diversity | 2.65% | 9.03% |
| 4. Variety of instructional strategies and problem solving | 3.17% | 3.23% |
| 5. Learning environment, motivation, and management | 10.05% | 12.26% |
| 6. Interactive learning and communication | 8.99% | 10.97% |
| 7. Instructional planning | 7.94% | 10.32% |
| 8. Assessment | 2.12% | 3.87% |
| 9. Professional development and reflection | 4.23% | 5.16% |
| 10. Collaboration, ethics, and relationships | 4.23% | 5.16% |
| 11. Teacher traits | 33.86% | 14.19% |
| 12. Learner outcomes | 1.06% | 10.97% |
| 13. Uncodeable data | 1.06% | 0.64% |

Categories 11 and 12 (which were not based on INTASC principles) showed considerable attention and the most marked differences between the two groups. We identified the 11$^{th}$ category as teacher traits to incorporate responses such as: "enthusiasm, patience, and open-minded." This was the most common category among sophomore responses. Fully a third of the responses of the sophomores fell into this category focused around the traits of the teacher as being integral to successful teaching (33.9%). This was also the most common category for senior responses but by a much smaller margin. Only 14% of the senior responses fit this category.

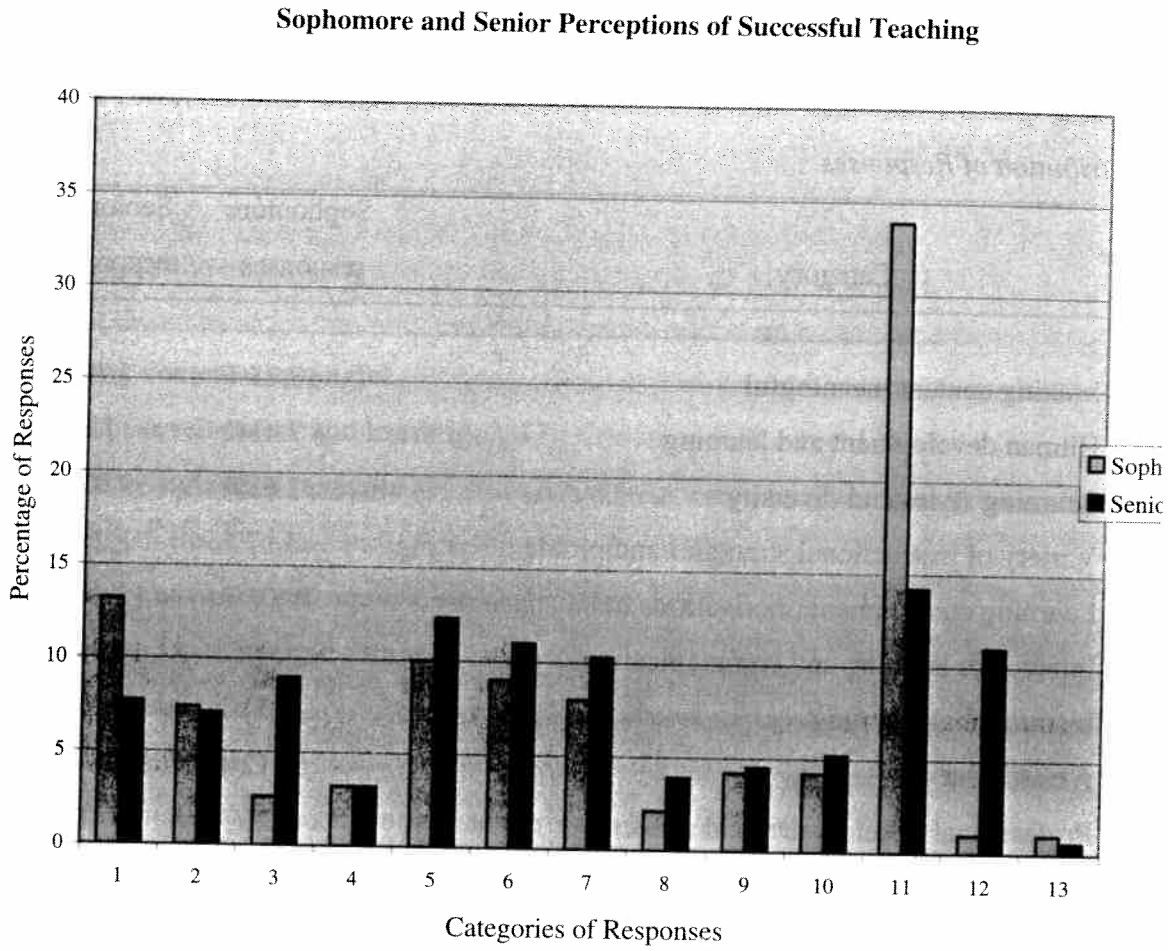


*Figure 1.* Comparison Chart

The 12th category focused on learner outcomes. This was the third most frequent category among seniors, receiving 11% of the responses. Senior responses described successful teaching as: "seeing the light bulb come on, when kids make the raised bar, and student success." This represents a different focus in teacher candidates' thinking.

It was also possible to identify differences between sophomore responses and senior responses based on the level of description and the level of detail. In general, many sophomore responses demonstrated broad concepts while many senior responses appeared to demonstrate greater understanding of the context of teaching as well as the application of concepts. For example, in Category 5 (learning environment) sophomore responses were "behavior modification" and "motivates" while senior responses were "building a sense of community in the classroom" and "effective behavior management plan with positive reinforcement." When listing descriptors related to Category 1 (making

content meaningful), sophomores offered "well-educated background" and "know their subject and about teaching strategies" while seniors offered "teaching from different perspectives or viewpoints." Similar differences can be seen in Category 9 (professional development and reflection) where sophomores described successful teaching as "self-motivated" and "learn from students" while seniors described "never stop educating yourself/ keep up to date" and constantly assessing teaching and techniques." These differences help us draw conclusions related to our question of how our teacher candidates' beliefs may change during the course of their program.

## Discussion

In discussing the results of this study, it is appropriate to acknowledge the limitations of this study. Because it sought information about the teacher candidates of a particular program through qualitative means, the results of this study are not generalizable to other settings. Additionally, because it did not follow a particular group of candidates longitudinally, the value of directly comparing the two groups is limited. Furthermore, the sophomores participated in this activity in a more formal setting while the seniors did not see consequences or evaluation connected to their participation in the activity.

Despite these limitations, it appears clear that the seniors had a much greater focus on the student as central to successful teaching. The emergence of Category 12 demonstrates a shift in focus. The INTASC principles center around the knowledge, dispositions, and performances of effective teachers creating a focus on teacher capabilities. Category 12 (learner outcomes) moved the focus away from the teacher to include students for consideration. The sophomores provided two responses (in both cases the wording was "student success") for Category 12 but this category appeared regularly in the senior responses. This would seem to show a shifted focus to judging the success of teachers by the success of their students. The fact that the two categories in which the seniors showed the greatest growth were Category 12 (Learner Outcomes) and Category 3 (Learning Styles and Diversity) suggests that the seniors are demonstrating a shift toward student-centered considerations. According to Fuller's (1969) stages of concern in teacher development, a concern for pupil learning and well-being was not

common until the third stage. The presence of Category 12 in our seniors' descriptions of successful teaching may suggest that the seniors are beginning to move toward this stage.

It is impossible to attribute any changes in the responses of the senior candidates directly to the students' college related experiences, their extended internships, or the effect of Professional Development Schools, yet any or all of these may be factors. The teacher candidates have had significant opportunities for learning in all these formats. During the second internship, a great deal of data is collected related to each candidate's competence and readiness to serve as a professional teacher. In the future, it may be interesting to compare those forms of data to this study to examine the ways in which their educational philosophies, evaluations on INTASC scales, reactions to scenarios, and portfolios relate to their emerging understanding of successful teaching. With such information, it may be possible to draw more precise conclusions.

While the demonstration of a concern over learner outcomes is encouraging, it is equally important to acknowledge the importance of Category 11 (teacher traits). Rather than focusing on student performance, teacher knowledge, beliefs or dispositions, this category focuses more directly on the personal traits which may be associated with successful teachers. This category clearly dominates the focus of the sophomores but is still important to the seniors. As Kagan's (1992) meta-analysis points out, teacher candidates enter preparation programs with established beliefs which are difficult to shift. Robertson (1997) suggests that popular culture and media create an ideal of the teacher as a heroic personality worthy of the devotion and love of students. An awareness of this phenomenon may have relevance when considering this focus on character traits.

The traits placed in this category did not fit clearly into any of the INTASC-related categories, yet they still appear to be valuable. In our search for observable objectives and data-driven approaches we must not forget the human aspect of teaching. Our teacher candidates remind us that teachers influence students as role models who make lasting impressions. It is difficult for teacher education programs to teach or evaluate the human characteristics that our students see as desirable teacher traits yet they remain vitally important to our profession and to the young people influenced by teachers. As Palmer (1998) argues, "good teaching cannot be reduced to technique; good teaching comes from the identity and integrity of the teacher" (p. 10).

An additional aspect demonstrated by this study is the development of the teacher candidates' view of teaching. The sophomores present a somewhat one-dimensional portrait of successful teaching with a strong emphasis on teacher traits and limited consideration of other facets. The seniors' description of successful teaching is multi-dimensional presenting a more mature, balanced understanding of what successful teaching involves. They include the areas presented by the sophomores but further develop them and embrace additional descriptors. Kagan's synthesis (1992) on the subject suggests that pre-existing assumptions about education do not disappear. The changes we observed may demonstrate that the beliefs form a scheme and that additional aspects are assimilated as part of teacher development.

It is interesting to note that the categories emerging from the analysis of data ultimately fall into three strands, personal traits, competencies, and impact on students. This invites comparison to Fuller's first (1969) model where he presented stages of concerns focused on self, task, and impact. He presented these themes as stages with teachers progressing from one stage of focus on to the next. Our candidates seem to demonstrate that their focus expanded from an emphasis on the first strand to expansion in the second strand and inclusion of the third. Clearly, perceptions of successful teaching and concerns are different aspects of teacher thought and may be totally unrelated. It would be presumptive to suggest relationships based on these data, yet the similarities do invite conjecture. This may warrant future investigation.

This study will be useful to us in our reexamination of programs. It has provided useful feedback related to the teaching priorities and dispositions of our candidates at different stages. We began a significant revision of our conceptual framework and find ourselves considering strands related to the individual, the professional, and their responsibility to society. It is interesting to note the ways in which this examination of our candidates' perceptions of successful teaching clarifies our own ability to describe our priorities.

In conclusion, while previous research shows changing orientations of teacher candidates in relation to specific topics, the unstructured nature of an open-ended question generates reactions and personal perceptions about successful teaching without any prompting from established instruments. Our effort to learn whether teacher

candidates' views on successful teaching shift over time provided us with insight into the perceptions of teacher candidates at two levels of their preparation.

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APPENDIX

**Interview Questions:**

Item 1: **Tell us your name and share some of your previous experiences with children. Tell us what you learned from your experiences.**

Item 2: **Why do you want to become a teacher? How has your decision been confirmed in your experiences at MSM?**

Item 3: **Teachers must serve as role models and leaders. What qualities do you possess that will help you fill those roles?**

Item 4: **Now, we'd like you to work together to develop a description of successful teaching. You may want to reflect on your philosophy of teaching and formal knowledge of learning and teaching.**

Item 5: **What questions do you have?**

# AN APPLICATION OF Q METHODOLOGY: DETERMINING COLLEGE FACULTY PERSPECTIVES AND CONSENSUS REGARDING THE CREATION OF A SCHOOL OF TECHNOLOGY

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*This study demonstrates a seldom-used application of Q methodology where the perspectives and consensus of a college committee were determined relative to a proposed organizational change. The development of the statement concourse sorted by the participants and the subsequent analysis of the Q sorts are described. Committee members responded positively to the Q methodology process and results, commenting that the methodology and its results left them feeling empowered because Q revealed all of the group's perspectives and facilitated dialogue and collaboration among the group membership.*

Even with multiple perspectives, the group must collaborate in order to accomplish its goals (Witte & Engelhardt, 2004). Clark et al. (1996) suggested that In the summer of 2004, the researcher was asked to chair/facilitate a committee to consider the creation of a School of Technology (SOT). The preliminary charge of the SOT committee chair (researcher) was to determine the strengths and weaknesses of this proposed organizational change. Both consensus and disagreement among the membership were to be determined, yet this type of analysis within the context of organizational change in higher education can prove difficult and time consuming (Bender, 2002). Successful promotion of organizational change in higher education requires a shared and inclusive process (Kezar, 2001).

Q methodology (Q) is well suited for such a situation. Q is a technique for measuring subjectivity. The process begins with the selection or creation of a concourse of items. Typically, these items are developed through interviews or other group member input (Brown, 1980). During the sorting process, participants sort each item relative to the others and place them on a normalized grid. Thus, the Q sort forces each participant to rate the items based on his or her subjectivity (Stephenson, 1953). Factor analysis categorizes participants with similar

perspectives into factors. The analyses also reveal consensus statements among the different factors (Brown, 1980).

Q methodology is more typically used within non-education social science fields such as political science and conflict management (Brown, 1980). Q can be used to prepare facilitators for dialogue regarding a topic through revealing consensus and differences of opinion (Focht, 2004). In this study, the researcher used Q to determine both consensus and differences in opinion about the creation of a School of Technology (SOT). These results enabled a shared and inclusive process for developing a framework for the proposed organizational change.

*Setting the Stage for Application of Q*

The college is on the campus of a large, public university in the Midwest. It offers both associate and bachelor degrees in a variety of fields that include engineering technology and public service. During the summer of 2004, the college's name was changed and plans for reorganization began. Administrators and select faculty developed a preliminary plan for the reorganization at an earlier retreat.

This reorganization focused on three aspects of the existing college: bachelor degrees, associate degrees, and general studies. Thus, the college dean formed three committees to consider each category of this reorganization: a new School of Technology (SOT), a Community College, and General Studies. The dean asked faculty to volunteer for one or more of these committees and selected committee chairpersons for each of these committees, including the researcher to lead the SOT committee. The committees met in the summer and during the fall semester of 2004. The SOT committee contained tenured and non-tenured faculty. These faculty represented a variety of programs, including those with and without bachelor degrees.

*School of Technology Committee*

The dean determined the initial direction of the SOT committee: Our initial charge was to examine the proposed SOT as the home of all of the college's bachelor's degrees. The college's associate degrees, some feeding into the bachelor

degrees and others not, would be housed in a "community college" within our college. These changes would represent a new organization for the degrees within the college. The current faculty organization, however, would remain in its current form. Thus, the SOT committee's first charge was to examine this proposed organizational change related to the creation of a School of Technology. Specifically, the dean requested that the 30-member SOT committee consider three questions: (a) What are the strengths of this concept? (b) What are the weaknesses of this concept? and (c) What are the concerns regarding this design concept? The dean was particularly interested in the committee's consensus regarding the proposed organizational change. After this initial evaluation, the committee was to develop a framework related to the organizational change.

*Collaboration and Organizational Change in the Literature*

Institutional change within a higher education institution can be extremely difficult and time consuming (Bender, 2002). Kezar (2001) suggested that successful promotion of organizational change in higher education requires a shared and inclusive process. This is especially important when the team consists of experts from a variety of fields and perspectives because diverse group membership can create difficulties with group process and the development of consensus (Knight et al., 1999).

this collaboration must be democratic in that all of the different voices of the group should be heard so that each group member might feel a sense of empowerment (Clark et al., 1996; John-Steiner, Weber, & Minnis, 1998). Still, collaboration creates both multiple outcomes and questions (John-Steiner et al., 1998).

In order to create a cooperative and consensus building environment within such diverse groups, efficient group techniques must be utilized (Witte & Engelhardt, 2004). In addition, the assessment process must provide high quality accurate data in order to lead to appropriate strategic and operational decisions (Henderson, Mcadam, & Parkinson, 2005). For these assessment procedures to be effective, the appropriate issues must be identified, the right questions need to be

asked, and the data need to be collected and analyzed in a timely manner (Bender, 2002).

As will be demonstrated here, Q methodology provides group perspectives as represented by factors. In addition, Q methodology determines consensus statements for the group. The data collection and analysis is straightforward and not time consuming. As an added benefit, according to Focht (2004), the revealing of consensus and opinion through Q methodology enables facilitators to prepare for dialogue regarding a topic. The purpose of this paper is to demonstrate how to use Q methodology in a group setting in order to determine consensus and perspectives. In addition, the benefits of this methodology relative to organizational change and collaboration are described.

## Method

Stephenson (1953) developed Q methodology (Q) as a means of measuring subjectivity (see also Brown, 1986; McKeown & Thomas, 1988). Typically, Q methodology is used for behavioral research in various fields including psychology, sociology, conflict management, and marketing (Brown, 1980; Thomas & Watson, 2002). Studies may include analysis of an individual or a group of persons. Within a group, Q methodology identifies the differences of opinion and the number within the group who hold these opinions. Thus, Q methodology is an appropriate choice whenever a researcher wishes to determine the various perspectives and consensus in a group regarding any topic (Brown, 1980).

However, Q methodology is rare within educational research (Brown, 1980). Thomas and Watson (2002) described Q methodology as a powerful, theoretically grounded, and quantitative tool for examining opinions and attitudes. In Q, participants sort a concourse of items based upon their opinion relative to the topic. The analysis then reveals both different perspectives within and consensus among members of the group. In this way, Q methodology is a measure of operant subjectivity (Brown, 1980). Because Q measures personal opinion regarding a concourse of items related to a topic, validity is not a consideration (Brown, 1999). Similarly, operational definitions are not meaningful in Q methodology because the

researcher's view of the items is independent of the determination of the views of the participant (Brown, 1980).

Alternatives for determining perspectives are not as powerful as Q. Likert scale evaluations and rank ordering can lead to the loss of meaning (McKeown, 2001). Although all are subjective, the factors determined in Q are grounded in concrete behavior and are typically reliable and replicable (Brown, 1980).

However, factor analysis within Q methodology is not *R* factor analysis where items such as scores or personal traits are correlated. Neither is Q methodology a type of Q factor analysis where people are factor analyzed based upon items. Instead, Q methodology is a set of procedures, theory, and philosophy that supports the same kind of subjectivity research that is typically the focus of qualitative research (Brown, 1997). Q is unique in that it forces participants to rate each statement relative to the others in a forced distribution based upon that participant's opinion within a particular setting. Thus, the starting point for Q is the development of a concourse of items.

*Development of the Q Sort Items*

The concourse of items for the Q sort may consist of anything from statements to pictures. McKeown and Thomas (1988) make distinctions between "naturalistic" and "ready made" Q statements. They describe "naturalistic" statements as those taken from participants' oral or written communications. "Ready made" statements, on the other hand, draw from sources other than those of the participants' communications. Hybrid samples are those that combine both "naturalistic" and "ready made" items. None of these types of Q statements is inherently superior to the other; instead, the researcher should select the type best suited to the project at hand (McKeown & Thomas).

In this study, the concourse of statements came from the committee members' input during the first meeting. Each committee member in attendance wrote two weaknesses, two strengths, and any concerns about the proposed SOT that would hold all of the college's bachelor degrees. Individuals then broke into groups of two or three to discuss what they had written. Committee-wide discussion and input followed. Some members, unable to attend the first meeting, submitted

input via email before the meeting. By the conclusion of the committee's first meeting, members had submitted 59 statements regarding the strengths and weaknesses (including concerns) of the proposed SOT. Specifically, there were 20 strength statements, 14 weakness statements, and 25 concern statements. The 59 statements were reduced to 50 based upon subsequent committee input regarding redundancies. Thus, this study used a concourse of 50 Q statements that McKeown and Thomas (1988) would describe as "naturalistic." Once the concourse of statements was created and prepared for the sorting process, the committee met in order to perform the Q sort.

*The Q Sort*

Each of the 50 statements was placed on a separate piece of paper to facilitate the sorting process. As recommended by McKeown and Thomas (1988), participants performed a preliminary sort. As participants read each statement, they sorted them into one of three piles: participant felt agreement, participant felt disagreement, and participant felt neutral, ambivalent, or uncertain. It is best if the preliminary sort piles are of similar size in order to make the final sort easier.

For the final sort, participants placed the statements on a bipolar, pseudo-normal scale. Typical grids range from a maximum negative value to a maximum positive value regarding a topic (Brown, 1980; McKeown & Thomas, 1988). Figure 1 displays the grid used for this investigation that ranged from -5 (*strongly disagree*) to +5 (*strongly agree*). The sorters placed one statement in each box along the continuum. Because each statement was on its own piece of paper, the sorters were able to rearrange the individual pieces of paper until they were satisfied with the distribution of items.

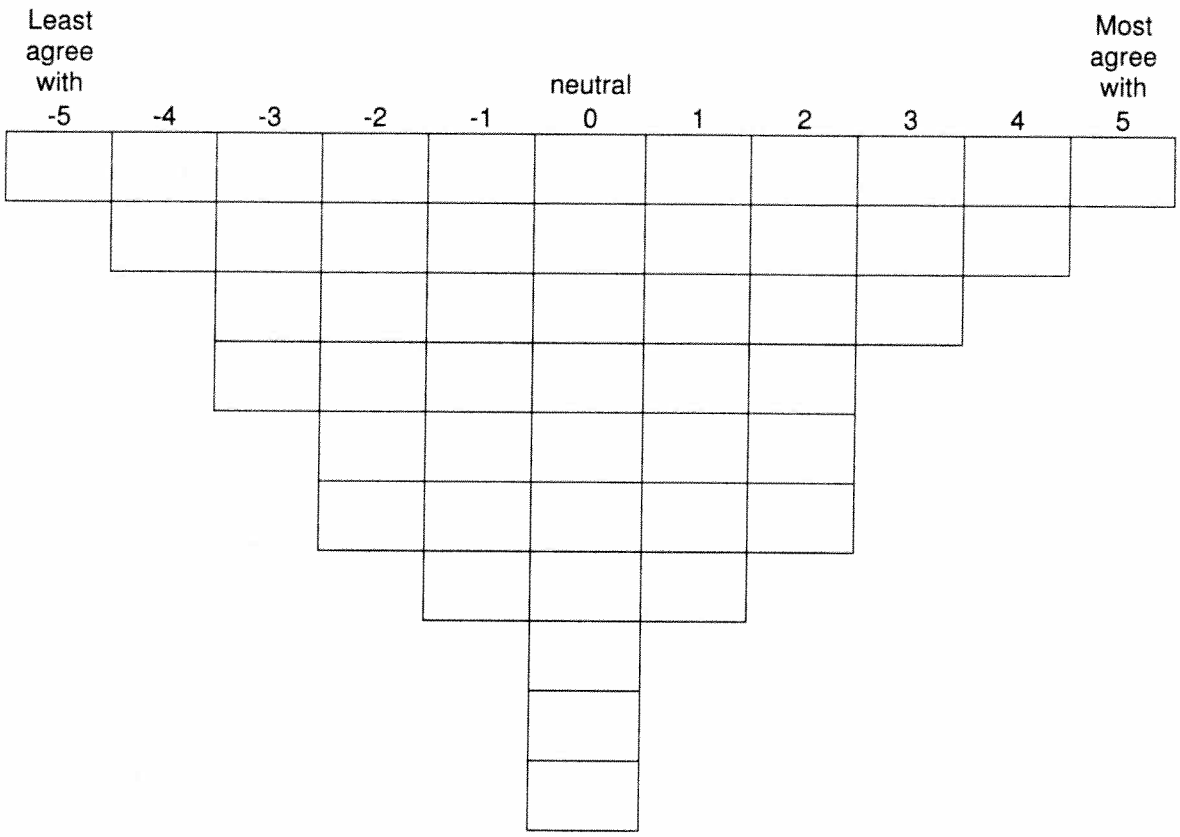


Figure 1: *Q sort grid for this research project*

When the sorters completed the sorting process, they wrote the item numbers on the grid to represent their sort. As instructed, participants commented on their most *agree/disagree* statements placed in the -5 and +5 positions on the grid. These comments assisted the researcher during the factor interpretation phase. Participants did not identify their names or their academic departments in order to protect their anonymity.

In this study, the researcher used PQ Method software to analyze the Q sorts. PQ Method is available for free download (http://www.rz.unibw-muenchen.de/~p41bsmk/qmethod/) and is designed specifically for recording and analyzing the Q sort data. Although PQ Method is a program designed to run in DOS, the software can run within the Windows operating system. PQ Method is menu-driven and allows the user to make choices regarding the analyses.

*Analysis of the Q sorts*

The analyses of the Q sorts involve correlation, factor analysis, and the calculation of factor scores (Brown, 1986). However, analyses of the Q sorts are accomplished best with software designed specifically for Q methodology. Alternatives, such as SPSS, cannot provide all of the analyses of programs customized for Q methodology (Stephen, 1997) such as PQ Method.

In PQ Method, the user first specifies the grid used for the Q sort and then enters the statement text. After recording this preliminary information, the user enters the Q-sort statement numbers for each participant. The software checks each set of sorts for duplicate and missing statement numbers. Once the researcher enters the sorts, the data are ready for factor analysis.

PQ Method allows for both centroid and principal components factor analysis (Schmolck, 2002). Within the Q methodology, the centroid method is the most typically used and recommended for extracting the factors (McKeown & Thomas, 1988; Schmolck). According to Brown (1980, 1986) and Stephenson (1953), the centroid method is the preferred method of factor extraction in Q because of the indeterminacy of its solution (one correct solution does not exist among the infinite solutions possible). Based upon these recommendations, the researcher employed the centroid method to extract the factors. The researcher first ran the analysis with the maximum extraction of factors allowed by the software (seven). As a result of the analysis, three factors emerged.

The indeterminacy of the centroid solution allows the researcher to rotate the factors based upon theoretical considerations using hand rotation (Brown, 1980, 1986; Stephenson, 1953). PQ Method enables hand rotation via a graphical interface. Brown (1986) explained that centroid extraction of the factors, followed by hand rotation, allows the investigator the opportunity to rotate based upon hunches and to examine the data from a theoretical standpoint. Brown (1980) included a detailed explanation of hand rotation procedures.

The PQ Method software offers a choice of hand rotation and Varimax rotation (Schmolck, 2002). McKeown and Thomas (1988) suggested that, in some cases, it may be important to assure that a certain Q sorter has a high load on one

factor where that Q sorter has a distinct position within the group of sorters. This distinct position may include a leadership role within the group. In this study, the researcher used a preliminary Varimax rotation followed by hand rotation in order to isolate a factor that included the chair of the SOT committee while minimizing mixed loadings.

Once the rotation was complete, the researcher allowed the program to flag the individuals for each factor. The researcher adjusted the flagging to include only clean loadings of 0.33 or higher. The flagging of individuals for each factor is required before selecting QANALYZE from the PQ Method menu. QANALYZE performs the final Q analysis of the rotated factors. Viewing of the project files includes consensus statements for the group and statement z-scores for each factor. The researcher presented the results 1 week after the Q sort, at the regularly scheduled SOT meeting.

## Results

Table 1 contains the correlations between the three factors. As desired, the correlation matrix indicated that the factors did not correlate well. In fact, the strongest correlation was between Factors 2 and 3 at 0.2804. Recall that in Q, factor analysis categorizes participants with similar perspectives into factors, based upon their Q sorts. In other words, each of the factors represented a category of opinion regarding a topic (Brown, 1986).

Table 1

*Correlations between the Rotated Factor Scores*

| Factor number | Factor 2 | Factor 3 |
|---|---|---|
| 1 | -0.2767 | 0.2804 |
| 2 | | -0.0459 |

Table 2 contains the factor loadings for each of the three rotated factors. Particular participants were flagged as associated with factors. Each "X" in this table denotes this flagging (e.g., Person 7 is associated with Factor 3). Each factor

represented a perspective regarding the proposed SOT. Person 3 loaded similarly on each of the three factors. Person 5 had loadings above .33 on Factors 1 and 2. Therefore, neither Person 5 nor Person 3 was associated with a single factor. The remaining persons were associated with one of the three factors because they had loadings above 0.33 on only one factor.

Table 2

*The Three Rotated Factors Related to the "Virtual" SOT Concept*

| Q sort | Factor 1 | Factor 2 | Factor 3 |
|---|---|---|---|
| Person 1 | -.01 | .52 * | -.00 |
| Person 2 | .50* | .32 | .13 |
| Person 3 | .34 | .33 | -.32 |
| Person 4 | .34 * | .23 | -.00 |
| Person 5 | .62 | -.50 | .20 |
| Person 6 | .68 * | -.04 | .05 |
| Person 7 | .32 | .18 | .49 * |
| Person 8 | .45 * | -.19 | -.03 |
| Person 9 | .58 * | -.02 | -.22 |
| Person 10 | .29 | -.61 * | .08 |

*Note.* The * indicates those persons with loadings of .33 or higher on only one factor. In Q methodology, each factor represents a different perspective.

As already mentioned, the analyses included more than the factor correlations and loadings. Tables 3 and 4 contain the consensus statements determined by the analyses. Q methodology also creates a set of normalized factor scores for each factor. Therefore, in this study, PQ Method produced three sets of normalized z-scores, each containing all 50 statements listed in rank-order based upon these z-scores. Thus, the z-scores can be used to create a representative Q-sort grid for each factor. However, it is the strongest z-scores (the most *agree* and *disagree*) that truly distinguish each of the factors. These statements helped to describe, interpret, and name the factors in the next section

Table 3

*Statements that Represent a Consensus of Agreement within the Q Sorts*

| Statement number | Statement text (all scored as *disagree* for factor 1 loaders) |
|---|---|
| 40. | associate degree costs more than other community colleges |
| 49. | university gets more money but we won't see any of it. |
| 26. | competition between CC&SOT (e.g. new structure would encourage competition, not cooperation between associate and bachelor degrees) |
| 22. | no new funding for new/better labs |
| 50. | (need) marketing separate from UA for the SOT |
| 41. | feedback plan that would allow us to monitor what is happening (with real data - and ability to make changes) |

Table 4

*Statements that Represent a Consensus of Disagreement within the Q Sorts*

| Statement number | Statement text (all scored as *disagree* for factor 1 loaders) |
|---|---|
| 42. | "School" might seem vocational. |
| 35. | eliminate department chairs - replace departments with centers |

Tables 5, 6, and 7 report the four statements that received the highest, positive z-scores for each of the three factors. These statements represented the *most agree* side of the grid for these perspectives. Tables 6, 7, and 8 contain four statements for each of the three factors that received the highest, negative z-scores. For each factor, these statements represented the *most disagree* side of the grid.

Table 5

*Four Highest Positive Z-score Statements for Factor 1 Representing Strongly Agree within the Q Sorts, in Rank Order*

| Statement number | Statement text (all scored as *agree* for factor 1 loaders) |
|---|---|
| 5. | SOT will be perceived better than C&T. Image |
| 4. | encourage more thinking out of the box...new ideas and innovation |
| 9. | easier to market our Bachelor degrees |
| 22. | no new funding for new/better labs |

Table 6

*Four Highest Positive Z-score Statements for Factor 2 Representing Strongly Agree within the Q Sorts, in Rank Order*

| Statement number | Statement text (all scored as *agree* for factor 2 loaders) |
|---|---|
| 21. | novel concept out of sync with other Schools of Technology |
| 28. | the SOT does not symbolize technology - it symbolizes bachelor degrees? |
| 19. | confusing to students, transfers, faculty/staff |
| 27. | Can "grad school" structure work with our programs? |

Table 7

*Four Highest Positive Z-score Statements for Factor 3 Representing Strongly Agree within the Q Sorts, in Rank Order*

| Statement number | Statement text (all scored as *agree* for factor 3 loaders) |
|---|---|
| 7. | easier to market a SOT |
| 5. | SOT will be perceived better than C&T. Image |
| 9. | easier to market our Bachelor degrees. (if they are located in the SOT) |
| 38. | student input on this concept (Is it important?) |

*Interpreting the Factors*

Factor 1 consists of five of the ten participants and is, therefore, the largest factor of the three. Based on the top four most *agree* statement rankings, those who loaded on Factor 1 are not apprehensive about the lack of funding (statement 22) that would accompany the organizational change. Instead, they look forward to the change presenting an improved image of the college (statement 5), a way to better market the college's bachelor degrees (statement 9), and the impetus to innovation (statement 4). From the factor's most *disagree* statements, based upon the statement z-scores, this perspective was not concerned with the lack of a centralized, physical location for the SOT (statement 44) or with the proposed name (statements 42, 48). Overall, Factor 1 loaders see opportunities arising from the proposed organizational change and they are looking forward to these positive effects such as improved image (statements 5, 42), new ideas (4), and a focus on bachelor degrees (9). The researcher named Factor 1 "It's a good thing" because of this positive attitude toward the creation of the SOT.

Table 8

*Four Highest Negative Z-score Statements for Factor 1 Representing Strongly Disagree within the Q Sorts, in Rank Order*

| Statement number | Statement text (all scored as *disagree* for factor 1 loaders) |
|---|---|
| 46. | SOT honorable mention during the next Super Bowl? |
| 44. | Where is it located? {concern that the SOT would have no physical location} |
| 48. | redundant use of Summit - drop the use of "Summit" from SOT name |
| 42. | "school" might seem vocational |

Two participants were associated with Factor 2. Person 1 has a positive factor loading and Person 10 has a negative factor loading. This suggests that Person 10's view is in opposition to that of Person 1. The statements that distinguish Factor 2 represent concerns about the proposed structure of the SOT

("most agree" statements 21, 28, 19, 27). Unlike Factor 1, Factor 2 does not foresee the reorganization as a means to innovation and cultural change within the college ("most disagree" statements 6, 3, 17). However, based upon written comments, those with this perspective view the School of Technology idea as positive. Similarly, this perspective aired concern that the SOT does not emulate other schools of technology and that the SOT will not contain all of the technical degrees offered by the college. The most *disagree* statements indicate that this perspective supposes there is a need for additional resources and funding (most *disagree* statements 3, 17). Overall, this factor, as representing the positive loader, shows caution for the details of the proposed organizational change. The negative loader of Factor 2 has an inverted view in that this participant is not concerned about such details but, instead, sees an opportunity that is similar, but not identical, to that of Factor 1. Thus, based upon the positive factor loading and the statements that distinguished the factor, the researcher named Factor 2 "Cautious change wanted but give us more."

Table 9

*Four Highest Negative Z-score Statements for Factor 2 Representing Strongly Disagree within the Q Sorts, in Rank Order*

| Statement number | Statement text (all scored as *disagree* for factor 2 loaders) |
|---|---|
| 6. | more focused on our areas of expertise |
| 3. | more focused College and more resources to do the job |
| 17. | better use of faculty and resources. |
| 16. | protect our right to offer bachelor degrees if we go stand alone |

The researcher named Factor 3 "It's all about marketing and image." This factor represents the perspective that the virtual SOT will create a marketing opportunity for the college's bachelor degrees based on the highest positive z-score statements (7, 5, 9) that distinguished this factor. This perspective also sees student involvement as an important key to the proposed organizational change (*strongly agree* statement 38). Overall, this perspective, like Factor 1, regards the proposed

change as a positive opportunity. Unlike Factor 1 however, Factor 3 views this opportunity as solely about marketing. Factor 3 is focused on the marketing of the college's bachelor degrees (*strongly agree* statement 9) but not their expansion into masters' degree programs (*strongly disagree* statement 12). Similarly, Factor 3 is not concerned with the actual structure of the proposed SOT (*strongly disagree* statements 35, 27, 25). Thus, overall, the Factor 3 perspective focuses on the creation of a School of Technology as an opportunity to bring attention to the bachelor degrees offered by the college. One SOT committee member is associated with Factor 3.

Table 10

*Four Highest Negative Z-score Statements for Factor 3 Representing Strongly Disagree within the Q Sorts, in Rank Order*

| Statement number | Statement text (all scored as *disagree* for factor 3 loader) |
|---|---|
| 12. | opportunity for master's degree |
| 35. | eliminate Department chairs - replace departments with centers |
| 27. | Can "grad school" structure work with our programs? ("Virtual" school) |
| 25. | Administration is undefined and unclear. Chain of command? |

*Consensus Statements*

In addition to the three perspectives discussed above, Q revealed six consensus statements. These consensus statements represented concerns regarding the proposed SOT. The majority of these statements dealt with money, from the cost of associate degrees within the college (statement 40) to lack of money allocated to programs within the SOT (statements 49, 22). Participants agreed on the need for separate marketing and flexibility related to the organizational change. Based on the disagree consensus statements, participants also agreed that the term "school" is not vocational and that the current department structure should not be eliminated.

## Conclusions and Implications

Within this study, Q methodology determined three perspectives and eight consensus statements from the participants' sorts. In addition, a rich description of each of these perspectives, of the level one would expect in qualitative research, was created through this quantitative analysis. The analysis was completed in a day, enabling the presentation of the results 1 week after the Q sorting process, at the committee's regularly scheduled meeting. As Bender (2002) stated, organizational change assessment needs to be effective in that the appropriate issues must be identified, the right questions need to be asked, and the data need to be collected and analyzed in a timely fashion. Q methodology demonstrated each of these traits within this study.

In addition, the literature presented on collaboration acknowledged the need for empowerment and democracy. The feedback the researcher received from the committee participants, both tenured and untenured, demonstrated that they viewed the results of their Q sorts as providing such an environment. As Focht (2004) stated, the Q methodology results enable the leader to prepare for dialogue regarding the topic of organizational change. Specifically in this study, once the Q results were revealed, the committee chair was able to help develop situations that promoted positive discussions and a movement toward creative solutions as we moved toward the creation of a framework for the SOT. In other words, the results allowed for appropriate strategic and operational decisions by the chair and by the committee members. Thus, the results provided through Q enabled the committee to move toward an organizational change that would benefit faculty, students, and the college.

This study demonstrates that Q methodology is a helpful tool for determining personal perspectives within an education setting. Although this study involved a college committee, the application of Q to determine perspectives and consensus among other groups could be beneficial in a wider range of educational settings. As an example, Jurczyk and Ramlo (2004) used Q to perform course evaluations. Other applications could include using Q methodology to determine

classroom perspectives on a variety of topics and then utilizing these perspectives to create dialogue within those classrooms.

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# STUDENT PERCEPTIONS OF ACADEMIC SERVICE AND INSTRUCTIONAL QUALITY OVER A FOUR-YEAR ACADEMIC EXPERIENCE

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*This article reports the results of a study of student perceptions of expected and experienced academic service and instructional quality across 4 years of college enrollment. Results indicated a pattern of perceived change over 4 years with a significant difference between students' expectations to experienced quality. The largest pre- to post-assessment change was a negative gap during the first semester in both academic service and instructional quality. Subscale scores revealed both positive and negative variations over the 4-year period. The findings suggested a continued support for linking in-class and out-of-class faculty and student development initiatives.*

## Introduction

Each year, 2 million high school graduates take one of the most anticipated steps of their lives as they leave home for college (U. S. Department of Education, 2001). Years of planning and growing expectations become experience and that experience becomes both dramatic and traumatic reality. By the end of the following 6 years, 59.2% of the students with a baccalaureate degree goal will graduate from the college or university where they started, and 67.4% will have completed at any institution (U. S. Department of Education, 2003).

Several factors influence first year students' learning outcomes and academic effort including personality traits (Bauer & Liang, 2003), expectancy of success (VanZile-Tamsen, 2001), individual views of the learning environment (Donahue, 2004), and

enrollment in freshmen or first-year experience courses (House & Kuchynka, 1997; Strumpf & Hunt, 1993). For Kuh (2000), student learning and retention are a function of academic effort and the interactions between students and important socializing agents such as faculty, student affairs professionals, and peers. In fact, Kotler and Fox (1985) indicated that non-classroom service quality combined with the student's classroom experience forms an overarching perception of quality teaching. Tinto (1993) suggested faculty actions both within and outside of the classroom shape the way students come to judge institutional quality and influence re-enrollment decisions. This study considered students' expectations and perceptions of academic service and instructional quality over time in an effort to better understand the interaction of expectations and experiences.

Research is replete with studies that measure post-assessment experiences used to investigate the college experience in a setting where perceptions of importance and experienced quality are captured at the same time (Schreiner & Juillerat, 2002). While a snapshot methodology is commonly used to measure student satisfaction, Campbell and Stanley (1963), Gall, Borg, and Gall (1996), Best and Kahn (1993), Trochim (1999), and Zikmund (2000) suggested pre- to post-assessment methodology improves understanding of respondent experiences between two points in time. Similarly, Pascarella, Wolniak, and Pierson (2003) indicated that a matched sample pre- to post-test design afford optimal "statistical control" for an individual's status on the outcome variable and measure the outcome variable at distinct points in time. This study provided a 4-year view of the collegiate experience through a matched sample pre- to post-assessment methodology beginning with direct from high school student expectations of academic service and instructional quality followed by measures of the "reality" that existed for the students following the first term and after 4 years.

The purpose of the study was to determine the congruence between the expected and experienced measures of academic service and instructional quality among students across 4 years of study. Academic service quality describes many non-classroom services provided by faculty such as availability, reliability, trustworthiness, and empathy. Instructional quality includes student evaluations of learning achieved and faculty

measures of enthusiasm, organization, interaction, individual rapport, breadth, assignments, and workload.

The study of expected and experienced quality draws upon work from the consumer satisfaction arena. Parasuraman, Zeithaml, and Berry (1988) and Boulding, Kalra, Staelin, and Zeithaml (1993) described customer satisfaction as the difference between expected and experienced quality. The difference is the quality gap or what is also known as the disconfirmation (Festinger, 1957). The gap is calculated using the formula Sg = O – E where *Sg* is the Service Quality Gap, *O* is experienced quality at the end of the longitudinal study period, and *E* is expected quality at the beginning of the study period. Zeithaml, Berry, and Parasuraman (1988) described how the gap shows both degree and direction. A positive gap suggests the experience exceeds expectations while a negative gap suggests quality does not meet expectations.

Schank (1990) suggested that a combination of expectations and observations is fundamental to a person's ability to understand and conduct daily affairs. Applying this within the higher education context, students enter college with mental models (Senge, 1990) or "scripts" that define their perception of the higher education experience. To be successful they must negotiate the ethos of the learning community while completing coursework and gaining knowledge. Each new experience updates the students' collection of knowledge about the college, higher education in general, and the alignment of a new experience with past experiences and expectations. The notion of a disconfirmation between expected and experienced quality indicates that the student perceived the experience to be different from current scripts about the college or university. The consumer perspective applied to higher education services was studied by Devine (1995) and Ruby (1998), who reported gaps between expected and experienced student services. Greiner and Westbrook (2002) found a direct correlation between academic service quality and instructional quality in their study of direct from high school students using a pre- to post-analysis of the students' first term experience.

While colleges and universities use several instruments to obtain information about student satisfaction (e.g., College Student Satisfaction Questionnaire, Student

Satisfaction Inventory, College Student Survey), researchers have noted the insufficiency of research on student satisfaction with college (Beltyukova & Fox, 2002). In addition, it is not clear how student expectations prior to college enrollment relate to student satisfaction with their collegiate experiences. Donahue (2004) contended that in order to promote first-year students' connection to their learning environment, it is necessary to ascertain students' perceptions, personal views, and experiences.

For our study, two research questions explored the difference between expected and experienced academic service and instructional quality: (a) What is the difference between the expected academic service quality and the experienced academic service quality of students experiencing 4 years of college? and (b) What is the difference between the expected instructional quality and the experienced instructional quality of students experiencing 4 years of college?

## Method

### *Participants*

Undergraduate students enrolled in an introductory biology class at a Midwestern private university in September 1999 served as the target group to obtain the sample and data used in this study. This class served as a convenient purposive sample to shed light on the research questions (Creswell, 1998; Trochim,1999). Introduction to Biology is a basic introductory experience that serves as a prerequisite for a variety of majors including pre-medicine, communications, business, arts, and pharmacy. The large lecture section includes smaller discussion groups held over the term. The class enrolled 360 students who completed the 1999 pre-term assessment of expected academic service and instructional quality and 245 who completed a post-assessment in November 1999. This yielded a sample of 198 direct from high school students representing 37% of the first-year class. Sixty-one of the 198 students completed an additional post-assessment 4 years after their first term of study.

The pre-term assessment is described as "Expected." The first post-assessment is described as "Experienced$_1$." The second post-assessment is described as "Experienced$_2$". Sixty-one students completed both the pre-term assessment of expected quality and the

2003 post-assessment of experienced quality or $Experienced_2$. Fifty students completed all three surveys, and were analyzed as a second, concurrent sample. The pre-term assessment was administered during the third class period of the fall semester. $Experienced_1$, was administered at the end of the first semester, but before final exams. The second post-assessment, $Experienced_2$, was administered by mail at the end of the Spring 2003 semester, but before graduation ceremonies. Together, the three-point measurements formed a longitudinal study of the form suggested by Trochim (1999) and a single group interrupted time-series design suggested by Creswell (2003).

Of the 198 direct from high school students who completed both the pre-term and first post-assessment, all were full-time students ages 17, 18, and 19 and 69% were female. Of the 61 students who completed the pre-term assessment and second post-assessment, most were women (82.0%) and enrolled full-time (93.9%). All graduated from high school in 1999. Ninety-seven percent responded on the pre-term assessment that they had high school GPAs of 3.0 or greater, while 72% responded that their college GPAs were 3.0 or greater. Forty-one respondents (67.2%) reported a GPA decline from high school to college. Fifty-two of the respondents (85.2%) indicated the same or a very similar major in both the pre-term assessment and post-assessment.

Participating students signed releases in 1999 agreeing to participate and were advised of the confidential nature of their responses. Releases were separated from questionnaires to ensure confidentiality. The decline of 137 direct from high school student responses between Expected and $Experienced_2$ was attributed primarily to the use of a mail survey for the $Experienced_2$ post-assessment, and the busy schedules of seniors during the weeks before the 2003 graduation ceremonies and summer break. An additional factor would include the normal attrition of students during the 4 years.

*Instrumentation*

The study used a pre- to post-assessment quasi-experimental design (Campbell & Stanley, 1963; Gall, Borg & Gall, 1996; Trochim, 1999; Zikmund, 2000). The pre- to post-assessment design provided a measurement of expectations followed by a period of time in which the student experiences the college to create a revised level of quality. The

post-assessment measured the students' rating of their experience of academic service and instructional quality.

The academic service quality dimensions were measured using the Service Quality (SERVQUAL) instrument developed by Parasuraman, Zeithaml, and Berry (1988) along five dimensions: tangibles, reliability, responsiveness, assurance, and empathy. The instrument creators demonstrated mean score stability across a variety of service organizations including: banks, credit card providers, repair and maintenance services, and telephone services. They intended for it to be a reliable and valid measure that can be adapted to a variety of organizations. Content and convergent validity was observed between individual scales and overall evaluations of quality. Coefficient alpha values ranged form 0.72 to 0.86 for each construct and 0.92 overall (Parasuraman et al., 1988). Tangibles describe the physical environment of the campus including buildings, appearance of the campus and faculty/staff, equipment, and other elements of the environment. Reliability explores whether the student can count on promises being met, while responsiveness explores willingness of the faculty to be responsive and helpful. Assurance describes personal trust, whether a student can trust the faculty with personal information, personal sense of self-worth, and the desire to grow. Empathy is the student's perception of the extent to which the faculty demonstrates a personal caring about the student.

The instructional quality dimensions were measured using Marsh's (1982, 1987) Students' Evaluation of Educational Quality (SEEQ). The Marsh instrument is a valid and reliable source of mean score data used to evaluate instructional quality of over a half-million students. Marsh's theoretical educational quality constructs are defined by nine dimensions of instructional quality: (a) learning, (b) enthusiasm, (c) organization, (d) group interaction, (e) individual rapport, (f) breadth, (g) examinations, (h) assignments, and (i) overall workload. Marsh and Dunkin (1997) reported that the instrument has provided consistent constructs in 21 subgroups of responses from an evaluation of 24,158 courses. The estimated reliability for SEEQ factors is about .95 for the average response from 50 students and .90 from 25 students. Marsh and Dunkin also reported that the

instrument is stable over time, noting that in a longitudinal study where students were asked to rate a course at the end of the course and again several years later, end-of-class ratings had a strong correlation ($r = 0.83$) with the retrospective ratings. In addition, the instrument has been used in over 50,000 classes representing more than 1 million surveys.

The survey instrument used in this research combined the two questionnaires. The combined instrument retained the original 7-point Likert scale for the SERVQUAL and the 5-point Likert scale for the SEEQ.

*Data Analysis*

The analysis of the data covered three student groups: (a) the 198 matched direct from high school students who completed both Expected and Experienced academic service assessments and 197 matched direct from high school students who completed Expected and Experienced instructional quality assessments; (b) 61 matched students who completed Expected and Experienced$_2$ assessments; and (c) 50 matched students who completed Expected, Experienced$_1$, and Experienced$_2$ assessments resulting in repeated measures t-tests of mean comparisons for the three time periods. The methodology provided researchers with a modification of the single group interrupted time-series design described by Creswell (2003) and a longitudinal perspective of the changes in perception that may take place within the first few months and 4 years of the college experience.

## Results

The 198/197 students who completed the Expected and Experienced$_1$ assessments came to the university with high expectations of academic service and instructional quality and indeed received academic service and instruction well above the mid-points on the research instrument scales (See Table A1).

Significant differences between expected and experienced academic service quality were found in three of the five subscales including tangibles, reliability, and assurance. Significant differences between expected and experienced instructional quality occurred in all nine subscales. In all instances, the scores on the post-assessments were lower indicating a disconfirmation or negative gap.

The scores of the 61 students who completed the Expected and $Experienced_2$ surveys 4 years later are listed in Table A2. Students' expectations significantly exceeded experienced quality in the academic service quality measure. The negative gap occurred in the overall construct and four of the five subscales: tangibles, reliability, assurance, and empathy. Expectation also exceeded experienced quality in the instructional quality measure. A significant difference (negative gap) occurred in the overall construct and in all the subscales: (a) learning, (b) enthusiasm, (c) organization, (d) group interaction, (e) rapport, (f) breadth, (g) examinations, (h) assignments, and (i) overall workload. Overall, the scores revealed a predominantly negative change between expected and experienced instructional quality for first-year students over the duration of the 4-year academic experience.

The expectations of 50 students completing all three surveys were challenged within the first semester as the expectation ratings exceeded experienced quality in all but the construct responsiveness. Table A3 shows the average score, and changes in scores with the September 1999 pre-term assessment as the common reference point. The comparison of the pre-term assessment with both $Experienced_1$ and $Experienced_2$ post-assessments showed a negative change in both time periods for all constructs except responsiveness. Comparisons between the pre-term assessment and both $Experienced_1$ and $Experienced_2$ post-assessments were significant at the .05 level for all constructs except responsiveness, empathy, and overall learning in the first comparison, and responsiveness, learning, individual rapport, and overall learning in the second comparison.

A comparison between $Experienced_1$ and $Experienced_2$ showed three significant differences in scores on three constructs, tangibles, empathy, and individual rapport. On empathy and individual rapport there were significant increases and on tangibles there was a significant decrease in scores. Generally, the largest change between expected and experienced service quality occurred within the first 4 months of the college experience as 13 of the 16 comparisons showed a significant change in the first time interval

(Expected to Experienced$_1$) and only three comparisons proved significant between the second time interval (Experienced$_1$ to Experienced$_2$).

Table A3 shows three patterns of change between the three points of time. In six constructs the scores declined in both the first and second time interval (Expected to Experienced$_1$ and Experienced$_1$ to Experienced$_2$). The constructs were: (a) tangibles, (b) assurance, (c) enthusiasm, (d) organization, (e) breadth, (f) assignments, and (g) overall learning. The first six of these showed greater declines in the first time interval than in the second interval. The data suggested a first-semester decline and that the students did not adapt to university's level of academic service and instruction quality on these constructs to the same extent that they adapted to those with declines followed by increases.

In six constructs the scores declined in the first time interval and rose in the second time interval (Expected to Experienced$_1$ and Experienced$_1$ to Experienced$_2$). The pattern of decline followed by a rise occurred in the constructs of: (a) reliability, (b) empathy, (c) learning, (d) group interaction, (e) individual rapport, and (f) exams. The variable pattern of changes may have been the result of the students becoming more familiar with the collegiate experience as it existed versus as they initially expected. Only in responsiveness did the scores increase in both time intervals, but those increases were not significant (at the .05 level).

## Discussion, Conclusions, and Recommendations

The findings of this study concur with Tinto's (1993) notion that faculty actions outside of the traditional classroom influence the means by which students "come to judge the intellectual ethos of the institution" (p. 53).

The negative gap found in this study may be attributed to many causes and raises many questions beyond the scope of this research. Is the negative gap simply the difference between the students' mental model of the high school experience versus the reality of the higher education experience? At what point does the negative gap impact student retention? How different is the anticipated to experienced change of the continuing student from those who left the university following the first term or during the 4 years? Is it possible that faculty and student service professionals do not fully

understand the impact of their actions within and outside the classroom setting in relation to academic service and instructional quality?

Not all of the scores decreased over time. In fact, the empathy construct decreased and then significantly increased over time. Individual rapport decreased significantly and then increased significantly over time, although not returning to the pre-term level. This does suggest variability of scores occur in both a negative and positive direction.

The findings of this study add support to our understanding that the interaction between the students' experience inside and outside the classroom has a profound impact on the collegiate experience. It provides additional evidence of the need to consider the complexity of how students view their learning environment in an effort to better understand students' college experiences in their first year and beyond (Donahue, 2004).

The findings also support the importance of longitudinal research to get a more complete picture of the collegiate experience. For example, the relatively high scores on $Experienced_2$, if examined from a one-shot evaluation, would seem generally high. It is not until one observes the change between expected and experienced that a more complete and different picture of the impact of the collegiate experience emerges. Thus, this research supports the contention of Strange et al. (2002), that chronicling changes in students' attitudes and beliefs over the course of their college experience is valuable to efforts to support students.

This study examined the congruence between the expected and experienced measures of academic service and instructional quality. When the 4-year mean score comparisons were considered within the parameters of this subject university setting, the following conclusions were found: (a) Student expectation of academic service quality and instructional quality is significantly higher than the actual experience encountered with the greatest change taking place within the first semester and (b) Student expectation to experienced academic service and instructional quality is a dynamic process over the 4-year collegiate experience.

This research could be extended to educational areas including secondary schools and graduate schools to complete an overall picture of the relationship between expected

and experienced student service and instructional quality. Research should be conducted to determine the impact of the negative gap on satisfaction and retention.

Attention to students' expectations and experiences of the college experiences provides multiple benefits to academe. It is hoped that this type of research may lead to a dialog among faculty, student service administrators, and students to discuss those aspects of the collegiate experience most significant to them, thereby providing opportunity to find new ways to enrich the collegiate experience.

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Appendix

Table A1
*Mean Comparison of Expected and Experienced Quality*

| | Mean Expected | Mean Experienced$_1$ | N | t | P |
|---|---|---|---|---|---|
| Service Quality[1] | 5.80 | 5.26 | 198 | 9.085 | 0.001* |
| Instructional Quality[2] | 4.37 | 3.87 | 197 | 14.811 | 0.001* |

*significant at the .05 level.
(1) Likert scale of 1 to 7 with 1 = *strongly disagree* and 7 = *strongly agree*
(2) Likert scale of 1 to 5 with 1 = *strongly disagree* and 5 = *strongly agree*

Table A2
*Mean Comparison of Expected and Experienced$_2$ Quality*

| | Mean Expected | Mean Experienced$_2$ | N | t | p |
|---|---|---|---|---|---|
| Service Quality[1] | 5.84 | 5.44 | 61 | 4.393 | 0.000* |
| Instructional Quality[2] | 4.36 | 3.96 | 61 | 6.763 | 0.000* |

*significant at the .05 level.
(1) Likert scale of 1 to 7 with 1 = *strongly disagree* and 7 = *strongly agree*
(2) Likert scale of 1 to 5 with 1 = *strongly disagree* and 5 = *strongly agree*

Table A3

*Pre-term Assessment vs. First and Second Post-assessment Scores*

| Academic Service Quality[1] | Pre-term assessment September 1999 Mean Expected | First Post-assessment November 1999 Mean Experienced1 | Second Post-assessment April 2003 Mean Experienced2 | Change: First Post-assessment Less Pre-term assessment Gap$_1$ | Change: Second Post-assessment Less Pre-term assessment Gap$_2$ | Probability Associated with *t* Test: Pre-term assessment vs. First Post-assessment Pre vs. Experienced$_1$ | | Probability Associated with *t* Test: Pre-term assessment vs. Second Post-assessment Pre vs. Experienced$_2$ | | Probability Associated with *t* Test: First Post-assessment vs. Second Post-assessment Experienced$_1$ vs. Experienced$_2$ | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Tangibles | 5.71 | 4.99 | 4.69 | -0.72 | -1.02 | 0.000 | * | 0.000 | * | 0.016 | * |
| Reliability | 6.44 | 5.69 | 5.81 | -0.76 | -0.64 | 0.000 | * | 0.000 | * | 0.289 | |
| Responsiveness | 5.46 | 5.50 | 5.58 | 0.04 | 0.12 | 0.809 | | 0.437 | | 0.503 | |
| Assurance | 6.46 | 5.62 | 5.53 | -0.84 | -0.94 | 0.000 | * | 0.000 | * | 0.659 | |
| Empathy | 5.16 | 5.02 | 5.52 | -0.14 | 0.36 | 0.366 | | 0.019 | * | 0.000 | * |
| Average Service | 5.84 | 5.36 | 5.44 | -0.48 | -0.40 | 0.000 | * | 0.000 | * | 0.304 | |
| Instructional Quality[2] | | | | | | | | | | | |
| Learning | 4.49 | 4.22 | 4.37 | -0.27 | -0.12 | 0.003 | * | 0.185 | | 0.113 | |
| Enthusiasm | 4.46 | 3.96 | 3.77 | -0.50 | -0.69 | 0.000 | * | 0.000 | * | 0.104 | |
| Organization | 4.46 | 4.07 | 4.05 | -0.39 | -0.41 | 0.000 | * | 0.000 | * | 0.868 | |
| Group Interaction | 4.58 | 4.04 | 4.23 | -0.54 | -0.35 | 0.000 | * | 0.001 | * | 0.074 | |
| Individual Rapport | 4.47 | 4.11 | 4.29 | -0.36 | -0.18 | 0.001 | * | 0.058 | | 0.046 | * |
| Breadth | 4.12 | 3.97 | 3.91 | -0.15 | -0.21 | 0.031 | * | 0.048 | * | 0.439 | |
| Exams | 4.77 | 3.97 | 4.07 | -0.81 | -0.70 | 0.000 | * | 0.000 | * | 0.296 | |
| Assignments | 4.38 | 3.87 | 3.63 | -0.51 | -0.75 | 0.000 | * | 0.000 | * | 0.083 | |
| Overall Learning | 3.75 | 3.73 | 3.65 | -0.02 | -0.10 | 0.802 | | 0.357 | | 0.387 | |
| Average Instruction | 4.37 | 4.00 | 4.01 | -0.37 | -0.36 | 0.000 | * | 0.000 | * | 0.881 | |
| N | 50 | 50 | 50 | | | | | | | | |

*Significant at the 0.05 level. (1) Likert scale of 1 to 7 with 1 = *strongly disagree* and 7 = *strongly agree* (2) Likert scale of 1 to 5 with 1 = *strongly disagree* and 5 = *strongly agree*

# YOUNG WOMEN'S STEM CAREER GOALS FROM JUNIOR TO SENIOR HIGH SCHOOL

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*The educational and career goals of 35 young women were compared from junior to senior high school. Degree expectations increased significantly, with 85% of seniors reporting graduate degree goals. Science, technology, engineering, and mathematics (STEM) career preferences decreased significantly, from 91% in junior high to 63% of seniors. The most popular career area was the health profession, chosen by 24% of respondents. What young women most liked about STEM careers was the mental challenge, learning/discovery, and helping others on the job. What students disliked was the mathematics involved, hard work required, and a perception that a STEM career was dull or tedious.*

## Introduction

For more than 20 years, the US has been warned that more scientists, mathematicians, and engineers would be needed to compete in 21st century world markets (National Commission on Excellence in Education, 1983; National Science Board [NSB], 1993, 1998, 2004; National Science Foundation [NSF], 1994, 2001; Task Force on Education for Economic Growth, 1983). These alarms intensified when forecasted shortages were coupled with the realization that the majority of entrants to that workforce would be women and minorities, who typically have not pursued technical and scientific careers (Bae & Smith, 1996; NSB, 1998, 2004; Oakes, 1990; Stumpf & Stanley, 1996). The NSB (1998) predicted a 44% employment increase in science and engineering (S&E) fields or 1.36 million jobs from 1996 to 2006. Women made up 22% of the S&E work force in 1995 and 25% in 1999, the largest percentage in the biological sciences (40%) and mathematics/computer science (33%) and much lower percentages in physical science (22% to 23%) and engineering (9% to 10%; NSB, 1998, 2004).

The preferences of females for the biological sciences and males for the physical sciences (Dawson, 2000, Rayman & Jackson, 1996) have been found as early as fourth grade (Kahle, 1996; Kahle & Rennie, 1993). Furthermore, young women's high school achievements in mathematics and science do not necessarily translate into positive attitudes toward these subjects or related career interests (Catsambis, 1995; Greenfield, 1996). Given projected trends in science, technology, engineering, and mathematics (STEM) fields, we must nurture the mathematics and science interests and achievements of all students to increase their prospects of entering high demand STEM occupations.

The purpose of this study was to trace changes in the educational and career aspirations of a group of 35 young women over 4-5 years, when they had shown interest in STEM fields as junior high school students. A primary objective was to ascertain whether young women's degree goals and interest in a STEM career had endured or declined from junior to senior high school. Students' positive and negative characterizations of STEM professions were examined to better understand factors that attract or turn women away from these occupations. Comparisons were made in the desirable and undesirable characteristics reported by young women who maintained STEM career goals versus those who did not, as differences might indicate distinct perceptions, beliefs, or misconceptions within a group. Such findings might indicate intervention strategies, types of experiences or knowledge needed to provide a more accurate or balanced view of STEM fields. Young women's career goals were further compared to trend for female representation in the STEM professions.

## Review of Literature

Examination of the obstacles that lead to the loss of talented women in STEM fields points to varied and complex factors that may interact and mirror the structures and opportunities available in our society (Catsambis, 1995; Hanson, 1996; Jacobs, Finken, Griffen & Wright, 1998; National Center for Education Statistics [NCES], 1997; Trauth, 2002). With regard to science experiences, Hanson (1996) explained, "gender is not just a direct influence, but rather it might also work indirectly through family experiences that affect school experiences and that ultimately affect individual characteristics and experience" (p. 5). For example, surveys of science-talented girls found their science career goals were strongly related to their intrinsic interest in science, and, to a lesser

extent, their science experiences and parents' attitudes (Jacobs et al., 1998). Women and men respond in varied ways to the influences of public policy, national and local norms, school experiences, and family values on gender identity and work (Trauth, 2002).

Across all ethnic groups, boys were twice as likely as girls to prefer STEM careers by eighth grade and into high school (American Association of University Women [AAUW], 1992; Catsambis, 1995). Even in Hawaii, where gender equity in achievement and attitudes toward science and science careers exist, few young women enter these occupations, nor do they choose engineering or the physical sciences (Greenfield, 1996). Researchers have used varied approaches to identify factors that limit girls' participation in STEM fields (Catsambis, 1995; Clewell, Anderson, & Thorpe, 1992; Hanson, 1996), including the study of girls' (a) beliefs and attitudes toward mathematics and science, (b) access to mathematics and science courses and extracurricular experiences, and (c) knowledge of and exposure to role models in STEM professions.

Beliefs About and Attitudes toward Mathematics and Science

Some research maintains that girls' interests and science experiences are primarily affected by their beliefs and attitudes (Catsambis, 1995; Hanson, 1996). Compared to boys, girls have less positive attitudes toward mathematics (Hyde, Fennema, Ryan, Frost, & Hopp, 1990) and science (Weinburgh, 1995). From a social learning theory perspective, motivation is a product of two factors, (a) one's expectations for success and (b) the associated value (Bandura, 1986). Students will not be motivated if they question their abilities or do not value mathematics or science.

*Self-efficacy in mathematics and/or science.* Girls opted out of mathematics and science because they lacked confidence, and as girls' confidence declines, so did their attitudes toward mathematics and science (Jones, Mullis, Raizen, Weiss, & Westin, 1992). Compared to males, females' beliefs about their competence and levels of self-efficacy, more often affected their mathematics and science achievement and participation (Lappan, Shaughnessy, & Boggs, 1996).

A decrease in mathematics and science self-concept from junior to senior high school came earlier and was more pronounced for females, making them more vulnerable (Byrne & Shavelson, 1987; Greenfield, 1997; Smith, 2000). High school girls often underestimated their abilities (Byrne & Shavelson, 1987; Marsh, Parker, & Barnes,

1985), felt less adequate and had lower expectations for success in mathematics and science (Guzzetti & Williams, 1996; Kahle, 1996; Kahle & Rennie, 1993; Meece & Jones, 1996; Stipek & Gralinski, 1991), although their achievements were the same or higher than those of males (Greenfield, 1997; Guzetti & Williams, 1996; Sax, 1995; Seymour 1995). Confidence affected aspirations as more girls than boys said they were not smart enough or not good enough for their dream jobs (AAUW, 1991). Lent, Lopez and Bieschke (1991, 1993) found that students' feelings of competence in science mediated the relationship between their ability and science-related career goals. Others suggested that girls' preferences for biology contributed to their higher levels of confidence and expectations for success in the health professions and much lower expectations for success in the physical sciences and engineering when compared to boys (Eccles, Barber, & Jozefowicz, 1998).

*Stereotypic views of mathematics and science.* Girls may have less positive attitudes toward math and science because they see these fields as masculine domains (Eisenhart, Finkel, & Marion, 1996; Hill, Pettus & Hedin, 1990; Taber, 1992). Parents, teachers, and school counselors may foster sex-role stereotypes (Vetter, 1996) when they encourage the mathematics achievement of boys more than girls (Kahle & Meece, 1994) or have different educational and career expectations for them (Greenfield, 1997; Kahle, 1996, Kahle & Meece, 1994; Shakeshaft, 1995; Shephardson & Pizzini, 1992). Compared to males, female science majors in college noted more parental influence, with fathers' expectations most influential, except when mothers had a career (Seymour & Hewitt, 1997). Educators turn women away from STEM fields when they emphasize competition versus collaboration or characterize such work as solitary and extremely demanding (Astin & Sax, 1996), requiring "super woman" qualities (Miller & Silver, 1992).

*Perceived role conflict versus compatibility.* When math and science were portrayed as masculine, young women experienced conflict between their interest in these subjects and their own personal life and popularity (Clewell, Anderson, & Thorpe, 1992; Stage & Maple, 1996). Research has examined women's perceptions of a role conflict between STEM careers and family responsibilities (Betz, 1994; McCracken & Weitzman, 1997; Nauta, Epperson, & Kahn, 1998; Packard, 2002; Seymour & Hewitt, 1997; Smith, 2000) because a STEM career is very demanding (Nauta et al., 1998). Women more than men

experienced societal pressures when blending career and family responsibilities (Lips, 1992; Seymour & Hewitt, 1997) and women in STEM professions more often reported that family duties interfered with their work (Burlew & Johnson, 1992).

Smith (2000) noted that women in STEM fields were more content when their professional and personal interests were compatible. Women were attracted to science when they saw this work as helpful to others (Astin & Astin, 1993; Vetter, 1996) or focused on social concerns and interdependence (Davis & Rosser, 1996; Hynes, 1995; Mills, 1993; Rosser, 1993; Sax, 1994). This may contribute to women's preferences for the biological and medical sciences where opportunities to address societal problems may be more apparent than in other STEM professions.

*Access to Mathematics and Science Extracurricular Activities*

The NCES (1997) reported that females were as likely as males to complete advanced mathematics and science courses, except physics, where females were under-represented. While the course-taking patterns of male and female students were similar, their pursuit of out-of-school mathematics and science experiences was quite different (Catsambis, 1995; Greenfield, 1996, 1997; Hanson, 1996; NCES, 1997). Middle school boys were more likely to have visited science museums, participated in science fairs or math competitions, used a microscope, and met a scientist (Hanson, 1996; Jones, 1991) Girls' science fair projects were mostly in the life sciences and they were attracted to museum exhibits focusing on the human body or puzzles, while boys submitted projects and preferred exhibits that used mathematics, physical, earth, or computer science (Greenfield, 1995a, 1995b). These experiences may originate from students' interests, but they also enhanced the intrinsic and utility value of math and science.

Extracurricular science activities positively affected students so there was less decline in attitudes toward science throughout junior and senior high school (Hofstein, 1990). Applications of mathematics and science in authentic real world contexts reinforce concepts and processes learned in school and affect students' career expectations (Smith 2000; Vetter, 1996). Smith noted that high challenge, low threat tinkering or video activities motivated females to take risks and seek further challenges that heightened interest in further STEM pursuits and contributed to their decision to enter STEM fields.

*Exposure to Role Models and Career Information*

Females and minority students may have limited exposure to STEM role models and career information (Hill et al., 1990; Schuck, 1998). If they lack knowledge of career requirements, girls may not understand that math and science education is essential to entering STEM fields. Local occupational norms also influenced adolescents' career aspirations (Ianni, 1989), (e.g., girls used limited female representation to judge STEM fields as white male domains; Eisenhart et al., 1996; Taber, 1992). Alternatively, exposure to female scientists improved adolescents' attitudes toward both science and women in science (Smith & Erb, 1986; Terry & Baird, 1997). Female role models encouraged girls to take risks (Smith, 2000) and counter stereotypes about what is possible for women. Meeting and interacting with a scientist of one's own race and gender were powerful influences on science-related career choices (Hill et al., 1990).

Except for the biological sciences which are more gender-balanced, women in the STEM professions may feel isolated and receive little feedback to judge their performance and develop confidence (Nauta et al., 1998; Stage & Maple, 1996). Female role models provided reassurance and demonstrated ways to combine career and family responsibilities (Nauta et al., 1998). Female colleagues also contributed to a "normalization process"; when women recognized that others found a situation to be challenging or arduous, they were less likely to attribute their difficulties to a lack of ability (Nauta et al., 1998; Packard, 2002). Adolescent girls' decline in self-efficacy, less positive attitudes and beliefs, and limited STEM extracurricular participation and career information may each operate or interact to weaken their interests in mathematics and science and affect their career choices.

## Method

*Participants*

Participants in this study were junior high school students who indicated an interest in STEM fields. Their educational and career aspirations were compared over 3 to 5 years, using parallel survey forms, to determine changes that occurred. I analyzed changes in young women's degree expectations as they could limit or expand students' career options. Young women's interests in and specific STEM career goals were examined to determine whether they were maintained or decreased significantly over

time. Features of STEM careers reported as most and least desirable were reviewed to understand what attracted or turned students away from STEM fields. The positive and negative descriptors of students with STEM versus non-STEM career goals were compared to identify differences in their perceptions, beliefs, or experiences.

The participants represented three cohorts of young women who attended a week-long Summer Institute designed to support interest in STEM fields. The program featured workshops and field site visits, led by female role models, to illustrate applications of mathematics and science on the job and the pivotal nature of mathematics and science education for entry into STEM professions. The 69 participants, from 1994 to 1996, represented varied school districts in southeastern Pennsylvania and expressed a desire to explore STEM careers as part of the application process.

From 1997 to 1999, the original 69 participants were asked to complete follow-up surveys that paralleled the application survey. In the 3 to 5 years that had passed, many students had relocated or did not return the survey. Initial mailings yielded limited data from 20 students and phone interviews led to 15 additional responses. The 35 respondents represented 51% of the original 69 participants. The findings represented data from a select group of young women and do not generalize to females in Pennsylvania or even the southeastern region of that state. Of the 35 students, 11 were juniors and 18 were seniors in high school, while 6 were freshmen in college. Nineteen or 56% reported their ethnicity as White, while 15 or 44% were minorities, specifically 10 or 32% African Americans, 3 Asian Americans, 1 Puerto Rican and 1 Armenian American.

*Instrumentation and Procedures*

The survey was developed using guidelines established by Davis and Humphreys (1985) and in consultation with Campbell Kibler Associates, experts in the evaluation of mathematics/science intervention programs for young women. Copies of the junior and senior high school surveys are available in a previous article (VanLeuvan, 2004). Students' responses were entered as ordinal ranks or nominal codes when categories of like responses occurred. A test of intra-rater agreement of coded responses over the survey yielded 85.3% agreement. Test-retest reliability measures resulted in $r = 0.86$ for the entire survey, with comparable results for particular sections, (i.e., $r = 0.83$ for degree

expectations, $r = 0.74$ for level of interest in math and science-based fields, $r = 0.88$ for career preferences and influences on career choice).

Junior high school students completed the initial survey prior to the Summer Institute and the follow-up survey when they were close to graduation from high school. This study focused on responses to three sections of the survey. The first set of analyses centered on participants' degree expectations. The second relevant section addressed the participants' levels of interest in STEM careers and actual career preferences. In the third section, participants' reported aspects of STEM careers that they liked most and least.

*Analysis of degree expectations.* Prior research has noted that young women set lower educational goals over time (Holland & Eisenhardt, 1991; Miller & Silver, 1992; VanLeuvan, 2004), especially after they marry or become parents (Haggstrom, Kanause, & Morrison, 1986; Hanson, 1996; Marini, 1984). Because the level of education completed affects students' career options, young women may view the educational requirements for STEM careers as out of reach, unattainable, or undesirable aspects of these fields. To determine differences, students' degree goals were assigned ranks of 0 (*no degree*), 1 (*associate*), 2 ( *bachelor*), 3 ( *masters*), or 4 ( *doctoral degree*). I performed a McNemar Test for Significance of Change, a $\chi^2$ test for dependent samples involving nominal data, to compare degree expectations from junior to senior high school for two groups of students, (a) those who set higher goals from an undergraduate to a graduate degree versus (b) students with lower goals from a graduate to undergraduate degree. A $\chi^2$ test of high school seniors' degree expectations by race, and $\chi^2$ pair-wise comparisons by race were also completed to ascertain significant differences.

*Interest in STEM careers.* A primary question of this longitudinal study focused on the strength and stability of young women's STEM career aspirations. Would young women maintain or change their level of interest in STEM fields from junior to senior high school? For this purpose, students' expressed levels of interest in STEM careers were assigned rankings, of 3 (*high*), 2 (*moderate*), 1 (*low*), or 0 (*no interest*). I performed the McNemar Test for Significance of Change in the proportion of students who (a) increased to a *very strong* level of interest versus (b) those who decreased from very strong to a lower level of interest in a STEM career from junior to senior high school.

The study also compared the career preferences of these young women to female representation in STEM fields. If young women's interest in a STEM career continued, did their preferences mirror past trends with the largest representation of women in the biological sciences versus mathematics, the physical sciences, or engineering in decreasing order? From the girls' listed specific career preferences, types of responses were grouped to form categories, (i.e., the health professions including medicine, physical therapy, dietician, or nursing, veterinarian, biology, chemistry, engineering, computer science/ technology, mathematics, and non-STEM career options).

*Desirable and undesirable characteristics of STEM careers.* A final study objective was the examination of characteristics of STEM work that were attractive versus unattractive to young women. Would students who expressed STEM versus non-STEM career preferences identify the same features of this work as desirable or undesirable? Similar descriptors were grouped to determine common desirable versus undesirable features of STEM work. The categories were developed over three data sets, the current study, studies of a 1991-1992 cohort (VanLeuvan, 2001), and a parallel 1995-1996 cohort of young women (VanLeuvan, 2004) and are described in the section entitled Results. Separate $\chi^2$ tests were completed for each set of desirable and undesirable characteristics that had been identified by students with and without STEM career goals.

## Results

Significant differences were found in young women's educational and career aspirations from junior to senior high school. As seniors, these young women had set very ambitious degree goals and there was a significant difference in their degree expectations over time. Unlike what had been found for other groups of young women (VanLeuvan, 2001, 2004), a larger number of respondents reported higher versus lower degree goals from junior to senior high school. There was a significant decrease in the proportion of young women who indicated a very strong interest in at least one STEM field from seventh to 12$^{th}$ grade. The health professions were most popular, in agreement with previous research (VanLeuvan, 2001, 2004).

No significant differences were found for the set of desirable or undesirable characteristics identified by seniors with versus those without STEM occupational goals. When describing desirable characteristics of STEM careers, these young women most

often stated the following: (a) mental challenge; (b) learning or discovery involved; and (c) opportunity to help people through STEM work. As they explained what they would not like about a STEM career, young women most often reported: (a) doing the mathematics; (b) the perception that it could be dull or tedious; and (c) the hard work required.

*Degree Level Goals*

Participants reported their educational and career goals in junior high school and near graduation. As they approached college, most students were very ambitious with 29 of 35 respondents (83%) expecting to complete graduate work. The degree goals for 9 students were unchanged from junior to senior high school, leaving 26 students with changed expectations. Seven students had lower and 19 had higher degree expectations and the resultant $\chi^2$ (1, $N$ = 35) = 5.54, $p < .05$ indicated a significant difference in degree goals from junior to senior high school.

The goal of obtaining a graduate degree was embraced by members of all racial/ethnic groups. A master's degree was targeted by 13 White and 4 minority students, who identified their race/ethnicity as African American, Asian, Puerto Rican, and Armenian American. Earning a doctoral degree was the ultimate objective for 7 African American, 4 White, and 1 Asian American student. A $\chi^2$ test indicated no significant differences in degree expectations by race, White, African American, Asian American, $\chi^2$ (9, $N$ = 35) = 14.582, $p < .05$. However, the greatest differences between observed and expected values occurred at the master's level for Whites (3.77) and African Americans (-4.34) and the doctoral level for African Americans (3.23). Pair-wise comparisons yielded significant differences between the degree expectations of Whites and African American students, $\chi^2$ (3, $N$ = 35) = 11.81, $p < .05$.

*Career Aspirations*

The number of girls who reported a very strong interest in at least one STEM area dropped from 32 or 91% in junior high to 22 or 63% near graduation from high school. The McNemar Test for Significance of Change indicated significant differences between (a) 2 students who increased from a lower to a very strong level of interest versus (b) 12 students who decreased from very strong to a lower level of interest in STEM fields from

junior to senior high school, $\chi^2$ (1, $N$ = 35) = 7.14, $p$ < .05. Seventeen senior high school students or 49% reported a very strong interest in science-based careers, while 5 students or 14% were very interested in mathematics-based careers, and another 6 or 17%, rated engineering or computer science as very interesting. These percents should not be summed as students reported their interest in more than one area.

*Specific career goals.* Students listed up to three jobs they would like to have when they were 25 years old. Twenty-one respondents or 60% listed a very strong preference for at least one STEM occupation, while 22 had indicated a very strong interest in STEM work on the previous section of the survey. The health professions were reported most often with 10 students or 29%, including 3 each for medicine and physical therapy, and another 4 for other health services. Five respondents or 14% had strong preferences for the sciences, with 2 interested in environmental science and 1 student each in biology, chemistry, and physics. Engineering was a goal for 3 respondents or 9% and 1 preferred computer science. Two students hoped to major in mathematics and ultimately wanted to teach, 1 in college and another in high school. Fourteen high school students or 40% reported non-STEM career preferences that included business management, entrepreneur, lawyer, teacher, psychologist, and international studies.

*Attitudes toward STEM Careers*

Separate $\chi^2$ tests indicated no significant differences in the set of most desirable, $\chi^2$ (6, $N$ = 35) = 8.517, $p$ < .05, and least desirable characteristics of STEM fields, $\chi^2$ (5, $N$ = 35) = 6.573, $p$ < .05, identified by (a) 21 students with STEM versus (b) 14 with non-STEM career goals. The most frequent category of desirable characteristics, reported by 9 students or 26% and 5 with STEM goals, described the mental challenge or type of thinking required for STEM work. Comments included: "Puzzle it portrays. Like how logical it is;" "figuring out puzzles;" "it's analytical;" and "you have to be smart." Six girls or 17%, 4 with STEM goals, noted they would enjoy learning new concepts or techniques at work. Another 5 students or 14%, 4 with STEM goals, said they liked STEM careers because they would be helping others, (i.e., through research, the health professions or teaching about their field). Three comments reflected the girls' intrinsic interests, (e.g., "Using subjects I enjoy every day" and "I love biology and physics

concepts"). Other remarks included: "working with the environment;" "breaking into the math and science industry;" and [there are] "a lot of possibilities." Four students stated, "Nothing," indicating they had no interest in these fields.

The most frequent category of undesirable characteristics, given by 7 students or 20% and 3 with STEM goals, indicated that students disliked the mathematics used in STEM work, (e.g., "doing calculations" or "using formulae"). Five students or 14%, including 3 with STEM goals, characterized STEM work as potentially boring, (e.g., "It could get dull," "probably tedious"). Another group of 4 girls with STEM aspirations or 11% disliked the challenge or hard work required for STEM careers, (e.g., "the challenge to get in," "the hard work to get a (STEM) career," and "all the science knowledge that has to be remembered"). Six students or 17%, 5 with STEM goals, stated there was nothing that they did not like. Other comments indicated that respondents would not like, "frustrations that come with the job," "when you can't figure a problem out," and "right or wrong answers, never in between." Two students merely reported they were not interested in a STEM career and five students did not respond to this entry on the survey.

## Discussion

One problem encountered and typical of longitudinal work is the difficulty in maintaining contact with participants over an extended period of time. The 35 respondents may represent a subgroup that was more interested in mathematics and science, or more motivated and/or conscientious than the other 34 students who did not return the survey. The findings might change significantly if the number of respondents was increased, although attempts were made to broaden the pool. The findings represent responses from a select group of young women and do not generalize to other females in Pennsylvania or the southeastern region of the state.

As junior high school students, the participants were ostensibly interested in the STEM professions. Over time, it is clear that 14 girls or 40% developed other interests and formulated very different career goals. The follow-up responses are not limited to and do not solely represent the opinions, attitudes, and beliefs of young women with STEM career aspirations. Young women's responses do provide some insight into their thinking about STEM careers and why they may or may not see them as desirable.

### *Degree Level Goals*

These young women had extraordinary degree goals, with 83% expecting to complete a graduate degree. The 49% of students with master's degree goals exceeded the proportions of college-bound seniors with master's degree expectations both nationally, 31% in 1998 and 1999, and in Pennsylvania, 27% in 1998 and 26% in 1999 (Educational Testing Service [ETS],1999, 2000). Likewise, the 34% of students with doctoral degree goals exceeded proportions nationally, 23% in 1998 and 22% in 1999, and in Pennsylvania, 17% in 1998 and 16% in 1999 (ETS, 1999, 2000). Significantly more students had higher (19) versus lower (7) degree goals from junior to senior high school. This finding is contrary to research that indicated a decline in the academic goals of young women from junior to senior high school (VanLeuvan, 2004) and over longer periods of time (Haggstrom et al., 1986; Hanson, 1996; Holland & Eisenhardt, 1991; Marini, 1984; Miller & Silver, 1992).

The degree expectations of these young women seem very optimistic given past indicators in science and engineering fields. The NSB (1998) noted that women earned 55% of master's and 39% of doctoral degrees awarded in 1995; in science and engineering women earned 38% of master's and 31% of doctoral degrees. Most interesting is the fact that 7 of the 11 girls expecting a doctorate were African American. African Americans earned only 6% of master's and 3% of doctoral degrees granted in 1995 (NSB, 1998). Tracking over several years enables us to see whether these ambitious career goals come to fruition.

*Young Women's Career Aspirations*

There is a significant decline from 91% to 63% of young women who reported STEM career goals from junior to senior high school. The most popular STEM preferences are the health professions at 29%, followed by engineering at 9%. Similar results were found in an earlier and parallel study, where the largest percentage of young women, 41% (VanLeuvan, 2001) and 28% (VanLeuvan, 2004), expressed preferences for the health professions, while 13% preferred engineering (VanLeuvan, 2001, 2004). In related work, Eccles et al. (1998) reported that girls' preferences for biological sciences contribute to their higher levels of confidence and expectations for success in the health and medical professions but lower expectations for success in physical science and engineering when compared to boys. Other research indicates that women are attracted to

the biological and health/medical professions because they are more gender-balanced, welcoming, and supportive (Betz, 1994) or because women believe these professions will accommodate career and family responsibilities (Miller & Silver, 1992). Respondents did not report these qualities when describing characteristics of STEM careers.

How do the career choices reported here compare with female representation in STEM fields? Of the 22% to 25% of the S & E work force that were women in 1995 and 1999, the largest percentage were employed in the biological sciences (40%), followed by mathematics (33%), the physical sciences (22-23%) and engineering (9-10%) (NSB, 1998, 2004). If their career goals come to fruition, these students will increase women's representation in the science and engineering work force in comparable proportions.

*Attitudes toward Mathematics and Science*

There was no difference in the characteristics of STEM careers identified as desirable or undesirable by students with and those without STEM aspirations. Characterizations of STEM careers as mentally challenging formed the most frequent category of positive descriptors for 29% of students here and a lower 19% (VanLeuvan, 2001) and 11% (VanLeuvan, 2004) of young women in two other studies. This finding supports work by Greenfield (1995b) and Smith (2000) and indicates that challenge and problem solving tasks appeal to many young women. While 17% of the respondents in this study note they would most enjoy discovering and learning new concepts or techniques in STEM work, 20% of the seniors in two earlier studies did so (VanLeuvan, 2001, 2004). These young women seem to be attracted to the dynamic, generative qualities they associate with STEM fields, especially in science-based professions. Another 14% of respondents state they would most like helping others (Astin & Astin, 1993; Vetter, 1996) or contributing to society (Davis & Rosser, 1996; Hynes, 1995; Mills 1993; Rosser, 1993; Sax 1994b) through STEM work, while smaller percentages were found in other studies, 6% (VanLeuvan, 2004) and 8% (VanLeuvan, 2001). These perceptions may contribute to girls' preferences for the biological and health professions where societal contributions are more apparent than in other STEM fields. Two respondents (9%) reported that their intrinsic interest in science or mathematics attracted them to a STEM career, while a larger proportion of other cohorts did so, 14% (VanLeuvan, 2004) and 21% (VanLeuvan, 2001). Jacobs et al. (1998) also reported that

girls' science career goals are strongly related to their intrinsic interests in science. Young women's positive characterizations of STEM fields suggest that career awareness and extracurricular activities should highlight exploratory and creative aspects of specific occupations and explain the ways that such work addresses social concerns, improves our lives, and/or contributes to the solution of societal problems.

The largest category of negative characterizations of STEM professions concerns the mathematics as reported by 20%, with a comparable 18% for a parallel cohort of young women (VanLeuvan, 2004) but 4% for another group (VanLeuvan, 2001). Another 14% characterized STEM work as boring or tedious. These students may have transferred negative feelings about their mathematics experiences to STEM careers. It is important to note that 3 students, who stated that they do not like the mathematics involved, still indicate STEM goals in medicine, environmental science, and engineering. The mathematical components of these jobs may deter their career aspirations.

Through follow-up interviews we might better understand the specific aspects of mathematics work applications that young women see as desirable or undesirable. We might also ascertain whether students have accurate perceptions of the mathematics used in specific STEM professions. Such research may suggest specific intervention strategies, such as shadowing a STEM professional with special attention to the mathematics used on the job. Future work could explore how and when girls' interest in STEM careers is affected by their perceptions of the ways that mathematics is used in those careers. Are young women attracted to specific careers because they believe these professions require less or different types of mathematics competency?

Five seniors with STEM career goals indicate there is nothing they would not like about this work, reflecting their positive attitudes. Four students (11%), however, dislike the hard work and challenge required in a STEM career, with similar results found for other cohorts of young women, 11% (VanLeuvan, 2004) and 9% (VanLeuvan, 2001). These results offer some corroboration for studies that have examined women's perceptions of STEM professions as very demanding (Astin & Sax, 1996; Miller & Silver, 1992; Rayman & Jackson, 1996). However, 26% of respondents described the mental challenge as a desirable characteristic, with 19% (VanLeuvan, 2001) and 4.5% (VanLeuvan, 2004) of other cohorts in agreement. Other researchers have noted that the

demands of STEM occupations are viewed as especially burdensome when young women anticipate or have family responsibilities (Seymour & Hewitt, 1997). Young women may then reject STEM goals because they do not see ways to combine their career and family roles (Betz, 1994; Burlew & Johnson, 1992; Lips, 1992; Nauta et al., 1998). The attitudinal findings discussed from this purview must be considered as speculative given the limited size of the study.

This work enables us to better understand aspects of STEM careers seen as desirable versus undesirable by these young women. Some students characterized STEM professions as hard work, exacting a costly personal toll. Exposure to female role models, who balance a career, family, and social life, might counter such negative perceptions. Other students dislike the accuracy and exactness of mathematical procedures they see as integral to STEM work. These young women would benefit from mathematics activities that emphasize workplace applications and incorporate problem solving, exploration, collaboration, and communication as promoted by national standards (National Council of Teachers of Mathematics, 2000). Experiences shadowing an engineer or research scientist would provide opportunities to view applications of mathematics and science skills and principles to this work. Young women may then develop less negative and more realistic views of the mathematics required for specific careers.

It will be interesting to trace the progress and aspirations of these young women throughout college and beyond. Will external forces or the advent of marriage and children deter them from achieving their goals? Even if these young women fulfill their degree-level expectations, will they pursue a STEM career where males have dominated in the past (AAUW, 1991, 1992; Clewell, Anderson, & Thorpe, 1992)? Training may provide access to highly skilled technical professions, but access will not guarantee retention or advancement, especially if the workplace is inhospitable to women (Hanson, 1996). This, too, needs further exploration.

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# AN ANALYSIS OF UNIVERSITY MISSION: FIRST-YEAR STUDENTS' PERCEPTIONS

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*A random sample of first-year students (n = 84) reported perceptions of their faith-based university's mission and values through qualitative and quantitative methods. As expected, religious affiliation and racial identity played a significant role in students' perceptions. Minority more than Caucasian students believed that diversity on campus should be increased, while non-Catholic/non-Christian Caucasian students reported the strongest lifelong commitment to education and service than other religious and racial student categories. Open-ended responses on institutional mission and values by both male and female students revealed that obtaining a well-rounded education in an urban setting included serving others while respecting their diversity and dignity as individuals.*

In his book, *The Dying of the Light*, Burtchaell (1998) discussed the indirect and slow erosion of institutional mission statements due to the disengagement of private colleges and universities from their church affiliations. Mission statements that once included words like "values, morals, and congregational affiliations" now give way to words like "independent, coeducational, and residential." Nevertheless, mission statements are an organization's means of publicly proclaiming for critical assessment the institution's objectives, expectations, and values (Holland, 1999). Within higher education settings, mission statements focus the energies of employees to balance the relationship between educational goals and the needs of the outside world and integrate objectives held by diverse stakeholders (e.g., administrators, faculty, and staff), enabling everyone to work toward common goals (Berg, Csikszentmihalyi, & Nakamura, 2003). Institutional missions may be conveyed through administrative operations, academic programs and policies, and student services (Ferrari & Cowman, 2004). They identify the institution's intentions to accomplish goals, and its premise for action (Rowley, Lujan, & Dolence, 1997).

The skills and competencies acquired through higher education that reflect the institution's mission and values may impact student development (Ferrari & Cowman, 2004). For instance, if a university in its mission statement claims to promote and foster public service, intellectual integrity, critical thinking skills, moral and civic development, and racial and religious tolerance, then it is important to evaluate whether such virtues are actualized and realized by students (Ehrlich, 2000; Gardner, 2001; Halstead & Taylor, 2000). Evaluating how much an institution's mission and values affect new students may be helpful in the review of educational policies and administrative operations and in ascertaining the impact of community-based service programs (Dill, 1997) as well as identifiable benchmarks of the school (Ferrari & Cowman, 2004).

We define *institutional values* within higher education settings as goals and outcomes, as well as procedural operations, which are actualized to students and staff reflecting the identifiable benchmarks of the organization (Ferrari & Cowman, 2004; Filkins & Ferrari, 2004). In the present study, we explore how our university expresses its mission and values to members of its organization, specifically incoming *first- year students*. First-year students might have enrolled in a particular institution because they agreed with the mission of the school that was reflected in its recruitment approach and marketing. That is, a school that believes critical thinking and community service are two important aspects of an education at that institution should reflect those activities in its recruitment materials. Understanding how first-year students who now experience the institution perceive that mission through campus programs and activities seems an important line of educational assessment.

Despite the educational literature cited above, only one study examined first-year students' perceptions of their higher education institution's mission. Rapp (2000) assessed first-year student expectations, perceptions, emotions, and knowledge about the university. Results showed that 50% of the time, students held misperceptions about the university, and these misperceptions increased the gap between students' expectations and experiences. Rapp suggested that bridging the gap between first-year students' expectations and experiences at the university may lead to better retention rates. Studies have shown that *racial identity* may play a role in comprehending new students' adjustment to their college institution (Hu, Shouping, & Kuh, 2003a, 2003b). Students of color who attend predominantly Caucasian universities had a stronger commitment to and pride in their racial group, a higher level of cultural awareness,

more adaptive personal resources such as leadership and efficacy, and better psychosocial adjustment than Caucasian students (Chavez, Guido-DiBrito, & Mallory, 2003; Coleman, 1999). Among faith-based colleges and universities, one of the primary interests of the student affairs departments is to transmit to students the values, philosophy, and faith teachings of the institution regardless of a student's *religious preference*. Studies conducted to understand first-year students' faith development at a Baptist institution revealed that the college environment promoted faith development (i.e., the values upon which the institution was founded), and affected students' decision-making strategies toward everyday life choices (Newman, 1998). Another study found that students enrolled in faith-based colleges and universities more frequently engage in community service than students enrolled in non-faith based institutions (Low & Handal, 1995; Newman, 1998; Serow & Dreyden, 1990).

The present study was exploratory, given the fact that few systematic investigations have examined perceptions of institutional missions within higher education settings. We investigated whether racial and religious differences would be reported among first-year students in their perceptions and experiences of a faith-based, urban university. First-year students of color, compared to their Caucasian peers, might report different perceptions of how diversity on campus is reflective of the university's mission to be inclusive. First-year students who identify themselves as Catholic or Christian at the present faith-based institution might also report different perceptions of the institution's mission than peers of non-Catholic, Christian, or other religious affiliation.

*DePaul's Mission Statement*

DePaul University is a private, teaching university with over 23,000 students educated across several metropolitan campuses in the Chicago area (see Filkins & Ferrari, 2004). The university's benchmark characteristic is an "*urban, Catholic, and Vincentian*" institution and expresses its vision through the values inherent to these concepts. The *urban* mission and values of the university are expressed by delivering quality education to locations in and immediately around the city of Chicago. The university literature states that it expresses its *Catholic* mission and values by direct service to the poor and economically disenfranchised through such programs as student engagement in volunteer and community service directed at impoverished communities (Sullivan, 1997). Murphy (1991) noted that although it is a Roman Catholic school of higher education like other institutions, DePaul University invoked *Vincentianism* (referring to the

namesake of the school, St. Vincent DePaul) through respect for human dignity, diversity, and individual "personalism" (see also Sullivan, 1997). The *DePaul Values Inventory* (*DeVI*) was created to examine student perceptions of DePaul University's institutional mission and values (Ferrari & Cowman, 2004).

## Method

In the present study both quantitative and qualitative methods were used to gain a more complete understanding of institutional perceptions among first-year students with different religious and ethnic identities. It was expected that because the university campus is predominantly Caucasian, students of color (African American, Hispanic/Latino, Asian/ Pacific Islander) would score higher than Caucasian students on their perceptions of the university's mission and values which promote acceptance of diverse populations (Chavez et al., 2003; Hu et al., 2003a, 2003b; Sanders, 1997). Furthermore, the present study compared first-year students' religious affiliations to assess any relationship between students' faith orientation on perceptions of the university's mission and values. Because the present university is a faith-based institution founded on the tenets of Catholicism and the philosophy of St. Vincent de Paul, it was expected that students who reported a Catholic and/or Christian affiliation would report significantly different perceptions of the university's mission and values than first-year students who reported an affiliation other than Catholic or Christian religious orientation (e.g., Buddhist, Hindu, Muslim), or students who reported that they were affiliated with no religion. Qualitative data were expected to support students' quantitative scores of institutional values.

### *Participants*

A random sample of 84 first-year college students enrolled at a medium-size urban faith-based teaching university (43 women, 40 men; *M* age = 18.4 years old, *SD* = 0.60) and living on campus in a residential hall was selected from a larger sample of freshmen participants enrolled in an introductory psychology class. Most participants (64.6%) were self-identified as *Caucasian* ($n = 53$), and the remainder were students of color ($n = 31$), consistent with the profile of students at this university. Participants also identified themselves with one of four religious affiliations: Roman Catholic ($n = 39$; 25 women, 14 men; *M* age = 18.28 years old, *SD* = 0.60); Christian ($n = 29$; 12 women, 17 men; *M* age = 18.48, *SD* = 0.69); Non-Christian/Catholic ($n = 7$; 3 women, 4 men; *M* age = 18.14, *SD* = 0.69) and no affiliation ($n = 8$; 3women, 5 men; *M* age = 18.62; *SD* = 0.52).

*Psychometric Scales*

All participants completed the *DePaul Values Inventory* (*DeVI*; Ferrari & Cowman, 2004), a measure that assesses a student's perception of a university's mission and values. The *DeVI* is a 25-item questionnaire composed of four sub-scales with each item rated on a 7-point Likert scale (1 = *strongly disagree* to 7 = *strongly agree*). The first sub-scale was called *institutional values* (9 items; present sample alpha = 0.86; $M$ = 38.06; $SD$ = 10.09), comprised of questions that related to students' understanding of the university's overall mission and institutional values as an urban, faith-based university, as outlined in the mission statement. The second sub-scale, *emphasis on diversity* (3 items; present sample alpha = 0.86; $M$= 12.23; $SD$ = 3.40), assessed whether students believed the administration acts on its mission of including diversity by actively recruiting persons of color and women as faculty and staff. The third sub-scale, *general altruistic campus atmosphere* (7 items; present sample alpha = 0.90; $M$= 34.78; $SD$ = 8.32), assessed students' perceptions that the university respects the dignity of others through a campus culture or climate that is supportive and altruistic. The fourth sub-scale, *life-long commitment to education and values* (6 items; present sample alpha = 0.85; $M$= 28.37; $SD$ = 7.37), examined whether students believed that the values of learning and community service would continue to influence their lives after graduation. Previous studies found the factor structure to be consistent across varied student samples while maintaining acceptable internal consistency as a research tool (see Ferrari & Cowman, 2004; Filkins & Ferrari, 2004). Also, no significant sex differences across *DeVI* sub-scale scores have been reported (Ferrari & Bristow, 2005; Ferrari, Kapoor, & Cowman, in press). Moreover, sub-scales were independent of social desirability tendencies (Ferrari & Bristow) and personal value structures of morality (Ferrari, Kapoor, & Cowman, in press).

In addition, all participants completed a sheet of qualitative items attached to the *DeVI*. Qualitative data were reviewed to obtain a representative set of themes that captured first-year students' perceptions. This qualitative instrument contained four open-ended concept prompts or probes administered prior to students' responding to the 25-item *DeVI* rating scales. The open-ended prompts asked the students to write their understanding of the Catholic, Vincentian, urban, and mission concepts related to this institution. There was approximately a half sheet of paper (12-14 lines) provided for each item. The goal of this procedure was not to inform students of the

institution's mission, but to capture their understanding or perception of the mission reflected in their own words.

Because it is possible that participants would provide responses on the *DeVI* that might reflect social approval rather than true opinions, all participants completed the revised Marlowe-Crowne Social Desirability Scale – Form C (Reynolds, 1982), a 13-item true/false instrument that assessed each respondent's tendency to provide socially appropriate answers. This scale is a revision of the original, well-known, reliable and valid 33-item Marlowe-Crowne Scale (Crowne & Marlowe, 1960), and the short Form-C used in the present study has strong reliability and validity across several samples and populations (Andrews & Meyer, 2003; Kohn, O'Brien, & Pickering, 2003; Tait, French, & Hulse, 2003).With the current sample, the Form-C scale had an alpha of 0.79 ($M = 6.33$; $SD = 2.39$).

*Procedure*

Small group testing sessions of 20 to 30 students were held during the start of the winter quarter of the first year. After returning a signed consent form, participants completed a demographic sheet (age, sex, race, and religious affiliation). The four open-ended questions or probes, the *DeVI*, and the social desirability scale were administered. The sequence of both the DeVI (with its four open-ended items) and the social desirability measures were counterbalanced, to control for order and fatigue effects. It took participants less than 30 minutes to complete all items.

*Data Analysis*

Initially, descriptive analyses correlating *DeVI* subscale scores with social desirability scores were conducted. Also, sex differences in *DeVI* subscale scores were calculated. Subsequently, analyses of variance by race and religion on *DeVI* subscale scores were computed. In addition, a report and sample statements of the themes that emerged by participants to the four probes were presented.

## Results

Scores on the *DeVI* subscales were correlated with the measure of social desirability, to ascertain whether there were response biases among participants. There were no significant correlation coefficients between social desirability and the four *DeVI* subscale scores ($p > .65$), consistent with previous research with the *DeVI* and other student samples (Ferrari & Cowman, 2004; Ferrari, Bristow, & Cowman, 2005; Filkins, & Ferrari, 2004). An analysis for potential sex

differences on *DeVI* subscales was conducted because this scale is a relatively new measure. Consistent with other studies (e.g., Ferrari & Cowman, 2004; Filkins & Ferrari, 2004), there were no significant differences in the perceptions between men and women among first-year students on the *DeVI* subscales. Both men and women reported similar perceptions of institutional mission and values from their qualitative statements on the *DeVI*.

Open-ended statements on the University mission reflected a theme of *serving others* by 55% of men and women. As one female student wrote, the mission is to teach students to "serve and help others to the best of your ability. Be supportive for people who need it, sacrifice yourself wholeheartedly for others." Similarly, a male student stated that the University's mission was "to teach students to give back to God, community, and to help everyone succeed."

Subsequently, a 2 (racial identity: Caucasian vs. minorities) by 4 (religious affiliation: Roman Catholic versus Christian versus non-Christian/non-Catholic versus none) *MANOVA* on the four *DeVI* subscale scores was conducted. It was expected that perceptions of the university's mission and values (assessed by the *DeVI* rating scales) would differ by religious affiliation and racial identity. There was a significant multivariate interaction effect between racial identity and religious affiliation, $F$ (12, 148) = 3.35, $p < .02$, Hotelling's Trace = 0.501, and a significant multivariate main effect for racial identity, $F$ (12, 148) = 3.45, $p < .02$, Hotelling's Trace = 0.421. Furthermore, *zero-order correlates* indicated significant correlations among the four *DeVI* subscales (*Md* $r$ = 0.66, range = 0.54 – 0.76). Therefore, several univariate *ANCOVAs* on each *DeVI* subscale score (controlling for the other three subscales) for the racial identity by religious affiliation interaction effect and for the racial identity main effect were conducted.

There was only one significant 2 (racial identity) by 4 (religious affiliation) *ANCOVA* (controlling for the other 3 *DeVI* scores) interaction effect, specifically for the *lifelong commitment to values* subscale of the *DeVI*, $F$ (3, 66) = 3.29, $p < .03$. Means scores on the *DeVI* sub-scales for religious affiliation and ethnic identity are reported in Table 1. As noted from the table, Caucasian students affiliated with non-Catholic/non-Christian faiths reported stronger lifelong value beliefs than Caucasian Catholics, Christians, or Caucasians with no religious affiliation, as well as Minority students identified as Catholics, Christians, non-Catholic/non-Christian, or no religious affiliation.

Table 1

*Means Score on DeVI Subscales for Racial Identity and Religious Affiliation among First-year Students*

| | *RACIAL IDENTITY* | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Caucasian | | | | Minorities | | | |
| Variable | R.C. | Chr. | Non-Cath/Chr. | None | R.C. | Chr. | Non-Cath/Chr. | None |
| DePaul Values Inventory: | | | | | | | | |
| Institutional values | 36.53 | 35.11 | 40.00 | 39.50 | 39.83 | 35.47 | 27.83 | 18.00 |
| | (2.42) | (2.88) | (7.29) | (5.77) | (3.33) | (3.12) | (5.96) | (10.32) |
| Emphasis on Diversity | 11.33 | 11.79 | 13.00 | 12.62 | 15.08 | 12.10 | 11.83 | 10.00 |
| | (0.99) | (1.18) | (2.99) | (2.36) | (1.36) | (1.28) | (2.42) | (4.23) |
| Altruistic Campus Atmosphere | 35.26 | 32.54 | 43.50 | 38.87 | 35.87 | 34.03 | 29.00 | 24.00 |
| | (2.03) | (2.42) | (6.14) | (4.85) | (2.80) | (2.63) | (5.01) | (8.68) |
| Life-long Commitment | 27.42[b] | 28.89[b] | 35.50[a] | 26.00[b] | 23.75[b] | 26.30[b] | 26.17[b] | 29.00[b] |
| | (1.79) | (2.14) | (5.42) | (4.29) | (2.47) | (2.32) | (4.43) | (3.67) |

*Note*. Value in parentheses is standard deviation. Superscripts that do not match are significantly different ( $p < .05$).

Abbreviations are as follows: *Altruistic campus atmosphere* = Pro-social, altruistic campus atmosphere; *Life-long commit*ment = Life-long commitment to values. R.C. = Roman Catholic; *Chr.* = Christian; *Non-Cath/Chr.* = Non-Christian/Non-Catholic; *None*= No religious affiliation.

An example statement that expresses a *lifelong commitment to values* written by a Caucasian student of a non-Catholic/non-Christian faith reflects that the University "prepares every student with the tools necessary to be successful in life, relationships, family and work"

When Caucasian students of non-Catholic/non-Christian faiths wrote about generalizing University values into their future lives, many respondents (66%) claimed a *well-rounded education* combines all three university values of urban, Catholic, and Vincentian; for example, one student wrote that the *lifelong commitment to values* institutional belief at the school helps one "gain insight and experience into the city, community, and individuality of others."

In addition, there was only one significant *ANCOVA* (controlling for the other 3 *DeVI* scores) racial identity main effect, specifically on the *employing diversity* subscale of the *DeVI*, $F(1, 66) = 3.97$, $p < .05$. First-year minority students reported significantly stronger perceptions ($M = 13.82$, $SD = 3.56$) than first-year Caucasian students ($M = 10.22$, $SD = 3.33$) that the university was supportive of its mission to support diversity. A statement by a first-year student of color about *Vincentianism* best reflects this perception: "the University's mission is treating everyone with respect, dignity, and living in a community altogether."

*Some Additional Qualitative Statements*

Overall, qualitative data supported the perceptions by students of the University's mission and values. First-year students wrote many themes about the mission of the university. For instance, most male and female students regardless of racial identity or religious affiliation (68%) wrote that the institution atmosphere supported diversity, charity, respect, morality, and a sense of feeling reciprocally involved with the community. More than half of respondents (55%) wrote themes that the *urban identity* of the school's mission included city excitement, a fast-paced life, a concentration of people, progressive ideas, and economic opportunities for success. In relation to the notion of a *Catholic identity*, most students (63%) wrote of social justice, helping the less fortunate, faith and spirituality, serving others, but less often (<10%) on following doctrines (such as the Ten Commandments) or practices and rituals (e.g., attending Mass and other religious services). As for a *Vincentian identity*, most respondents (68%) wrote that the institution provided a quality education while respecting the dignity and individuality of others.

Of course, there were first-year students from both racial identities and across religious affiliations who wrote negative perceptions of the university's mission and values. However, less than 10% of first-year students expressed negative themes, such that the university has no urban values, no Catholic mission, and even no overall mission. Very few first-year students (<10%) wrote about the urban setting as an unsafe neighborhood, that the institution was concerned only

for material possessions, or that the University's main mission reflected institutional greed (such as by providing an expensive education).

## Discussion

First-year students generally tend to answer in similar ways on their university's mission and its values with quantitative and qualitative methods. That is, we find no significant sex difference in perceptions of the university mission and our self-report measure of institutional mission is independent of social desirability tendencies, consistent with other studies using this inventory (Ferrari & Cowman, 2004; Ferrari et al., 2005; Filkins & Ferrari, 2004). Furthermore, the four *DeVI* subscales are significantly correlated, suggesting they may not be mutually exclusive measures. This result, however, is not a flaw of the measure we used; instead, it demonstrates that institutional missions are complex, multidimensional components that need to be further examined and explored separately as well as together.

On the *DeVI* rating scales and open-ended probes it is surprising that first-year Caucasian students with non-Catholic and non-Christian affiliations compared to their peers reported that once they graduate they would have more of a lifelong commitment to values experienced at the university. It is possible that this perception simply reflected first-year student "optimism" for their future. These students believed that over time they would embrace all the values they learned at the university in future personal and professional situations. Alternatively, it may be that these first-year students are more open to new experiences and beliefs than students who enter the university with traditional religious preferences that are philosophically consistent to the views of the university. Bryant, Choi, and Yasuno (2003) found that across 50 different colleges, students became less religious and more spiritual during their first year of college. Future research should examine beliefs, attitudes, and performances of students whose religious affiliations do not match those espoused by their university and how spirituality may change during one's college education.

In addition, the present study found significant racial identity and religious preference differences in perceptions of their university's mission. Not surprisingly, minority compared to Caucasian student ratings on the *DeVI* are stronger when asked whether the University supported the employment of persons of color and women. This result may reflect their heightened sensitivity to observing such cases in our culture (Hu et al., 2003a, 2003b). Administrators need to create environments where varied learning and educational opportunities exist that promote

appreciation for racial diversity (Hu et al., 2003a, 2003b). Perhaps, students of color are more conscious of opportunities that support diversity on campus, given that they are new students in a new setting with new experiences. Future research should explore whether these perceptions change over time as students advance across their 4 years of education at a university.

*Limitations, Future Directions, and Implications*

The present study does have several limitations. All participants come from the same university whose mission and values might not match those of other institutions located in non-urban settings without religious affiliations or an emphasis on community service. Also, the present study includes a relatively small sample of first-year students, whose racial identities are not categorized into separate, discreet groups (e.g., African Americans versus Latinos/Latinas). Additional research is needed with larger and varied sample sizes of minority students in order to enhance generalization of results to students at the present institution.

Nevertheless, academic administrators need to systematically evaluate their institution's mission as perceived by students. By learning how first-year students understand their university's mission, educators and administrators will be able to evaluate academic and student affairs within the context of their school's objectives and goals. Program development might be enhanced by understanding what students are thinking about the institution's mission, particularly at a faith-based university (Brunelle-Joiner, 1999; Ferrari & Cowman, 2004). Clearly, more research on the topic of perceptions of institutional mission still is needed. Few studies examine the varied and complicated factors associated with these perceptions. The present study demonstrates that first-year students differ in their perceptions depending on racial identity and religious affiliations. Other relevant demographic variables need to be explored and programs developed and assessed to meet the needs of all students in higher education. Also, the use of quantitative and qualitative methodologies, as in the present study, adds a more complete picture of student perceptions.

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# PRELIMINARY MODEL OF DOCTORAL STUDENTS' PERSISTENCE IN THE COMPUTER-MEDIATED ASYNCHRONOUS LEARNING ENVIRONMENT

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*High failure rate and the ever-increasing time to degree are reported as chronic problems in doctoral education. This article revisits three major theories of students' persistence. It reports on the preliminary model of doctoral students' persistence in a computer -mediated asynchronous learning environment developed as a result of the mixed methods study that explored the factors contributing to students' persistence in a distributed doctoral program. This model includes both internal factors pertaining to the program, institution, and faculty; and external factors pertaining to the student, family, and employment.*

## Introduction

Graduate education is a major part of American higher education, with more than 1,850 million students enrolled in graduate programs (National Center for Education Statistics [NCES], 2002). Approximately one- fifth are graduate students pursuing doctoral degrees (National Science Foundation [NSF], 1998). From that number, 40% to 60% of the students who begin their doctoral studies do not persist to graduation (Bowen & Rudenstine, 1992; Geiger, 1997; Nolan, 1999; Tinto, 1993). About 20% give up at the dissertation stage (Bowen & Rudenstine; Cesari, 1990). In the vernacular of higher education, persistence means continuing to completion of a goal; generally viewed as the earning of a degree or certificate. Applying this definition to students pursuing doctoral degrees means a person earns the degree. High failure rate and the ever-increasing time to degree are reported as chronic problems in doctoral education (Lovitts & Nelson, 2000; NSF, 1998). A much higher dropout rate is reported among the students who pursue their doctoral degree via distance education (DE) (Carr, 2000; Diaz, 2000; Parker, 1999; Verduin & Clark, 1991).

Persistence in DE is a complex phenomenon influenced by a multitude of factors. They include challenges set by the distance learning environment; personally related internal and external variables; financial burdens; computer literacy; ability to access requisite technology; time management; and absent or questionable support from an employer and/or family member (Kember, 1990). In addition, the student population is composed of mainly part-time adult students, who often have numerous and demanding commitments to work, family, and social lives (Finke, 2000; Holmberg, 1995; Thompson, 1998). These students tend to be more vulnerable to factors encroaching on their academic progress because their school-related activities often are not primary life objectives.

Although many studies have been done to understand aspects of attrition or reasons for persistence of doctoral students in traditional campus-based programs (Bair & Haworth, 1999; Bowen & Rudenstine, 1992; Golde, 2001; Haworth, 1996; Kowalik, 1989), there is much less research on doctoral student attrition and persistence in DE, particularly computer-mediated asynchronous learning (CMAL) environments (Tinto, 1998). Existing studies focus mostly on undergraduate DE students, individual courses rather than programs, and other than CMAL distance learning delivery means (Ivankova & Stick, 2003). Moreover, there is no theory that can explain graduate students' persistence in such environments comparable to Tinto's (1975, 1993) Student Integration Theory and Bean's (1980, 1985, 1990) Student Attrition Model developed for traditional undergraduate students. Kember's (1989a, 1990, 1995) Model of Dropout from Distance Education Courses focused primarily on explaining attrition of undergraduate non-traditional students in single courses, but did not discuss persistence of graduate students matriculating in distance learning programs offered via distributed means.

A theoretical model explaining doctoral students' persistence in the CMAL environment may help academic institutions better meet DE students' needs, improve the quality of their academic experiences, and increase their retention and degree completion rate. This is especially important today when postsecondary institutions have to confront the growing problems of revenue generation and increasing budget cuts and turn to offering graduate programs in distributed environments. Knowledge of the evolving tendencies may also serve as a baseline for higher educational administrators in

elaborating extended education policies, designing and developing graduate DE programs, and improving DE student support infrastructure.

This article revisits the three major theories of students' persistence and reports on the preliminary model of students' persistence in the CMAL environment developed as a result of the mixed methods study that explored the factors contributing to students' persistence in a Distributed Doctoral Program.

## Theoretical Models of Students' Persistence

### *Tinto's Student Integration Theory*

Tinto's Student Integration Theory (1975) conceptualized persistence as an outcome of students' interactions with their colleges and universities as organizations. In this model, Tinto described the relationship between student background characteristics and educational expectations and the characteristics of academic institutions. Students' background characteristics were seen as important predictors of persistence because they helped determine how a student interacted with an institution's social and academic systems, and subsequently became integrated into it. Tinto's conceptual model represented five variable sets in a causal sequence: (a) background characteristics, (b) initial goal and institutional commitments, (c) academic and social integration, (d) subsequent goal and institutional commitments, and (e) withdrawal decisions.

Tinto (1993) identified attrition as lack of congruence between students and academic institutions. Academic performance and social involvement reflected the degree to which students were integrated into an institution and determined the degree to which students established committed goals for being graduated. Dropout was viewed as a consequence of a multidimensional process involving interactions between an individual and an institution. Tinto's model suggested the characteristics of an institution, like its resources, facilities, structural arrangements, and composition of its members, imposed limits on the development and integration of individuals within an institution and thus led to the development of academic and social climates, with which an individual must contend.

Tinto's (1975) theory, however, did not address external factors, such as the influence of family, friends and employers; their role in shaping perceptions, commitments, and preferences; and sustaining students' persistence (Bean & Metzner,

1985). Bean presented the Student Attrition Model (1980, 1985, 1990) to further expand upon undergraduate students' retention, taking into account the impact of external forces on students' persistence.

*Bean's Student Attrition Model*

Bean's model (1980, 1985, 1990) proposed that students' intentions to stay at their academic institutions were shaped by their beliefs and attitudes, which resulted from academic and social experiences at an institution. Positive college experiences led to favorable beliefs and attitudes toward an institution, which fostered an intention to persist. Factors external to an institution affected both attitudes and decisions of students and were active while a student was attending a college. A better match between student and institutional characteristics was presumed to lead to higher persistence rates (Cabrera, Castaneda, Nora, & Hengstler, 1992).

These two theoretical models, Student Integration Theory (Tinto, 1975, 1993) and Student Attrition Model (Bean, 1980, 1985, 1990) provided a comprehensive framework on college departure decisions (Cabrera, Nora, & Castaneda, 1993). Both models regarded persistence as the result of a complex set of interactions over a period of time, and both argued persistence was affected by a successful match between student and institution (Hossler, 1984). However, both Tinto's Student Integration Theory (1975, 1993) and Bean's Student Attrition Model (1980, 1985, 1990) focused on undergraduate residential, mostly first-year students. They assumed such students would be attending college as a primary responsibility and had no other primary commitments. In addition, the two theories did not distinguish between traditional (18 to 22-years olds) and nontraditional (older and working) student departure (Ashar & Skenes, 1993), and did not discuss the applicability of the model to graduate students, or in nontraditional educational settings, like distance education.

*Kember's Model of Dropout from Distance Education Courses*

Kember reformulated (1989a, 1990, 1995) Tinto's (1975, 1993) model for adult students in a DE learning environment. Kember (1995) argued if influences external to a campus have significant impact on traditional students' persistence, they must be important to DE students who also had more demanding commitments to work, family, and social lives. Kember's model of dropout from distance education courses included

the: (a) entry characteristics, (b) goal commitment, (c) academic, and (d) social integration components of Tinto's (1993) model.

The characteristics of Kember's (1995) model included background variables related to the: (a) student, (b) family and home situation, (c) work environment, and (d) educational history of the student. These variables were chosen because they influenced the succeeding components of the model instead of having any direct statistical relationship to dropout (Kember, 1989a). The goal commitment component considered intrinsic and extrinsic motivation.

Kember (1990) defined academic integration and social integration as embracing all facets of offering a distance education course by a higher education institution, including academic and administrative support systems, the package of study materials, and all forms of contact between faculty and students. To determine whether a student was successfully integrated academically required examining each facet of the academic environment. Social integration was measured by the degree to which a DE student was able to integrate part-time study with family, work, and social demands. Because DE students normally are employed full-time and most have family commitments, the extent to which such integration was successful was crucial to their chances for completing a course (Kember, 1989a). The model also presented as a cost/benefits analysis for a student considering whether to drop out or continue studying. A recycling loop reflected changes and developments as students proceeded through a course and took account of changes in variables during this period.

Kember's (1989a, 1990, 1995) model of dropout from DE courses subsequently was illustrated by student case studies collected in three countries (Kember, 1989b) and was independently tested using qualitative methods (Roberts, Boyton, Buete, & Dawson, 1991). Kember (1989b) used qualitative data collected from students from Australia, Papua, New Guinea, and the United Kingdom to explain the model of dropout from DE courses. The text data were collected through individual and telephone interviews, case notes, and open-ended survey questions. A variety of quotations from such diverse sources indicated the ready applicability of the model. Roberts et al. (1991) used an earlier theoretical version of the model (Kember, 1989a) and a similar semi-structured interview protocol to interview 36 DE students at Charles Sturt University in Australia.

They found possible interacting factors likely to influence DE students to continue or abandon their studies all encapsulated in one or more of Kember's model major components.

A number of quantitative studies have further refined and enhanced the model (Kember, 1995; Kember, Lai, Murphy, Siaw, & Yuen, 1992, 1994; Kember, Murphy, Siaw, & Yuen, 1991). Based on the quantitative data collected from 1,060 students in Hong Kong, Kember et al. (1991) investigated how students were able to integrate demands of their academic course with those of families, employers, and friends. The path model analysis confirmed the importance of social integration, along with academic integration, which acted as intervening variables between the background and outcome variables.

The focus of the Kember et al. (1992) study was development of the Distance Education Students' Progress Inventory and construction of the path analytic model of student progress based on the Kember (1989a) model. The data were collected through a questionnaire and administered to 1,060 students enrolled in four distance learning courses, and semi-structured interviews with 32 randomly selected participants. The results supported open entry for the courses as the identified constructs had a higher correlation than entry qualifications with the grades attained by students. Later, this study was replicated by Kember et al. (1994) with minor modifications in the inventory and at a different set of institutions, courses, and students. The study resulted in a similar path model for student progress. Reliability values for the majority of the subscales identified in the original study had improved. Both Kember et al. (1992, 1994) studies revealed the importance of social and academic integration to student progress in DE.

Kember (1995) replicated the initial studies (Kember et al., 1991, 1992). The aim of this study was to determine if a similar path model program for student progress in DE would be found for three different programs offered by the Open Learning Institute of Hong Kong. The total sample consisted of 1,087 enrolled students with the survey response rate of 51%. Principal component and path modeling analyses confirmed the substantive findings of the initial studies and confirmed a model developed from the qualitative data. It was concluded the model could be used to make predictions regarding student progress in open learning courses.

*Other Models of Student Persistence in DE*

Other researchers worked at developing formal models for predicting student completion specifically related to DE. In his literature review study of student attrition from correspondence courses, Billings (1989) found students who made the most progress had: (a) the intention of completing a course in 3 months, (b) submitted the first assignment within 40 days, (c) higher entrance examination scores and high GPAs, (d) completed other correspondence courses, (e) supportive family members, (f) high goals for completing the program, (g) lived closer to the instructor, and (h) good college-level preparation. The single most important variable was students' intention to complete.

Kennedy and Powell (1976) proposed a "descriptive model" which related the dropout process to characteristics and circumstances. Characteristics slow to change included such factors as educational background, motivation, and personality. Circumstances, which changed faster, included items such as health, finance, occupational changes, and family relationships. Characteristics and circumstances were brought together in a two-dimensional model. The pressure of adverse circumstances was seen as more likely to lead to at-risk situations or dropout for students with weak characteristics than it was for those with strong characteristics.

Thompson (1984) discussed dropout from external courses in terms of the cognitive style of field-dependence. She postulated field-independent people would be better suited to correspondence study because of their greater levels of independence and autonomy. For field-dependent people to be more successful in DE, she proposed greater interaction with the instructor by methods such as systematic telephone tutoring.

Fjortoft (1996) developed a model of persistence in DE based on the literature of adult education. The variables studied included: (a) age, (b) gender, (c) GPA, (d) satisfaction with college experience, (e) intrinsic job satisfaction, (f) ease of learning on one's own, (g) intrinsic benefits of degree completion, and (h) extrinsic benefits of degree completion. Based on a survey of 395 students, the results were interpreted to mean a positive relationship existed between perceived intrinsic benefits and persistence, whereas a negative relationship was found between both age and ease of learning on one's own and continued enrollment.

Thus, the models developed to predict student attrition and persistence in DE differed in the criteria used for relating dropout process and degree of variation from similar conventional higher education models. Although those models failed to predict graduate student persistence in distributed programs, they appeared to be capable of identifying predictor variables for DE success and persistence.

## Methods

This study was conducted to understand student persistence in a Distributed Doctoral Program in Educational Leadership in Higher Education (ELHE) offered by the University of Nebraska-Lincoln (UNL) (Ivankova, 2004). The program offers students a choice of either the Ph.D. or Ed.D. in Educational Studies with the emphasis in ELHE (Stick & Ivankova, 2004). It is delivered to students via distributed learning software, using multiple computer systems and platforms, such as Lotus Notes and Blackboard, utilizing the Internet as a connecting link, providing asynchronous and collaborative learning experiences to participants. It is possible for students to complete an entire doctoral degree, including meeting residency requirements, via distributed means. Importantly, the online program has the identical requirements for admission and demonstrated competence (written comprehensive examination, defend a dissertation proposal, an oral defense of the dissertation), but responds to students' needs by using cutting edge technology instead of having a physical on-campus presence.

### *Study Design*

This study used one of the most popular mixed methods designs in educational research: sequential explanatory design, which consists of two distinct phases, quantitative and qualitative (Creswell, 2003, 2005; Creswell, Clark, Gutman, & Hanson, 2003; Tashakkori & Teddlie, 1998). The rationale for choosing the mixed methods approach was that neither quantitative nor qualitative methods were sufficient by themselves to capture the trends and details of situations, such as the complex issue of doctoral students' persistence in the CMAL environment. When used in combination, quantitative and qualitative methods complement each other and provide a more complete picture of the research problem (Green, Caracelli, & Graham, 1989; Johnson & Turner, 2003; Tashakkori & Teddlie, 1998). The purpose of this mixed methods sequential explanatory study was to identify factors contributing to students' persistence

in the ELHE program by obtaining quantitative results from a survey of 278 of its current and former students, and then following up with 4 purposefully selected individuals to explore those results in more depth through a qualitative case study analysis.

In the first, quantitative phase of the study, the quantitative research questions focused on how selected internal and external variables to the ELHE program (program-related, advisor- and faculty-related, institutional-related, student-related factors, and external factors) served as predictors to students' persistence in the program. In the second, qualitative phase, four case studies from four distinct participant groups explored in-depth the results from the statistical tests. In this phase, the research questions addressed seven internal and external factors found to have differently contributed to the function, discriminating the four groups: program, online learning environment, faculty, student support services, self-motivation, virtual community, and academic advisor. The study design was reported elsewhere (Ivankova, Creswell, & Stick, in press).

*Quantitative Phase*

The goal of the quantitative phase was to identify the potential predictive power of selected variables on the doctoral students' persistence in the ELHE program. We collected the quantitative data via a web-based cross-sectional survey (Creswell, 2005; McMillan, 2000), using a self-developed and pilot tested instrument. The core survey items formed five 7-point Likert type scales and reflected the following composite 10 variables, representing a range of internal and external to the program factors: (a) online learning environment, (b) program, (c) virtual community, (d) faculty, (e) student support services, (f) academic advisor, (g) family and significant other, (h) employment, (i) finances, and (j) self-motivation. We identified those factors through the analysis of the related literature, three theoretical models of student persistence (Bean, 1980, 1985, 1990; Kember, 1989a, 1990, 1995; Tinto, 1975, 1993) and an earlier qualitative thematic analysis study of seven ELHE active students (Ivankova & Stick, 2002). Reliability and validity of the survey scale items were established based on both pilot and principle survey administration; using: (a) frequency distributions, (b) internal consistency reliability indexes, (c) inter-item correlations, and (d) factor analysis (Ivankova, 2004). We used a panel of professors teaching in the program to secure the content validity of the survey items.

Criteria for selecting the participants for the quantitative phase included being: (a) matriculated in ELHE versus other programs, (b) enrolled between 1994-Spring 2003, (c) completion of half of the online coursework; and (d) admitted, both active and inactive, graduated, withdrawn, or terminated from the program. For those who just started the program, they must have taken at least one online course in the ELHE program. A total of 278 students met all five criteria. Overall, 207 participants responded to the survey, which constituted a response rate of 74.5%. For analysis purposes, we organized all respondents into four groups based on their matriculation status in the program and similarity of academic experiences: (a) students who had completed 30 or fewer credit hours of course work (Beginning Group) ($n$=78), (b) students who had completed more than 30 credit hours of course work, including dissertation hours (Matriculated Group) ($n$=78), (c) former students who had graduated from the program with the doctoral degree (Graduated Group) ($n$=26), and (d) former students who either had withdrawn from the program, or had been inactive in the program during the last three terms (spring, fall, summer) prior to the survey administration (Withdrawn/Inactive Group) ($n$=25).

We used both univariate and multivariate statistical procedures to analyze the survey data. Cross tabulation and frequency counts helped analyze the survey demographic information and the participants' answers to separate items on each of the five survey scales. We utilized discriminant function analysis to identify the predictive power of 10 selected factors as related to students' persistence in the ELHE program.

The typical participants were: (a) between 36 and 54 years of age, (b) predominantly women, (c) employed full-time, (d) mostly out-of-state, and (e) married with children. The descriptive analysis of the survey scale items showed that most of the participants were satisfied with their academic experiences in the program claiming they received all the needed support from both the institution and external entities.

Based on the discriminant function analysis (Tabachnick & Fidell, 2000), only five variables: (a) program, (b) online learning environment, (c) student support services, (d) faculty, and (e) self-motivation significantly contributed to the discriminating function as related to the participants' persistence in the ELHE program. From those five variables, program and online learning environment had the highest correlation with the function and made the greatest contribution to discriminating among the four groups.

Other variables (virtual community, academic advisor, family and significant other, employment, and finances) made no significant contribution to discriminating among the four participant groups. The Withdrawn/Inactive group differed from the other three groups the most, while the Graduated group differed from both the Beginning and the Matriculated groups, though less from the Matriculated group. The Matriculated group differed notably from the Beginning group.

*Qualitative Phase*

The quantitative and qualitative phases were connected during an intermediate stage in the research process while selecting the participants for the qualitative case study analysis and developing the interview questions for the qualitative data collection based on the results of the statistical tests from the first, quantitative, phase. A systematic two-stage case selection procedure was developed which involved, first, identifying typical respondents in each participant group, and then selecting the best informant per group using a maximal variation sampling strategy (Creswell, 2005). The case selection and the interview protocol development procedures for the qualitative phase of this study were reported elsewhere (Ivankova, Creswell, & Stick, in press). As a result, 1 male and 3 female participants were selected who displayed different dimensions on such demographic characteristics, such as age, gender, residency, and family status, which allowed for preserving the multiple perspectives. All agreed to participate with the interview protocol, to supply the requisite artifacts, and to allow scrutiny of archival information from completed online courses.

In the qualitative phase, we utilized a multiple case study approach (Yin, 2003) to help explain why certain external and internal factors, tested in the first phase, were significant or not significant predictors of students' persistence in the ELHE program. A case study is an exploration of a "bounded system" or a case over time, through detailed, in-depth data collection involving multiple sources of information and rich in context (Merriam, 1998). A multiple case study design includes more than one case and the analysis is performed at two levels: within each case and across the cases (Stake, 1995; Yin, 2003).

To provide the richness and the depth of the case description (Creswell, 1998; Stake, 1995), we used multiple sources for collecting the data: (a) in-depth semi-

structured telephone interviews with four participants, (b) researcher's reflection notes recorded immediately after the interview, (c) electronic follow-up interviews with each participant to secure additional information on the emerging themes, (d) academic transcripts and students' files to validate the information obtained during the interviews and to get additional details related to the cases, (e) elicitation materials, such as photos, objects, and other personal things, provided by each participant related to their respective persistence in the program, (f) participants' responses to the open-ended and multiple choice questions on the survey in the first, quantitative phase, and (g) selected online classes taken by the participants and archived on the Lotus Notes server.

We audiotaped and transcribed verbatim each interview (Creswell, 2005) and provided verbal descriptions for all the image data. Students' transcripts and archival Lotus Notes courses were used for verifying the demographic information and the emerging themes. All the text data were entered into QSR N 6 qualitative software and a thematic analysis of the text data was conducted at two levels, within each case and across the cases. The steps in the qualitative analysis included: (a) preliminary exploration of the data by reading through the transcripts and writing memos, (b) coding the data by segmenting and labeling the text, (c) verifying the codes through inter-coder agreement check, (d) using codes to develop themes by aggregating similar codes together, (e) connecting and interrelating themes, (f) constructing a case study narrative composed of descriptions and themes, and (g) cross-case thematic analysis. The verification procedures included: (a) triangulating different sources of information, (b) member checking, (c) inter-coder agreement, (d) rich and thick descriptions of the cases, (e) reviewing and resolving disconfirming evidence, and (f) academic advisor's auditing (Creswell, 1998; Creswell & Miller, 2002; Lincoln & Guba, 1985; Miles & Huberman, 1994; Stake 1995).

## Results

Four themes related to the participants' persistence in the ELHE program emerged in the analysis of each case and across the cases: (a) quality of academic experiences, (b) online learning environment, (c) support and assistance, and (d) student self-motivation. A summary of each of the four themes is presented below, and a detailed

explanation of all the themes with respective participants' quotes is contained in the original study (Ivankova, 2004).

*The quality of academic experiences.* This included the quality of the program and relevance of the course work, the focus on engaged learning, quality of faculty and student feedback and their involvement in online courses, the quality of academic advising and an advisor's commitment to students.

*The online learning environment.* The CMAL environment offered students the convenience and flexibility of learning, although it differentially affected students' persistence. The students who persisted had a high comfort level with technology, good writing skills, and were comfortable interacting with other students online. The virtual community was not very important because it varied with each class and often was limited to a particular course.

*Support and assistance.* A supporting and encouraging environment, created by entities, both internal and external to the program, positively affected students' persistence in the program. The internal sources of support included: (a) faculty responsiveness and willingness to accommodate to distance learners' needs, (b) peer support and encouragement of each other, (c) academic advisor's assistance and guidance, and (d) the institutional student support services infrastructure. Support and encouragement from sources external to the program included families, employment, and pets.

*Self-motivation.* This included intrinsic motivation to pursue the doctoral degree in the CMAL environment, such as personal challenge, responsibility, love for learning, and experiencing the new learning format. Extrinsic factors cited were: (a) career advancement, (b) earning the credentials, (c) recognition, and (d) increase in pay.

In spite of being common for all participants, those themes differed in the number and similarity of sub-themes and categories comprising them. There were more similarities between the participants who were still in the program, although at different stages, than with those who graduated or withdrew from the program. The qualitative findings revealed that the quality of the program and the academic experiences learning in the online environment, the importance of the student support infrastructure, and

student goal commitment were integral components of those students' persistence in the ELHE program.

## Discussion of the Persistence Model

Five external and internal to the program factors were found to be predictors to students' persistence in the program: (a) program, (b) online learning environment, (c) student support services, (d) faculty, and (e) self-motivation. The qualitative follow up multiple case study analysis yielded four major clarifying themes: (a) quality of academic experiences, (b) online learning environment, (c) support and assistance, and (e) student self-motivation. The way those findings highlighted the quality of the program and participants' academic experiences in it, the importance of the student support infrastructure, and self-motivation to pursue the doctoral degree in the CMAL environment were consistent with the basic ideas of Tinto's Student Integration Theory (1975, 1993). At the same time, relative importance of the external factors to doctoral students' persistence did not fully support Bean's Student Attrition Model (1980, 1985, 1990), which claimed factors external to an institution equally affected students' matriculation in college. However, Bean's model was specifically tailored to the undergraduate student population. For doctoral students' pursuing the degree in the DE program, external factors might have played a secondary role to internal factors related to the program and the CMAL environment.

The qualitative and the quantitative findings from this study, mentioned above, also supported the principle components presented in Kember's (1989a, 1990, 1995) Model of Drop Out from Distance Education Courses. It is acknowledged that Kember's model was limited to mostly undergraduate non-traditional students and individual DE courses, the idea of academic and social integration as embracing all facets of a DE course offering found reflection in this study. The quality of the program and the academic learning experiences in the CMAL environment, the importance of the student support infrastructure, and student goal commitment were identified as being pivotal to the doctoral students' persistence in the distance learning program.

Based on the findings from the quantitative and qualitative phases of the study, a preliminary model of doctoral students' persistence in the ELHE program was developed (see Figure 1). This model includes both internal and external factors affecting students'

persistence. The solid arrow-lines represent the effect of five factors found to have significantly contributed to the function discriminating among the participant groups as related to their persistence in the program. Those included program-related factors, such as: (a) the program itself and online learning environment, (b) institution-related factors, (c) represented by student support services, (d) faculty-related factors, and (e) student-related factors, including self-motivation.

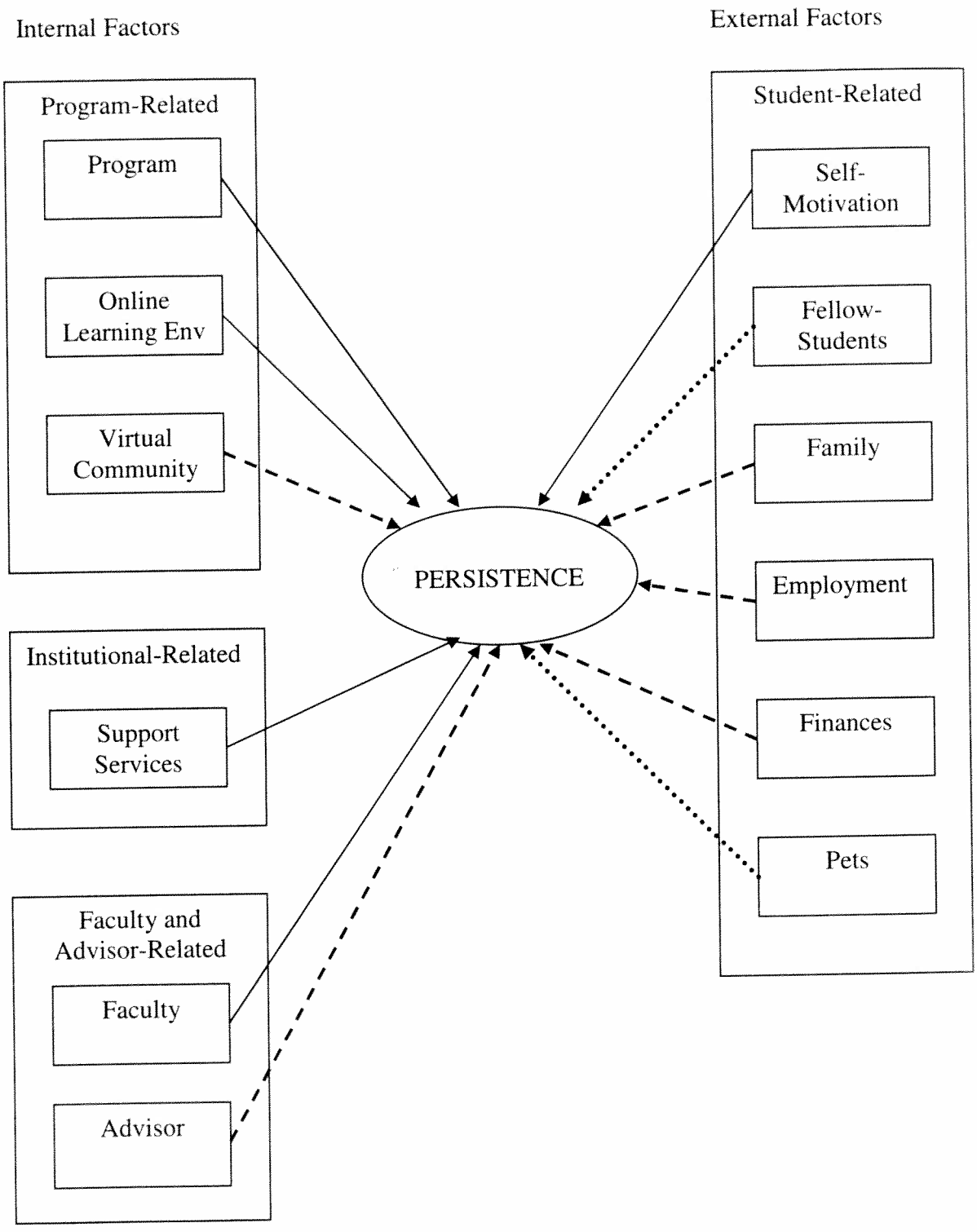


Figure 1. *Model of doctoral students' persistence in the computer-mediated asynchronous learning environment*

The broken arrow-lines represent the effect of the other five factors, which were found to have little discriminating power among the four matriculated groups. Those included such program-related factors as: (a) virtual community, (b) advisor-related factors, and (c) external factors, such as family, employment, and finances. Two other external factors were added to the model from the qualitative multiple case study analysis: fellow-students and pets. Dotted arrow-lines represent the effect of these two factors on students' persistence in the ELHE program.

## Conclusion

A preliminary model of doctoral students' persistence in the CMAL environment is a first attempt to understand what internal and external factors contributed to students' persistence in a doctoral program offered via distributed means. It is limited to one particular program offered from one particular institution and includes a limited number of factors. More research is needed to test and extend those findings to develop a reliable model that will help predict doctoral students' matriculation and completion rates in the distributed programs.

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