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# The Relationship between Self-Efficacy and Task Performance for Women in Science Related Careers

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THE RELATIONSHIP BETWEEN SELF-EFFICACY AND TASK PERFORMANCE

FOR WOMEN IN SCIENCE RELATED CAREERS



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ABSTRACT

The purpose of this study was to provide empirical support for the social cognitive framework of career development (Lent, Brown and Hackett, 1994). The specific components that this study focused on was the link between self-efficacy and task performance for women in science related careers. This study also provided support that self-efficacy interventions can have an impact on increasing these beliefs for high school girls (n=78).

A principal axis factor analysis with oblique rotation was used to validate the science self-efficacy subscales. A simultaneous multiple regression was performed between the subscales of the self-efficacy measure and a computer simulated task performance measure. No significant results were reported for the simultaneous multiple regression, but an examination of a simple regression for the engineering subscale indicated a relationship between these two variables.

CHAPTER I

INTRODUCTION

Despite the progress that women have made in the
occupational arena since the 1970's and 1980's women are
still under represented in science careers (Farmer, Wardrop,
Anderson, & Risinger, 1995). The percentages for women
earning undergraduate degrees in science reflects this under
representation. In 1987, only 15.2% of engineering degrees,
16.1% of physics degrees, and 37.2% of chemistry degrees
were awarded to women (Lips, 1992). This is a major concern
for women because these occupations bring substantial
financial security and provide more opportunity for
advancement than traditional female occupations. This is
also a concern for prospective employees because there is a
lack of candidates to fill jobs in science related
careers(Fouad, 1995). Based on these issues, it is
imperative that career and guidance counselors understand
factors associated with women choosing and pursuing science
careers.

In the past 10 years, several career development theories have been used to explain the nature of career development and career choice in relation to self-efficacy and task performance (e.g. Bandura, 1982, Lent, Brown & Hackett, 1994). Bandura's social cognitive theory suggests that cognitive processes such as an individual's beliefs about their abilities have a strong influence over behavior (1989). Bandura defines self-efficacy beliefs as judgements of how well one can execute courses of action required to deal with specific situations (1982). Bandura has contented that these beliefs are affected by past performance, by modeling, persuasion and autonomic arousal as well as by other cognitive processes. Social cognitive theory also suggests a relationship between self-efficacy and actual future task performance (Bandura, 1982).

Lent, Brown, and Hackett (1994) recently proposed a social cognitive model of career development based on Bandura's earlier research. This model provides a social cognitive framework that explains influences guiding career choice behavior. It assumes that one of the major components that guides this behavior are a person's self-efficacy beliefs. According to this model, human abilities

are ever changing and that in order to perform well on
challenging tasks a person generally must possess the skills
necessary and a good deal of confidence (self-efficacy) in
those abilities (Lent et. al., 1994). These beliefs are
assumed to have an influence over other components of career
development such as choice behavior.  Since these beliefs
have been shown to have such an effect on career choice
behavior, understanding them in relation to women's career
choices may shed light on the dynamics associated with
women's lack of participation in science careers.  Re-
examining how self-efficacy in particular pertains to
performance can help counselors and educators better
understand and increase performance for women who express
interest in achieving in science related careers.

Previous research has established a theoretical link
between self-efficacy beliefs and task performance (e.g.
Multon, Brown and Lent, 1991, Schunk, 1981, 1983a, 1983b,
1983c, 1984, Wood and Locke, 1987,).  However, no recent
research has been generated in support of the model proposed
by Lent  et. al (1994).  Some research has focused on the
relationship of self-efficacy beliefs and academic task
performance for science and mathematics careers (e.g. Betz

and Hackett, 1983, 1989, Borget and Gilroy, 1994, Dowling, 1978 Farmer, et. al., 1995, Lent, Lopez & Bieschke, 1991, Parajes and Miller, 1995, Reyes, 1984). However, little of this research has focused primarily on women.

Based on previous research supporting the link between self efficacy and task performance, this study attempted to replicate their findings and provide empirical support for the model proposed by Lent et. al. (1994). This study focused  specifically on self-efficacy beliefs in relation to academic task performance for high school girls in science careers. It was hypothesized for this study that those participants who indicated a high degree of self-efficacy in science careers would obtain a higher score on a measure of task performance in a science related field than their counterparts who indicated a lower degree of self-efficacy. An additional purpose of this study was to gather information about the self-efficacy measure used in this study.

CHAPTER II

LITERATURE REVIEW

## Self Efficacy and Task Performance

Self-efficacy beliefs have been proven to be a useful

predictor of academic performances in several studies.

Schunk conducted a series of studies with elementary school

children who were having difficulties with mathematics.

These studies investigated the development of perceived self

efficacy in relation to different variables such as

attributional feedback (Schunk, 1981; 1983a), goal setting,

and social comparison (1983b), and reward contingencies,

(Schunk, 1983c, 1984). Results of these studies suggest

that increasing self efficacy beliefs through intervention

methods, increased performance. The results also suggest

that regardless of whether the participants received an

intervention or not a strong positive relationship was

indicated between participants' self-efficacy judgements and

their subsequent demonstrated skills (Schunk, 1984).

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Results of these four studies provided the preliminary evidence for the relationship between self-efficacy and task performance. In addition, these studies suggest that self-efficacy interventions may help to increase women's participation in science careers.

Wood and Locke (1987) conducted a series of studies in order to examine the relationship between academic self-efficacy and performance in college courses. A total of 581 college undergraduates participated in these studies. No particular hypotheses were stated. The first study was used to select valid items from different self-efficacy measures. A measure was then established on the basis of subsequent revisions of this new item set. The new item set was then tested out on a sample in study 4. Based on this study, a final set of items was selected resulting in the self-efficacy measure. A selected portion of the original 581 participants completed the measure designed to assess self-efficacy strength, self-efficacy magnitude, grade goals and GPA. Task performance was measured by employing the total points in the course, which were calculated on the basis of two or three hourly exams and a final. A hierarchial regression was performed in order to analyze the data. The

results of this study indicated that self efficacy and academic performance were significantly related. These findings are supportive of Bandura's, as well as Lent et. al.'s theory.

In a meta-analyses of the relations of self-efficacy to academic performance and persistence Multon, Brown and Lent (1991) found a positive and statistically significant relationship between self-efficacy and academic performance across a wide variety of participants and experimental designs. In this meta-analyses 36 published studies of the self-efficacy/performance literature (1984-1988) were used yielding a total of 38 samples from which effect size could be directly recorded or derived. It was hypothesized that self-efficacy would relate positively to academic performance. In addition, the authors explored the possibility of moderators in these relationships. Altogether the analyses included 4,998 subjects with an average age of 16.6 years. The largest part of the samples consisted of elementary school children (60.6%) and college students (28.8%).

Nineteen different measures of academic performance were broken down into 3 categories (a)standardized

achievement tests (e.g. Iowa Basic Skills,) (b)class-room-related measures (e.g. self-rated performance, course grades, cumulative grade point average) and (c)basic skills tasks (e.g. subtraction problems, reading comprehension problems).

The results of this analysis suggest that self-efficacy beliefs accounted for approximately 14% of the variance in association with student's academic performance. Effect size estimates were also calculated for performance. Significant heterogeneity among effect size estimates were revealed indicating that the relationship of self-efficacy to performance may vary across types of students, measures and study characteristics. One of the conditions of interest that moderated effect size in the performance meta-analysis involved the type of performance measure used by investigators. The strongest effect sizes were found to be produced by the basic skills measures (.52). This finding provides evidence that self-efficacy beliefs are situation and domain specific in nature. In addition, this suggests that the use of assessment techniques that are task specific are more predictively efficient than use of more distal and global measures such as classroom-related or standardized

achievement measures.

## Mathematics Self-Efficacy and Science Career Choice

Self-efficacy has also been shown to be a useful predictor of performance and persistence in technical and scientific majors and a range of perceived career options and choice. Lent, Lopez and Bieschke (1987) conducted a study with 138 college students enrolled in introductory psychcourses, and choices of science careers. ology courses at a large Midwestern university. This study investigated the relation of sources of mathematical self efficacy to science-based career choice among these students. More specifically, the study investigated the relation of four hypothesized sources of efficacy information to mathematics self-efficacy percepts and the relations of self-efficacy, outcome expectations, interest in mathematics to science-related career choice. Each student completed measures of demographics, math self-efficacy, outcome expectations, math related course interests, career choice and perceived sources of math self-efficacy at group testing sessions. In addition, ACT scores, courses, and choices of science careers were obtained for each student. Hierarchical regression was performed in order to analyze the result.

Results demonstrated that outcome expectations complemented mathematics self-efficacy interests and choices in science careers. Results also indicated that interests mediated the effects of self-efficacy on science related career choice. These results suggest that self-efficacy plays an important role in career development.

A portion of another longitudinal study conducted by Farmer et. al. (1995) was concerned with the effects of mathematical self efficacy on choice of science, math and technology careers for women. The participants in this study were 97 women and 76 men who were participants of earlier data collection in 1980. In 1980 these participants were in high school, and aspired to a science related career. By 1990, 36% of the women had remained in a science related career. The cognitive set (mathematics self-efficacy) was included in this study because previous research has shown it to be a useful predictor of interest in a science career. Five items on a 5 point likert scale were used to measure math self-efficacy based on Hackett and Betz (1983) measure. Persisters and non persisters in a science, math or technology career were identified by determining whether the participants who were aspiring to

such a career in 1980 were still aspiring to these careers in 1990. Multiple regression was used to analyze this portion of the data. Results of this study indicated that math self-efficacy had an indirect effect on persistence by math utility which is analogous to Lent et. al.'s term outcome expectations. These results provide further proof that mathematical self-efficacy is a important predictor of science career choice.

Mathematics Self- Efficacy and Math Performances

Mathematics self-efficacy has also been investigated in relation to math performances specifically. Reyes (1984) initially studied the relationship between these two variables. Confidence in learning mathematics was generally assessed by asking students to judge their mathematical capabilities. The results of this investigation indicated confidence level to be a consistent predictor of performance on math-related tasks. More recently, researchers have been studying the actual construct of mathematics self efficacy as an individual's judgement of their capabilities to solve specific math problems, to perform math related tasks and to achieve high grades in a math related course (Betz and Hackett, 1983).

Dowling (1978) was the first researcher to create an instrument that measured the construct of confidence which specifically corresponded with a performance assessment. This instrument asked students to solve math problems on which they had based their confidence. In order to develop this measure math problems created for the National Longitudinal Study of Mathematical Abilities (NLSMA) were pooled. The new measure was then titled the Mathematics Confidence Scale. Students were asked to judge their confidence in their abilities to solve math problems and then were later asked to solve an alternate forms test of the problems in which their confidence was based. A correlation of .54 was obtained between self-efficacy and performance, indicating a strong relationship between these two variables.

Hackett and Betz (1983) subsequently, developed another measure of self-efficacy the MSES (Mathematics Self - Efficacy Scale). A subscale of Dowling's (1978) MCS was included and two additional subscales measuring confidence to perform certain math-related tasks and confidence in obtaining a high grade in math courses were incorporated. A pilot study using 114 undergraduate students was conducted

to revise the MSES. These students completed the original version of the MSES. Then the data from this study was used to subsequently, revise the measure and produce a shorter version. This instrument has been used to measure math self- efficacy and attitudes toward mathematics in several studies. Hackett and Betz (1989) used this measure in a study investigating the relationship between math self-efficacy and mathematical problem solving for undergraduate students. The correlation they obtained was .44 between the students' MSES scores and their performance on the alternate-forms test. These results support Dowling's earlier correlation between the two variables.

A recent study conducted by Parajes and Miller (1995) investigated the relationship between math self-efficacy and math performance with a sample of 391 undergraduate students. These students were assessed on three types of mathematics self-efficacy judgements: confidence to solve mathematics problems, confidence to succeed in math-related courses, and confidence to perform math related tasks. The first performance measure asked students to solve the specific problems in which they indicated their level of self-efficacy. The second performance measure consisted of

the students' majors. The researchers hypothesized that students' reported self-efficacy to solve problems that they were later asked to solve was a more powerful predictor of that performance than their perceived self-efficacy to perform math-related tasks or to succeed in math-related courses. Results supported this hypothesis. These results indicate that judgements of self-efficacy are domain and situation specific, supporting earlier research findings of Multon et. al. (1991).

The present study attempts to replicate the findings of previous researchers, and support the hypothesized link between women's science career self-efficacy and their performance on a science related task. It is assumed that a person who indicates a high level of self-efficacy will have a greater number of correct answers and thus, a better performance outcome than those who indicate a low level of self-efficacy.

CHAPTER III

METHOD

## Participants

As part of a larger study, 200 sophomore women were
randomly selected from a private all female Catholic high
school in a large Midwestern town. They were asked to
complete a demographics survey in order to provide
information on the participants' ethnicity, and zip codes.
The sample consisted of ( )% white females, ( )% Mexican
American,( )%, African American( )%, and ( ) %
classified themselves as Asian American.

## Measures

### Self-Efficacy Measure.

All 200 participants completed a 30 item questionnaire
to assess self efficacy beliefs in relation to science
careers. This measure required participants to rate how
successfully (1=unable to complete successfully to 10=able
to complete successfully) they felt that they could complete

30 tasks related to pursuing a science career (e.g. Complete a college course in Chemistry which involves the study of behavioral aspects of chemical systems). Betz and Hackett (1983) MSES was revised using the Occupational Outlook Handbook to construct this measure. The top science careers were taken from the OOH in order to assess self-efficacy in tasks associated with obtaining a position in these careers.

Task Performance Measure.

Task performance was measured for these women by the number of correctly answered items on a computer simulated aptitude exam. The exam consisted of 3 passages about science topics (e.g. chemistry) and 10 multiple choice questions about each passage. The students were asked to read the paragraphs and then answer the questions after each paragraph. Task performance was be assessed by determining the number of correct responses that were given to the questions. A score was generated for each of the participants.

Procedure

For the purpose of this study a portion of the sample (n=78) was used. 38 of these participants had been assigned to the self-efficacy group as a part of the larger

intervention study. The intervention was designed to increase the participants' self-efficacy beliefs in relation to pursuing a science career. The intervention consisted of 2 trainers teaching participants in groups of 10 skills associated with reading comprehension, summarizing and extracting the main ideas of passages from chemistry, biology and computer science texts. The participants were then divided into groups of 5 and given a passage about one of the above science careers. They were asked to extract the 1 main point and 2 subpoints from the passage. The participants earned points to be applied to a simulated Wheel of Fortune game. The object of the game was to try to identify a hidden phrase. The phrase consisted of 3 words. Each point could be applied toward uncovering a letter in one of the words. Once all the letters were uncovered and the phrase was discovered the game was over. The group was then asked to complete a self-efficacy measure.

40 of the participants were assigned to the control group and received no intervention. These participants completed the self-efficacy measure at the time of the demographics survey administration.

2 months later both groups completed the study by

participating in  the computer simulation designed to assess

task performance associated with a science related career.

Analyses

     In order to validate the self-efficacy measure the

participants' responses were subjected to a factor analysis.

To investigate the factor structure underlying the 30 item

self-efficacy measure, a principal axis factor analysis was

performed.  Four criteria were used to determine the number

of factors to be extracted for the final solution:  the

Kaiser criterion (eigen values over 1.0), Catell's scree

test, the percentage of variance accounted for by the factor

solution (Tinsley & Tinsley, 1987).

     Minimum item factor loadings were set at a cutoff of

.50.  None of the factors were eliminated based on this

cutoff, and no items loaded at below .50.  2 items were

dropped because of error.

     To examine the internal consistency, reliability

estimates using the coefficients alpha criterion were

calculated for each factor as well as for the entire scale.

Means and standard deviations for each factor were also

calculated.

     Multiple regression analysis was performed in order to

assess the relationship between the subscales of the self-efficacy measure and task performance.

CHAPTER IV

RESULTS

Factor Structure

A principal axis factor analysis was performed to
investigate the factor structure of the self-efficacy
measure. This original factor analysis yielded a six factor
solution. A definite scree was observed between factors
four and five, and a slight scree between factors five and
six. Based on these two criteria, the principal axis factor
analysis was orthogonally rotated to the varimax criterion
to examine the correlations among the observed variables.
Upon examination of the correlations it was noted that the
variables appeared to be highly intercorrelated suggesting
that the factors were interdependent. In this case, an
oblique rotation indicated a cleaner solution with less
items loading on more than one factor (factorially complex).
The factors were then examined and named. 2 items were
dropped from the scale thus, eliminating factor 6. These

items were not theoretically consistent with the construct

of self-efficacy. A subsequent principal axis factor

analysis with oblique rotation was performed on the

remaining items and yielded a five factor solution.

Bartlett's test for sphericity was significant (p=.0000).

To satisfy Kaiser's and Thurston's criteria (Tinsley

and Tinsley, 1987), only factors with eigen values over 1.0

were examined. Examination of the factors having eigen

values of 1.0 or more suggested extraction of five factors

that were retained, accounting for 61.1% of the total

variance. A value of .50 or above was used to as a cut off

for items that did or did not relate to a factor.

Factor loadings from the principal axis factoring

analysis are the following (see Table 1). Factor 1

consisted of 11 items with factor loadings that ranged from

.80 (Graduate with a degree in statistics) to .52 (Complete

a college course in Actuarial Science which involves the

study of charting and graphing numerical data) and accounted

for 34.8% of the common estimated variance. Analysis of the

highest loading items suggested that this factors assessed

tasks associated with a career that involved a high degree

of mathematical skills and knowledge (e.g. Statistician or

Actuary). This factor was therefore titled Mathematical self-efficacy. Factor 2 consisted of 5 items with factor loadings that ranged from .77 (Obtain employment as an engineer) to .59 (Complete a college course in engineering which involves the study of landscaping). This factor assessed tasks associated with a career in engineering and was titled Engineering self-efficacy. Factor 3 consisted of 5 items with factor loadings that ranged from .82 (Graduate with a degree in Computer science)to .70 (Obtain employment as a computer scientist) and was titled Computer Science self-efficacy. Factor 4 consisted of 4 items with factor loadings that ranged from .89 (Complete a college course in chemistry which involves the study of the chemical and physical properties of compounds) to .51 (Complete a college course in Chemistry which involves the study of the behavioral aspects of chemical systems) and was titled Chemistry Self-Efficacy. One item that loaded on factor 4 was factorially complex also loading on factor 2 (engineering self-efficacy). Factor 5 consisted of 3 with factor loadings of .76 (Complete a college course in economics and which involves the study of international economic structures) to .52 (Complete a college course in

Economics which involves the study of the mathematical
aspects of the nation's economy) and was titled Economics
self-efficacy.

2 items loaded on more than one factor. The first
factorially complex item that loaded on both factor 5(.61)
and factor 1 (.73) can be identified as complete a college
course in statistics which involves the study of descriptive
sample data. The second factor that also loaded on both
factor 1 (.61) and factor 5 (.56) can be identified as
obtain employment as an economist. These two items seem to
correlate to both the mathematics self-efficacy factor and
the economist self-efficacy factor. According to social
learning theory, self-efficacy is domain specific in nature
(Bandura, 1986). It therefore stands to reason that these
items would load on both these factors since it requires a
great deal of confidence in one's mathematical abilities to
be successful at both these tasks and careers.

Subscale Intercorrelations

Subscale intercorrelations ranged from .22 to .41.
The intercorrelations are reported in table 2.

TABLE 2

INTERCORRELATIONS OF THE SELF-EFFICACY SUBSCALES

| Subscale | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| Math | - | | | | |
| Engineer | .29 | - | | | |
| Computer Sci | .41 | .34 | - | | |
| Chemistry | .31 | .42 | .27 | - | |
| Economics | .39 | .29 | .32 | .22 | - |

All coefficients, p<.01.


Reliability

The reliability estimate for the entire 28-item inventory using Cronbach's alpha criterion, alpha = .93, reflecting strong internal consistency for the self-efficacy measure. Reliabilities were also estimated for each of the five factor scales. Alpha coefficient, of alpha = .88 was indicated, for the first scale: mathematical self-efficacy (11 items). The second scale, engineering self-efficacy (5

items), resulted in an alpha coefficient of, alpha = .78.

The third, computer science self efficacy, resulted in an

alpha coefficient of, alpha =.85. The fourth scale,

chemistry self-efficacy (3 items), resulted in an alpha

coefficient of, alpha = .80. The fifth scale, computer

self-efficacy (3 items), economics self-efficacy, resulted

in an alpha coefficient of , alpha = .69. The lower

reliability estimate may be reflective of the lower number

of items. Mean and standard deviations for each item and

for each factor scale were also calculated.

<u>Multiple Regression</u>

To examine whether task performance was predictive of

self-efficacy, a simultaneous multiple regression was used.

For the control group, correlations with the self-efficacy

subscales ranged from -.084 to .15 for task performance.

The correlations between the variables, means and standard

deviations are reported in table 3. Multiple regression

results were not significant, with an R square of .05, $F_{(5, 31)} = .39$, $p > .05$. The standardized beta weights were .16,.10,

and -.15 for economics self-efficacy, chemistry self-

efficacy and computer science self-efficacy respectively.

For engineering self-efficacy a beta weight of -.05 was

obtained.  Beta weights and significance levels are reported

in table 4.

TABLE 3

CORRELATION MATRIX, MEANS AND STANDARD DEVIATIONS FOR THE

CONTROL GROUP

|      | Task | Chem | Comp | Econ | Eng | Math | Mean | SD  |
|------|------|------|------|------|-----|------|------|-----|
| Task | –    | .15  | -.08 | .15  | .27 | .09  | 19.1 | 3.6 |
| Chem | .15  | –    | .29  | .34  | .10 | .10  | 5.3  | 2.1 |
| Comp | -.08 |      | –    | -.07 | .10 | .24  | 5.4  | 2.0 |
| Econ | .15  | .34  | .07  | –    | .43 | .40  | 5.5  | 1.8 |
| Eng  | .27  | .30  | .10  | .43  | –   | .07  | 5.4  | 1.9 |
| Math | .09  | .10  | .24  | .40  | .07 | –    | 2.8  | 1.0 |

TABLE 4

SIMULTANEOUS MULTIPLE REGRESSION RESULTS FOR THE CONTROL

GROUP


Multiple R            .24

R Square             .05

Adjusted R Square   -.09

Standard Error      3.8

F=.39        Significance of F=.85

--------------------------Variables in equation-----------

| Variable | B | SE B | Beta | T | SigT |
|---|---|---|---|---|---|
| Chem | .28 | .33 | .16 | .16 | .40 |
| Comp | -.27 | .34 | -.15 | -.80 | .42 |
| Econ | .20 | .43 | -.05 | -.29 | .64 |
| Eng | -.10 | .36 | .07 | .38 | .70 |

For the self-efficacy group, correlations with -.06 and
.12 for the task performance.  The correlations, means and
standard deviations are reported in table  Correlations
between the two variables range from .00 to .12.  Multiple
regression results were not significant, with an R square

.08, F(5, 26)=.49 (p>.05). Beta weights and significance

levels are reported in table 5.

## TABLE 5

INTERCORRELATIONS, MEANS, AND STANDARD DEVIATIONS FOR THE

SELF-EFFICACY GROUP

|      | TASK | CHEM | COMP | ECON | ENG | MATH | MEAN | SD  |
|------|------|------|------|------|-----|------|------|-----|
| TASK | –    | .00  | -.06 | .06  | .12 | -.04 | 19.5 | 4.6 |
| CHEM | .00  | –    | .40  | .50  | .56 | .38  | 4.7  | 2.2 |
| COMP | -.06 | .40  | –    | .48  | .59 | .58  | 4.5  | 2.5 |
| ECON | .06  | .50  | .48  | –    | .75 | .52  | 5.2  | 2.7 |
| ENG  | .12  | .56  | .59  | .75  | –   | .76  | 5.1  | 2.7 |
| MATH | -.04 | .38  | .58  | .52  | .76 | –    | 2.7  | 1.1 |

TABLE 6

SIMULTANEOUS MULTIPLE REGRESSION RESULTS FOR THE SELF-
EFFICACY GROUP

Multiple R             .29

R square               .08

Adjusted R Square   -.08

Standard Error        4.8

F=.49      Significance of F=.77

----------------------Variables in the equation-------

| Variable | B | SE B | Beta | T | SigT |
|----------|------|------|------|------|------|
| Chem | -.20 | .46 | -.09 | -.43 | .67 |
| Comp | -.23 | .44 | -.12 | -.53 | .59 |
| Econ | -.13 | .49 | -.07 | -.26 | .79 |
| Eng | .94 | .67 | .56 | 1.3 | .17 |
| Math | -1.3 | 1.2 | -.32 | -1.0 | .29 |

TABLE 7

SIMPLE REGRESSION RESULTS FOR THE ENGINEERING CONTROL GROUP

Multiple R             .49

R Square               .24

Adjusted R Square     .19

Standard Error        1.9

F= 4.2     Signif of F = .56

-------------------------Variables in Equation------------

| Variable | B | SE B | Beta | T | SigT |
|----------|-----|------|------|------|------|
| Eng | 3.1 | 1.5 | .49 | 1.03 | .56 |

## Simple Regression

A simple regression was performed between the self-efficacy variable and the engineering scores for the engineering paragraphs.  Simple regression results were not significant with R square = .24, $F(1.39)$= .49, $p > .05$. Regression results are displayed in table 7.

CHAPTER V

DISCUSSION

The purpose of this study was to provide empirical

research to validate the component Lent et. al. model(1991)

pertaining to the link between self-efficacy and task

performance for high school females.  In general results

supported this link for women in relation to science based

careers, even though no significant results were obtained.

Additionally, results support the findings of previous

research that self-efficacy is a domain specific concept.

The factor analysis provided a conceptual organization

of the identified 5 subscales of the self-efficacy measure

(mathematics self-efficacy, engineering self-efficacy,

computer science self-efficacy, chemistry self-efficacy and

economics self-efficacy).  A five factor solution appeared

to be empirically justified and theoretically meaningful for

this scale.

High intercorrelations between the items seems to

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suggest that there is overlap when judging self-efficacy beliefs. Since, self-efficacy is a domain specific concept it appears likely that this overlap would occur. Many of the different tasks assessed by this scale require the same abilities in order to perform them successfully. For example, a great deal of confidence in one's abilities to master mathematics is necessary in order to perform well in an engineering major or career. It would therefore, stand to reason that the participants would evaluate these constructs in a similar manner and respond accordingly.

Items assessed 5 domains of science self-efficacy. These items were task and career specific for the five areas of science and thus clustered together. The reliability of each of these subscales are estimated to be good indicating that this scale was consistently measuring the same construct.

Two simultaneous multiple regression results did not yield significant results. However, empirical support for the existence of a relationship between self-efficacy and task performance for women in relation to science careers was provided by a simple regression. One the possibilities that significant results were not obtained was the lack of

power (small n) in this study. Considering the possibility

of committing a type II error was so high, a simple

regression was performed between the engineering self-

efficacy variable and the eningeering task. No significant

results were found for this regression. The engineering

variable yielded an R square of .24 F(1,39)= .49 p>.05.

Lack of power in this study (small n) may be a possible

reason that a significant result was not obtained.

Therefore, because of the possibility of committing a type

II error was so high results should be examined carefully.

A positive relationship may be suggestive between the

eningeering self-effiacy subscale and the engineering task.

These results are consistent with Bandura's idea that self-

effiacy is task and domain specific in nature. These

results also support Lent, Brown and Hackett's model of

career development (1994) providing evidence for the link

between self-efficacy and task performance.

Limitations

As a result of the small sample size significant

results were not obtained. It is difficult to provide

evidence for a strong relationship between the two

variables. Another constraint is that the sample size

contained relatively few minority students and was conducted in a self-selected college preparatory environment. It is difficult to generalize findings from this study to different populations with varying backgrounds and educational experiences (e.g. inner city high school girls).

## Applications for the Field

Practical implications to be considered are the factors that effect women's lack of participation in science careers. Educators and counselors should take into consideration that lack of interest may not be the deciding factor for why women choose not to pursue science careers. Determinants such as the confidence a women feels in her abilities to perform the tasks associated with such careers need considerable attention. Educators and counselors can play a crucial role in the building and supporting of such confidence in abilities. Therefore, it is imperative that intervention strategies be employed by school personnel to support women who display interest in such nontraditional careers. Also, learning opportunities about such careers should be domain specific (e.g. learning excursions to laboratories).

Implications for Future Research

Future research may replicate this study using a larger more diverse sample. They may also pay greater attention toward schools in an less supportive atmosphere. There is room for exploring the results of interventions to promote science careers for girls who are not self-selected to attend a school that fosters such interests. The dynamics of their self-efficacy beliefs may further shed light on the lack of participation by women in these nontraditional careers.

Further validation of the social cognitive model is needed in order to establish it as a conceptual way of understanding career development as it applies to women. Furture research may want to focus on how other components of this model effect self-efficacy in relation to career choices and apsirations.

APPENDIX

PERMISSION LETTER

Saba Rasheed
6308 N. Winthrop Ave Apt. 406
Chicago, IL 60660

Scott Solberg
University of Wisconsin-Milwaukee
Department of Educational Psychology
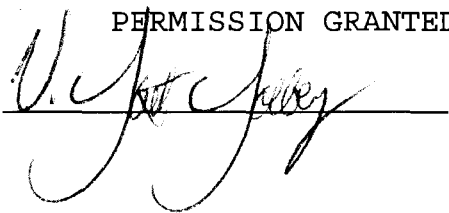Enderis Hall #745
P.O. Box 413
Milwaukee, WI 53201

January 1, 1996

Dear Dr. Solberg,
I am completing a thesis at Loyola University Chicago
entitled "The Relationship Between Self-Efficacy and Task
Performance for Women in Science Related Careers."  I would
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your approval, please sign this letter where indicated.
Thank you very much.

Sincerely,

Saba Rasheed

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REFERENCES

Bandura, A. (1983). Self-efficacy determinants of anticipated fears and calamaties. <u>Journal of Personality and Psychology, 45,</u> 464-469.

Bandura, A. (1989). Human agency in Social Cognitive Theory. <u>American Psychologist, 44,</u> 1175-1184.

Betz, N. and Hackett, G. (1983). The relationship between mathematics self-efficacy expectations to the selection of science-based college majors. <u>Journal of Vocational Behavior,23,</u> 329-345.

Cohen (1988). <u>Statistical Power Analysis for the Behavioral Sciences.</u> New York, NY: Academic Press.

Dowling, D.M. (1978). <u>The development of a mathematics confidence scale and its application in the study of confidence in women college students.</u> Unpublished doctoral dissertation, Ohio State University, Columbus.

Farmer, H.S., Wardrop, J.L., Anderson, M.Z., & Risinger, R. (1995). Women's career choices: Focus on science, math, and technology careers. <u>Journal of Counseling Psychology,42,</u> (2), 155-169.

Fouad, N.A. (1995). Career linking: An intervention

to promote math and science career awareness. <u>Journal of Counseling and Development,73,</u> (5), 527-533.

Hackett, G., & Betz, N.E. (1989). An exploration of the mathematics self-efficacy/mathematics performance correspondence. <u>Journal for Research in Mathematics Education,20,</u> 261-273.

Lent,R.W., Brown, S.D. & Hackett, G. (1994). Toward a unifying Social Cognitive Theory of career and academic interest, choice and performance. <u>Journal of Vocational Behavior, 45,</u> 79-122.

Lent R.W. Brown, S.D. & Larkin, K.C. (1986). Comparison of three theoretically derived variables in predicting career and academic behavior: Self-efficacy, interest congruence, and consequence thinking. <u>Journal of Counseling Psychology, 34,</u> (3), 293-298.

Lent, R.W., Lopez, F.G. and Bieschke, K.J. (1991). Mathematics self-efficacy: Sources and relations to science based career choice. <u>Journal of Counseling Psychology, 38,</u> (4), 424-430.

Lips, H.M. (1992). Gender- and science-related attitudes as predictors of college students' academic choices. <u>Journal of Vocational Behavior,40,</u> 62-81.

Multon, K.D., Brown, S.D. & Lent, R.W. (1991).

Relation of self-efficacy beliefs to academic outcomes: A

meta-analytic investigation. Journal of Counseling

Psychology,38, 30-38.

Pajares, F. & Miller, D.M. (1995). Mathematics self-

efficacy and mathematics performances: The need for

specifity of assessment. Journal of Counseling

Psychology,42, 190-198.

Schunk, D.H. (1981). Modeling and attributional

effects on children's achievement: A self-efficacy

analysis. Journal of Educational Psychology, 73, 93-105.

Schunk, D.H. (1983a). Ability versus effort

attributional feedback: Differential effects of self-

efficacy and achievement. Journal of Educational

Psychology, 75, 848-856.

Schunk (1983b). Developing children's self-efficacy

and skills: The roles of social comparative information and

goal setting. Contemporary Educational Psychology,8, 76-86.

Schunk (1983c). Reward contingencies and the

development of children's skills and self-efficacy. Journal

of Educational Pscyhology, 75, 511-518.

Schunk (1984). Self-efficacy perspective on

achievement behavior.  Educational Psychologist, 19,  48-58.

Shunk, D.H.& Rice, J.M. (1986).  Self-efficacy and skill development:  Influence on task strategies and attributions.  Journal of Educational Research,79, 238-244.

Tinsley, H.A. & Tinsley, D.J.  (1987).  Use of factor analysis in counseling psychology research.  Journal of Counseling Psychology,34, 414-424.

Wood, R.E. & Locke, E.A.  (1987).  The relation of self-efficacy and grade goals to academic performance. Educational and Psychological Measurement, 47,  1013-1020.

# VITA

The author, Saba Rasheed, was born in Winnepeg, Manitoba, Canada and was raised in Beckley, West Virginia. In September 1988, Miss Rasheed entered West Virginia University, receiving a Bachelor of Arts in psychology in December 1992. The next year and half Miss Rasheed spent working at a residential facility involved in the care of adults with mental retardation and volunteering for a center for domestic violence and rape victims. She was accepted to Loyola University Chicago in 1994 in the Department of Counseling Psychology. While pursuing a Master of Arts degree, she was a research assistant for the Center for Children and Families' H.O.M.E. (High-rise, On-site, Multi-family, Environment) Project, and completed her practicum at the Adult Outpatient Center with the Dupage County Health Department in Addison, Illinois.

## APPROVAL SHEET

The thesis submitted by Saba Rasheed has been read and approved by the following committee:

Dr. Steven D. Brown
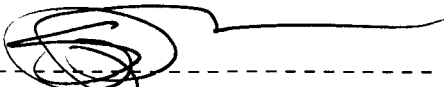Professor, Counseling Psychology
Loyola University Chicago

Dr. V. Scott Solberg
Assistant Professor, Educational Psychology
University of Wisconsin - Milwaukee

The final copies have been examined by the director of the thesis and the signature which appears below verifies the fact that any necessary changes have been incorporated and that the thesis is now given final approval by the Committee with reference to content and form.

The thesis is therefore accepted in partial fulfillment of the requirements for the degree of Master of Arts in the Community Counseling program in the Department of Counseling Psychology.

__3/27/95_____
Date

_____
Director's Signature