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AUTHOR	O'Connor, Sharon Anne; Miranda, Kathleen; Beasley, T. Mark	
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ABSTRACT

Cognizant of the American high school students' waning test scores and a decreased desire to pursue higher level courses in mathematics and science, there has been a categorical effort to identify the demographic and motivational variables that contribute to mathematics and science achievement. This study utilized the 1992 panel members (8,140 males, 8,349 females) of the National Education Longitudinal Study of 1988. Two theoretical frameworks were used in the study: Walberg's Educational Productivity Model analyzed the interconnections among parental influence, family structure (intact: two-parent and/or nonintact: one-parent households), and the SES predictor variables within the home environment section of the model. The Shavelson, Hubner, and Stanton Structural Model (1976) provided a theoretical mechanism for understanding the multifaceted construct of self-concept. The findings of the study disclosed that females and males closely paralleled each other on both criteria. The best predictor for achievement for both genders, regardless of family structure was prior ability. Similarly, both males and females in intact and nonintact households were directly influenced by low mathematics performance for the criterion mathematics. An additional key finding for males from both intact and nonintact households was that SES had a direct influence on both terminal variables. (Author)

THE LINKAGES AMONG THE HOME ENVIRONMENT AND ACADEMIC SELF-CONCEPTS ON ACHIEVEMENT OF INTACT AND NONINTACT FAMILY STRUCTURES OF AMERICAN HIGH SCHOOL STUDENTS

Sharon Anne O'Connor, Kathleen Miranda & T. Mark Beasley
School of Education and Human Services
St. John's University
New York

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Abstract

Cognizant of the American High School Students' waning test scores and a decreased desire to pursue higher level courses in mathematics and science, there has been a categoric effort to identify the demographic and motivational variables that contribute to mathematics and science achievement. This study utilized the 1992 panel members (males: 8140, females: 8349) of the National Education Longitudinal Study of 1988 (NELS: 88.) Two theoretical frameworks were used in the study: Walberg's Educational Productivity Model analyzed the interconnections among parental influence, family structure (intact: two-parent and/or nonintact: one-parent households), and the SES predictor variables within the home environment section of the model. The Shavelson, Hubner & Stanton Structural Model (1976) provided a theoretical mechanism for understanding the multifaceted construct of self-concept. The results of the study disclosed that females and males closely paralleled each other on both criterions. The best predictor for achievement for both genders, regardless of family structure was prior ability. Similarly, both males and females in intact and nonintact households were directly influenced by low mathematics performance for the criterion mathematics. An additional key finding for males from both intact and nonintact households was that SES had a direct influence on both terminal variables.

Introduction

In 1993 President Clinton and Secretary of Education Richard Riley advocated the "Goals 2000: Educate America Act" in order to prepare U.S. students to become economically competitive/productive in the current information age. The mandate was intended to answer the concerns rooted in *A Nation at Risk* (1983) which found that U.S. high school students had lower scores than students from other nations on international tests of mathematics and science (U. S. Department of Education, 1998). Several national studies sponsored by the United States Department of Education (High School and Beyond, 1982; National Assessment of Educational Process: ongoing; The National Longitudinal Study, 1972) confirmed that U.S. students were underachieving in several areas within the core areas of mathematics and science.

The U.S. Department of Labor (1991), cognizant of the technology revolution and its critical role for economic prosperity, emphasized the need to strengthen the technical, mathematical, and scientific expertise of the nation's workforce. Thus, Goals 2000 (To Educate America Act, 1994), was implemented to revamp the nation's school system and to increase student achievement in mathematics, science and technology.

Recent reports, however, were not as promising as expected. Although the Third International Mathematics and Science Study (TIMSS, 1998) cited encouraging results from the American fourth and eighth-grade assessments in mathematics and science, the twelfth grade assessment was less than desirable. American seniors (twelfth-graders) graduate from high school with a significantly weaker understanding of mathematics and science than their international counterparts (Forgione, 1998). Further international comparisons revealed that U.S. students had lower test scores, lower parental expectations and lower worker expectations than students from other nations (Grunland, 1993; Travis & Westbury, 1988). Moreover, the United States no longer prevailed among industrialized countries with the highest high school and college completion rates; both Germany and Japan had higher secondary school graduation rates for young adults, aged 25-34.

Thus in order to become internationally competitive in the chameolonic age of technology, which necessitates increased mathematical skills (National Research Council, 1991), there is a definite need to investigate additional demographic and motivational variables that contribute to student achievement.

The purpose of this study was to examine the causal linkages among specific environmental, educational, demographic and motivational factors that influence mathematics and science achievement of American secondary students and to ascertain salient parallels and/or differences between family structure and gender.

Limitations of the Study

Although this study was based on a large sample of United States high school students and is intended to represent the entire population of students who were in the eighth grade in 1988, there are several caveats that should be presented. Certain students, especially emotionally and educationally disabled students and students who spoke little or no English were excluded from the study, and thus bias due to under coverage was introduced.

In order to protect the identities of sample members, certain variables that contained disclosure risks were either altered or suppressed. Continuous variables were re-configured as categorical variables or suppressed completely (Ingels, Thalji, Pulliam, Bartot, Frankel, 1994). Manipulating selected variables affects their analytic potential, and information is lost when categorizing, especially if data lie near the endpoints of the intervals (Pagano and Gauvreau, 1993).

This study used a secondary source, the NELS: 88 data base for analysis. Use of secondary data poses both internal and external threats to validity (Gay, 1992). In particular, users of secondary source data should be wary of the accuracy and the consistency of the data. Many of the variables that were used in this study were obtained from self-reported surveys and may include a certain degree of bias. However, NCES and it sub-contractors ran pilot studies at each round and exercised great care to assure the accuracy of the responses (Ingels, Dowd, Baldridge, Stipe, Bartot, & Frankel, 1993).

This study may also contain measurement limitations. The use of a large, national survey limits the items from which to choose. Although item labels may appear compatible with those found in the literature, the chosen variables may convey a different meaning since there was not a perfect match of variables and variable options.

Unit non-response posed still another threat to the validity of the study. Although NELS:88 had rather high response rates, males, blacks, and Hispanics tended to be non-participants more often than females, whites and Asians. Moreover, as the rounds progressed student participation in the cognitive test portion of the study decreased. During the Base Year, 96.5% of the in-school participants completed the cognitive tests, but that percentage shrank from 94.1% completion rate among F1, in-school students to only 76.6% among F2 students. The reduced rate of participation came from two main sources: student refusal to take the examinations after completing the questionnaire and the omission of the tests for students who completed the abbreviated telephone surveys administered to some F2 participants.

Item non-response could have threatened the effectiveness of the NELS: 88 study, but the administrators of the test (NORC) and NCES controlled for item non-response by screening the surveys for completeness and accuracy before students left the room and by requesting students to complete (or correct) the item. If the student refused or was unable to do so, the administrator marked the code "unable to retrieve." Next, filters were used to check consistency with missing data; those items were then coded "legitimate skip." Finally, contextual data were used to impute responses for missing items when it was feasible.

Finally mortality is a threat to validity (Cook & Campbell, 1979). Although NCES attempted to follow as many students as possible in each of the follow-up studies, some students sampled in 1988 were lost in the 1990 sample from disability, death, and from scattering to non-represented high schools. In addition this study used only those sample members who remained in school for the entire 1988-1992 time period and for whom student questionnaires, and mathematics and science tests were available. It is possible that one or more subgroup will have an attrition rate that differs from the population that is to be represented.

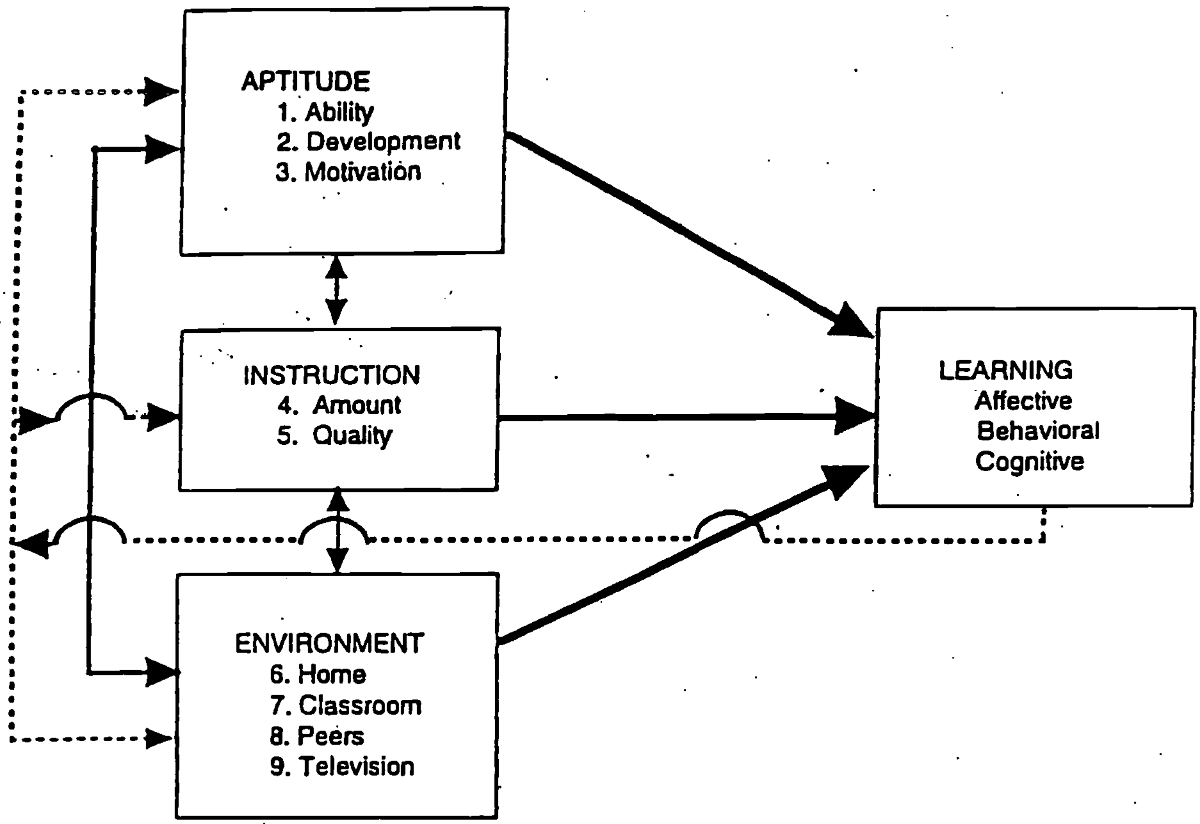
To overcome some of the potential limitations, NELS: 88 data include weighting factors that statistically adjust the data to compensate for unequal probability of selection of the sample and to reduce bias caused by student non-response. These weights were applied in this study.

PREVIOUS RESEARCH

Researchers have been cognizant of the effects of home environmental variables on student achievement for decades. In 1982 Iverson and Walberg analyzed eighteen research studies dealing with home environment and achievement to conclude that intellectual stimulation in the home had a strong influence on cognitive abilities. In 1984 Walberg replicated these findings through a synthesis of 2,575 empirical studies. From 1990 to 1992 Reynolds, Wang, and Walberg (1992) created a knowledge base of the factors that significantly helped students learn (see Figure 1.1) and concluded that family variables directly influenced student achievement to nearly the same degree as student aptitude and classroom instruction (Wang, Haertel, & Walberg, 1990).

Thus, invariable research has indicated that home environmental variables play a pivotal role in the student's cognitive development (Bandura, 1986; Campbell, 1994; Dornbusch, Ritter, Mont-Reynaud, 1990; Iverson and Walberg, 1982) and one of the

Figure 1.1 Walberg Productivity Model
Causal Influences on Student Learning (1986)



most salient components involve the family structure, specifically, the role of the parents (Eccles & Harold, 1993; Epstein, 1986; 1990; Wang, Haertel & Walberg, 1993; U.S. Department of Education, 1994). A legion of research (Dornbusch, Carlsmith, Bushwell, Titter, Leiderman, Hastorf & Gross, 1985; Dornbusch, Titter, Mont-Reynaud, & Chen, 1990) suggests that parental or family "actions" or "what you do" are more important than socioeconomic status, race, and other social differences.

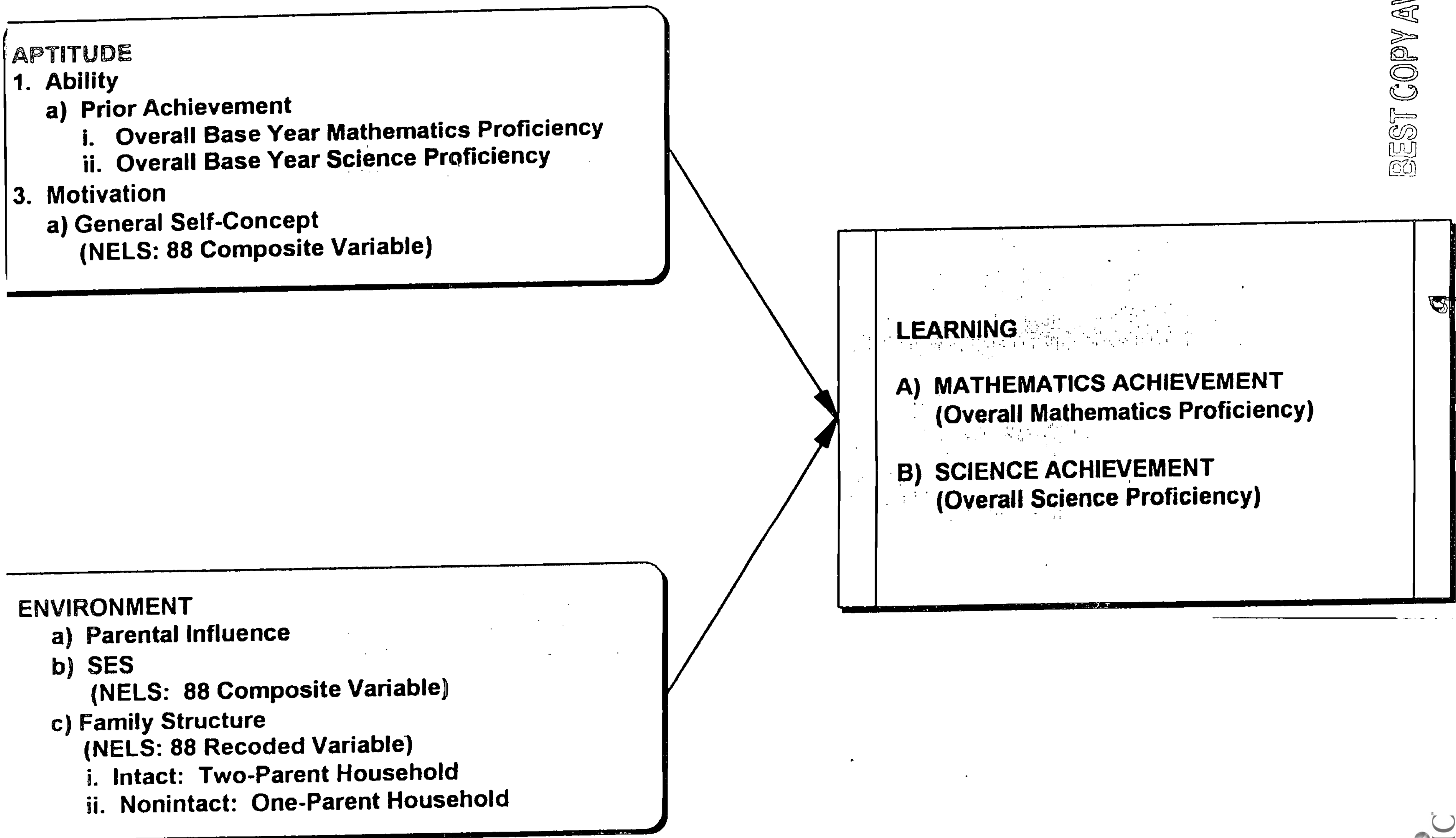
Therefore, family structure is a salient variable within the home that influences student achievement, and the way families arrange these environments affect the outcome and learning development of their children (Epstein, 1990). Utilizing the Walberg Educational Productivity Model, the aptitude and home environment elements can be divided into specific educational and socioeconomic factors (see Figure 1.2). Research shows that intact families (two-parent households) have a positive effect on student achievement (Campbell & Wu, 1994; O'Connor, 1997; Stafford & Bayer, 1993) and that nonintact families (single-parent households) can negatively affect the child's achievement, (Ferri, 1976; Guidubaldi & Perry, 1984), grade point averages, and attendance (Guidubaldi, Perry, & Cleminshaw, 1984).

This is of paramount importance to researchers because current demographic statistics evince the rise of nonintact households (Glick, 1989; Jellinek & Klavan, 1988; Norton & Moorman, 1987; U.S. Department of Education, 1994). In 1996, 68% of American children lived in two-parent (intact) households; a prominent decrease from 85% in 1970 (U.S. Bureau of the Census Current Population Reports, 1995). In 1988, 4.3 million children were living with a mother who had never married, an increase of 678% from 1970 (Hodgkinson, 1991). Another factor contributing to this increase is the sharp rise in the number of births by unmarried mothers: from 5% in 1960 to 32% in 1995 (U.S. Bureau of the Census Current Population Reports, 1995). Similarly, Emery & Forehand (1994) predict that 40% of all children in the United States will live in a divorced family by age 16, and this percentage will increase another 2% every year. Today almost 50% of America's young people will spend some part of their developmental years living in a nonintact household (Hodgkinson, 1991).

Evidence in the literature also shows socioeconomic status is related to the family's level of encouragement (Song & Hattie, 1984), to the quantity and level of

Figure1.2

Interconnections Analyzed Within The Walberg Productivity Model



intellectual resources available to the child (Campbell & Wu, 1994) and to student achievement (Bloom, 1964; Campbell & Koutsoulis, 1995; Campbell & Wu, Hoffer, 1995; Stone, 1988). The National Educational Longitudinal Study of 1988 denoted that students with higher SES complete more mathematics whereas Hoffer, Rasinski and Moore (1995) found that low SES students tend to take fewer courses; however, when course work was held constant, differences in mathematics achievement was not related to SES.

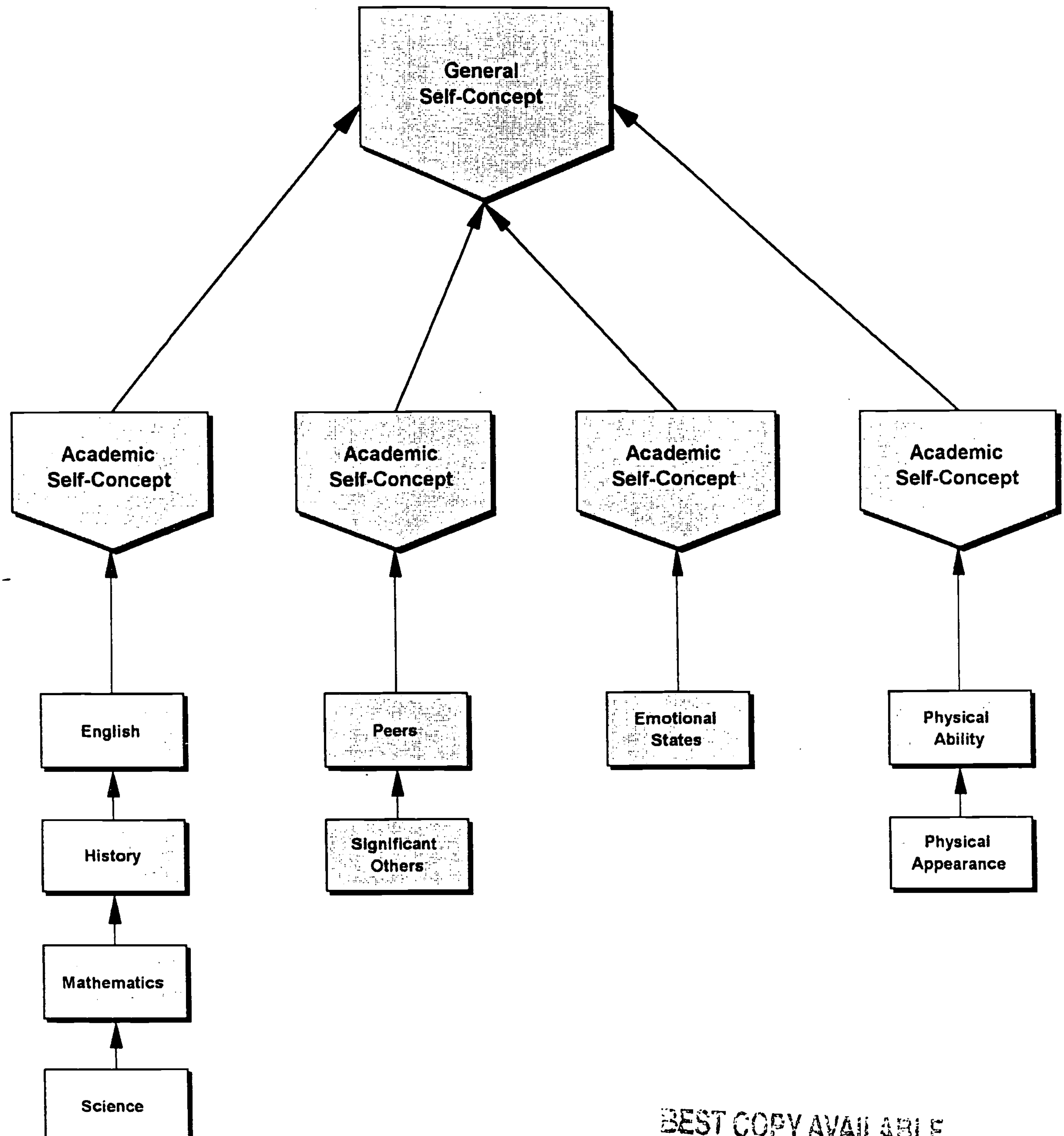
Another focus of the study was the multifaceted construct of self–concept. The Shavelson, Hubner, and Stanton structural model of self-concept (see Figure 1.3) configures general self-concept at the apex, followed by academic, social, emotional and physical self-concepts. A body of research supports the conception that self-concept is a diverse and hierarchical construct (Marsh, 1989; Marsh, Byrne, & Shavelson, 1988; Shavelson, Hubner & Stanton 1976) which is continually changing and growing in relation to an individual's experiences and development. Similarly, Slavin (1997) posited that self-concept includes the way we perceive our strengths, weaknesses, abilities, attitudes and values and self-esteem refers to how we evaluate our skills and abilities. Researchers have long acknowledged the relationship between self-concept or self-esteem and academic achievement (Byrne and Shavelson, 1986; Hansford and Hattie, 1982; Shavelson and Bolus, 1982, Taylor and Michael, 1991).

Research concurs that the nascent of self-concept is at birth and is strongly influenced by experiences at home, with peers and in school (Bandura, 1986; Slavin, 1997). Morse and Handley (1982) found that "significant others" (parents, teachers, peers) were mainly responsible for the formation of children's concepts. Luckey (1974) found that the family is the primary setting for the child's personality development and Johnson (1992) and Marjoribanks (1981) concluded that the family produces the climate that affects personality and cognitive development. Thus the parents emerge as the incipient influencing agents in the formation of the child's self-concept (O'Connor, 1997).

This study also examined gender disparities in terms of the demographic, motivational and environmental variables. There have been numerous studies on gender differences in self-concept research. Overwhelmingly, research reported that male's

Figure 1.3

Shavelson, Hubner & Stanton (1976) Hierarchical Model of Self-Concept



mathematics self-concepts were higher than female's mathematics self-concepts and female's verbal self-concepts exceed that of male's (Byrne & Shavelson, 1987; Eccles, Adler, Fulterman, Goff, Kaczala, Meece, & Midgley, 1985; Marsh, 1989; Skaalvik & Rankin, 1990) although females had higher achievement grades in both core areas (Campbell & Connolly, 1987; Kelly & Jordon, 1990). This led researchers to deduce that females possibly have low self-concepts in mathematics due to socialization factors and gender stereotyping (Campbell, 1994) as high mathematics achievement cannot explain their low mathematics self-concepts (Marsh, Byrne & Shavelson, 1988).

Gender differences become apparent at the secondary level when female students begin to exhibit less confidence mathematically, are less inclined to enroll in higher level mathematics courses and perform lower than males on problem solving and higher level mathematics tasks (Campbell & Beaudry, 1997; Eccles-Parsons, 1984; Ethington, 1992; Linn & Hyde, 1989).

METHODS

The National Education Longitudinal Study of 1988 (NELS: 88), conducted by the U.S. Department of Education's National Center for Education Statistics (NCES), supplied the data for this study. NELS 88 is a longitudinal study designed to provide trend data about U.S. students as they progressed from eighth grade through high school and on to post secondary education and/or into the labor force.

Sample

NCES used a two-stage stratified probability design to select a nationally representative sample of schools and students attending eighth grade in 1988. In the base year (BY) a stratified sample of schools based on geographical location, locus of control and student population was selected in the first stage, and then students were randomly sampled from the selected schools in the second stage. In the following rounds, the students became the primary unit of analysis.

This study's subjects were limited to the 16,489 students (8,140 males and 8,349 females) who participated in the first three rounds of the study which were conducted in 1988--Base Year (BY), 1990--First Follow-Up (F1), and 1992--Second Follow-Up (F2). They were chosen from the F2 student megafile (N2PSTMeg) by selecting the sample members who had a positive F2 panel weight (F2PNLWT > 0). At each round of the study, students were asked to complete a self-administered questionnaire and a battery of cognitive tests, including tests in mathematics and science. Information from these three sources supplied the data used in this study.

Instrumentation

The instruments used in NELS: 88 Base Year and a subsequent follow-up studies were designed to serve the longitudinal goals of NELS: 88 and to be compatible with previous NCES longitudinal studies (Ingels, et al.,1993). Each of the components of NELS;88 was field tested during the year prior to administration. Questionnaires were designed to be self-explanatory and to be completed within one hour. The cognitive tests measured achievement at grades eight, ten, and twelve, and achievement growth between grades tested.

The mathematics tests included 40 questions and were to be completed in 30 minutes. They tested simple mathematical skills, comprehension of mathematics concepts, and problem solving ability. Except in the base year, when all participants took the same test, there were three versions of the mathematics cognitive test of varying difficulty designed for each round. The purpose of the multi-level design was to guard against ceiling and floor effects which may occur when testing spans five years of schooling and must be administered in a limited amount of time, and still provide a continuum of scores. The mathematics tests measured mathematics proficiency levels ranging from competence in simple arithmetic using whole numbers to proficiency in solving complex word problems or demonstrated knowledge of mathematics found in advanced courses (Rock & Pollack, 1995).

The science tests consisted of 25 questions and they were administered in 20 minutes. The tests had questions pertaining to skills and knowledge, understanding and comprehension, and problem solving skills in chemistry, earth, life and physical sciences. Within each grade level all students received the same science test. The higher grade level forms included more advanced material to minimize ceiling effects (Rock & Pollack, 1995). Three proficiency levels were identified by the science tests, ranging from understanding of common knowledge that is acquired in everyday life to understanding complex scientific concepts requiring more than one step to solve.

Variable Selection

Twenty six variables were chosen from the NELS: 88 data based on the theoretical framework of the study. They were selected to fit the logical time frame of student growth and achievement. All variables came from the student questionnaires or the mathematics and science cognitive tests. Variables used to measure similar constructs by other researchers (Campbell, 1994; Hoffer et al., 1995; O'Connor, 1997) served as a guide to the current selection.

The overall mathematics and science proficiency scores from the base year mathematics and science cognitive tests administered by NCES as part of NELS: 88 were used to measure prior ability. These tests were administered in the spring of eighth grade. The F2 overall proficiency scores from mathematics and science cognitive tests which were taken in the spring of twelfth grade served as the dependent variables and were used as the measures of mathematics achievement and science achievement respectively.

It was assumed that the demographic variables family structure, SES, and gender occur at the beginning of a educational time line. The study utilized BYPARMAR (Parents marital status) to measure family structure. Originally measuring six possible family structures, this variable was compressed to categorize the student's family in 1988 as intact if two adults were in the family and non-intact if only one parent lived in the home.

NELS: 88 composite variables F2SEX (Composite sex) and F2SES1 (Socio-economic status composite) were used to measure the gender of the student and the socioeconomic status of the family. These composites were formed from the available information gathered during the three rounds of NELS:88. The SES construct is an equally weighted composite of parental education, occupation (placed on a Duncan SEI scale), and family income (Ingels, et al., 1993).

General self concept was measured using the NELS:88 composite variable F2CNCPT2 (Teen self concept, version 2). It is a standardized, weighted composite of all the self concept variables found in (F2S66 A-M) after negative questions had been recoded to coincide with positively posed questions.

Weighting the Data

Before using NELS:88 data in analysis, variables were weighted to eliminate systematic bias and to assure that results could be generalized to the population of students under investigation (Owings, McMillen, Ahmed, West, et al., 1994). The weights used in this study (F2PNLWT) were developed for the NCES and are intended to be used with data for NELS:88 sample students who participated in the first three rounds of the NELS:88. The weights were designed to compensate for students' unequal probabilities of selection into the sample and to adjust for the non-response of certain participants (Ingels et al., 1993). Conceptually, a weight is formed by multiplying the reciprocal of a sample member's probability of selection into the sample by a non-response factor. The school sub-sampling and student tracing procedures used in the Second Follow-Up made it necessary to develop six different weights to account for different F2 scenarios. Construction of F2 weights followed a four-step process. First, students were classified into one of eight sample groups that represented their NELS: 88 status in BY, F1, and F2. Next a design weight was developed for each student. If the weight was not affected by school sub-sampling, the F1 design weight was used. For students selected because of the availability of transcripts or other school sensitive contextual data, the FFUDW were divided by the school's Second Follow-Up probability of selection (p = 1.00, p = .75, p = .65, or p = .318) to obtain the student's Second Follow-Up design weight (SFUDW). Only 1500 of the 2258 represented schools were retained in the 1992 study, and the probability a school was sampled depended on the number of sample students in attendance (Ingels, et al., 1993).

Then the non-response adjustment factors were developed. In the Second Follow-Up weighting cells, based on the classification groups made in step one and on students' race and gender, were formed. These cell factors were adjusted to estimate national dropout rates. The resulting F2 panel weights (F2PNLWT), developed for students who participated in the three rounds of the NELS: 88, had a mean of 180.17. These weights were applied to the sample of 16,489 twelfth grade students in the panel who represented 2,970,835 students who were in the eighth grade in 1988 (Ingels, et al., 1993).

Design Effects

The complex sample design of NELS: 88 resulted in data that did not meet the usual assumptions of inferential statistics. The fact that NELS: 88 used a stratified, clustered sample rather than simple random sampling increased the variability of responses. Design effect (DEFF) provides a measure of the increased variance caused by the departure of the complex NELS:88 sample design from simple random sampling. DEFF is defined as the ratio of the variance of the estimator reflecting the sample design to of the variance of the estimator assuming simple random sampling.

SPSS 8.0 does not recognize complex sampling designs. When computing statistics, design corrected standard errors must be created for use in inferential statistics calculated in SPSS 8.0. Finding the exact design effect of the NELS: 88 data used in this study required computer software which was not available. In the absence of such software, Ingels et al. (1993) suggested that the design effect of the dependent variable provided a good estimate and should be used to correct for NELS: 88 complex sample design. In this study two F2 panel DEFFs were used. The DEFF for mathematics achievement is 5.169 and the DEFF for science is 4.448. The DEFF also corrects the degrees of freedom in the statistical analysis and provides an estimate of the effective sample size. In this study the effective sample size is 3,190 in the mathematics analyses and 3,707 students in the science analyses.

Statistical Analyses

Data was analyzed through the Statistical Package of Social Science (SPSS) program. The chosen predictor variables were entered into regression analyses using Campbell's (1977) guidelines off chronology, logic and research. Standardized beta coefficients greater than $^{-/+}$.1 were listed as significant in the terminal models.

Principal Axis Factoring and varimax rotation was employed to isolate salient factors within the researchers' chosen set of predictor items extracted from student questionnaires. These factors were then partitioned into two sets: those items pertaining to mathematics and those related to science. The number of factors were determined from initial PAF through assessment of eigenvalues and a scree plot (Cattell, 1966). Initial eigenvalues evinced two salient factors for both mathematics and science (see Table 1.1).

For the set measuring mathematics, the first purloined factor accounted for approximately 34% of the variance among the 8 items and was named math performance. The second factor accounted for approximately 25% of the variance and was named math effort.

For the set measuring science, the first extracted factor accounted for approximately 27% of the variance among the 8 items and was named science effort. The second factor accounted for approximately 17% of the variance and was named science interest.

Table 1.1

MATHEMATICS	
Factor 1: Mathematics Performance	**Factor 2: Mathematics Effort**
F1S63Q R gets good marks in mathematics	F2S21A How often R pays attention in math
F1S63J R has always done well in mathematics	F2S21B How often R completes work on time
F1S39A Describe R's math grades	F2S21D How often R participates in math class
F1S63S R does badly in tests of mathematics	F2S21C How often R does more math work than reqd
SCIENCE	
Factor 1: Science Effort	**Factor 2: Science Interest**
F2S17A Science class pay attention	BYS60B R's ability group for science
F2S17B Science class-do work on time	BYS72A Usually look forward to science class
F2S17C Science class-do more work than needed	BYS72B Afraid to ask questions in science class
F2S17D Science class-active participation	F1S39A Describe R's science grades

RESULTS

Separate regression analyses were run per gender and separated by family structure for both terminal variables. The direction and ordering of the variables were specified by the researchers who adhered to Campbell's (1997) guidelines of chronology, logic, and previous research.

The results of the male and female regression analyses for both criteria closely paralleled each other (see Figures 1.4 to 1.7). For both genders in both intact and nonintact households, prior achievement (as measured by the Base Year Cognitive Tests)

Figure 1.4

OVERALL MATHEMATICS PROFICIENCY
MALES
INTACT : ———— NONINTACT: -----------

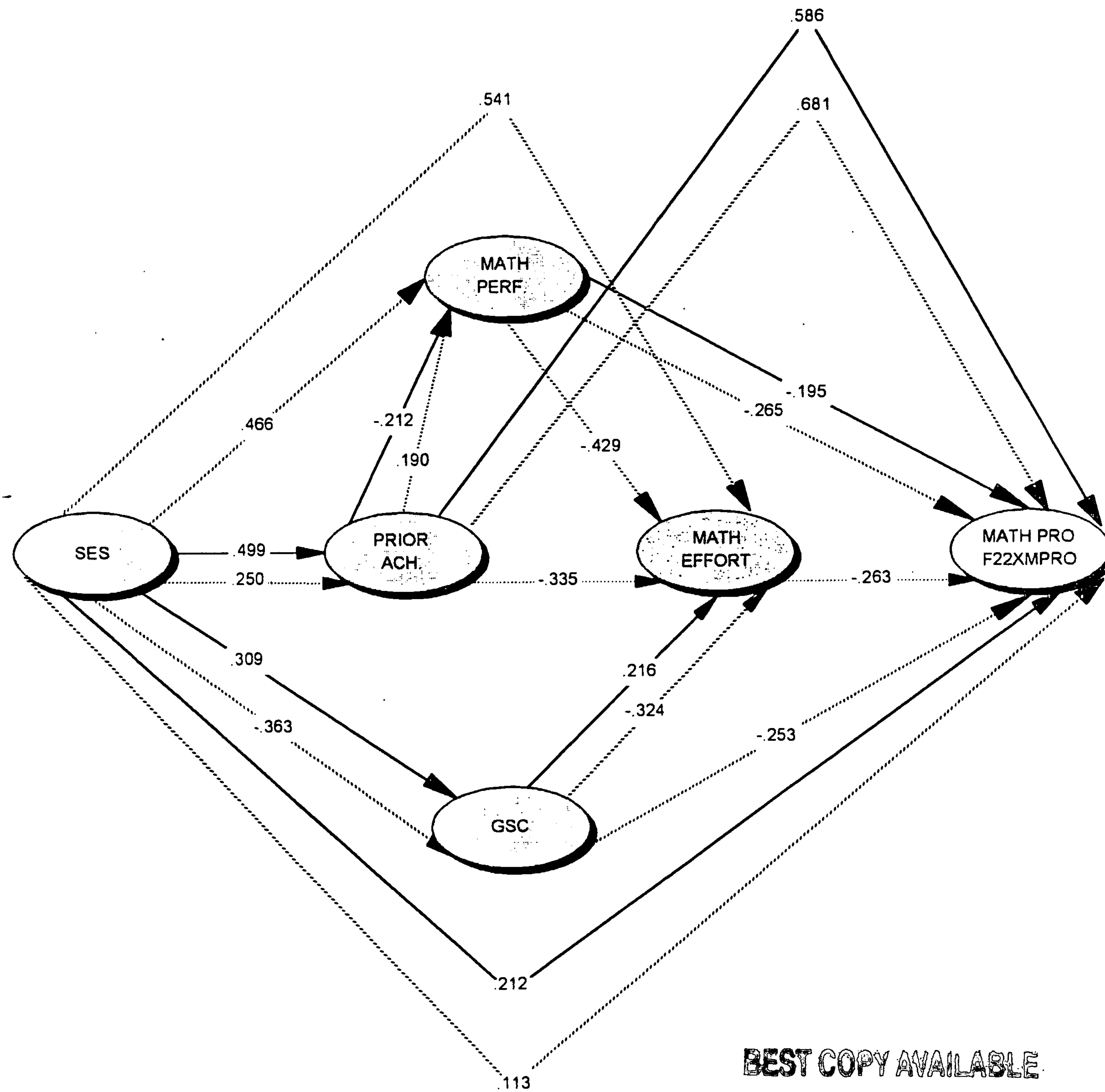


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Figure 1.5

OVERALL MATHEMATICS PROFICIENCY
FEMALES
INTACT : ———— NONINTACT: -----------

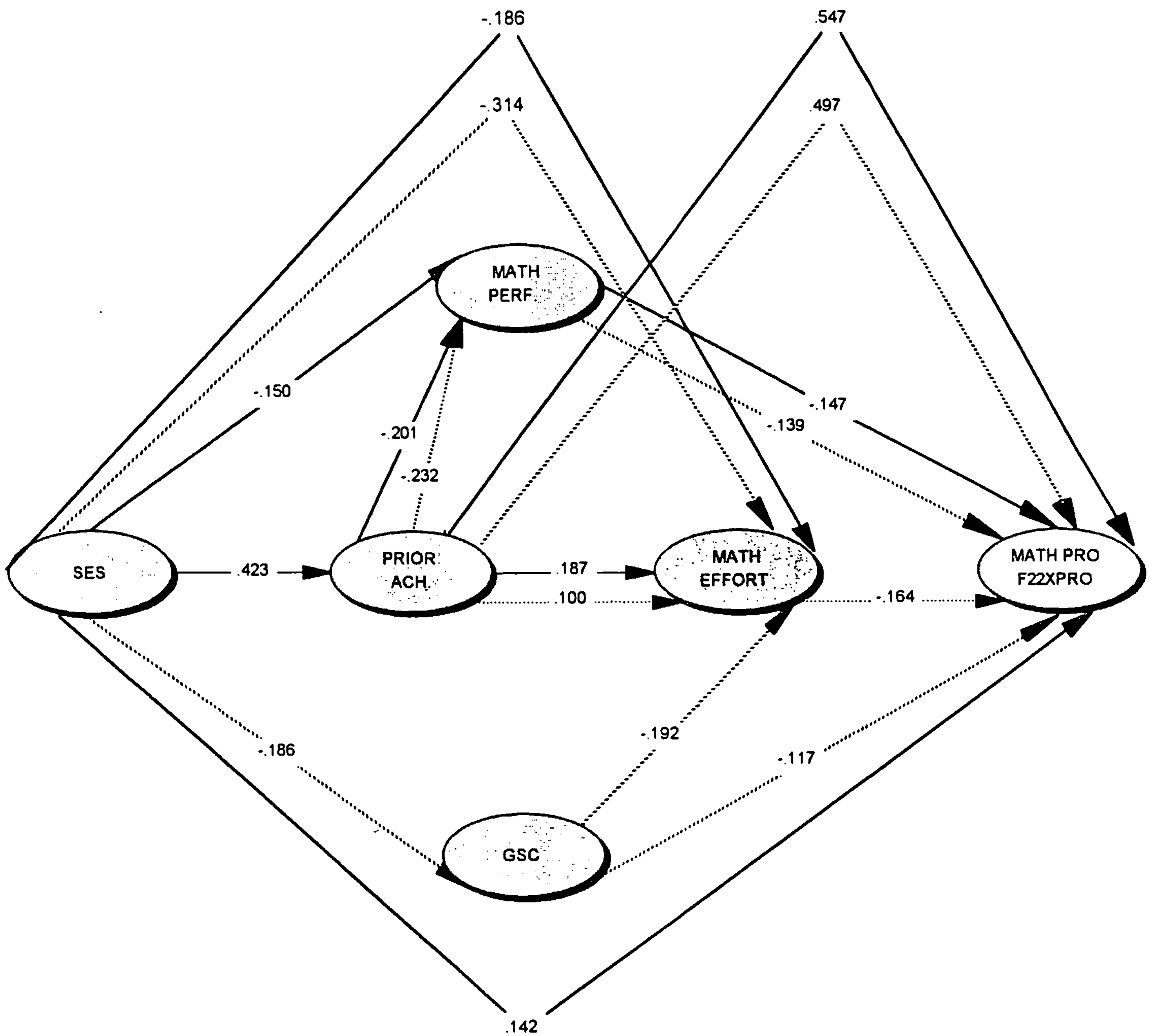

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Figure 1.6

OVERALL SCIENCE PROFICIENCY
MALES
INTACT : ———— NONINTACT: -----------

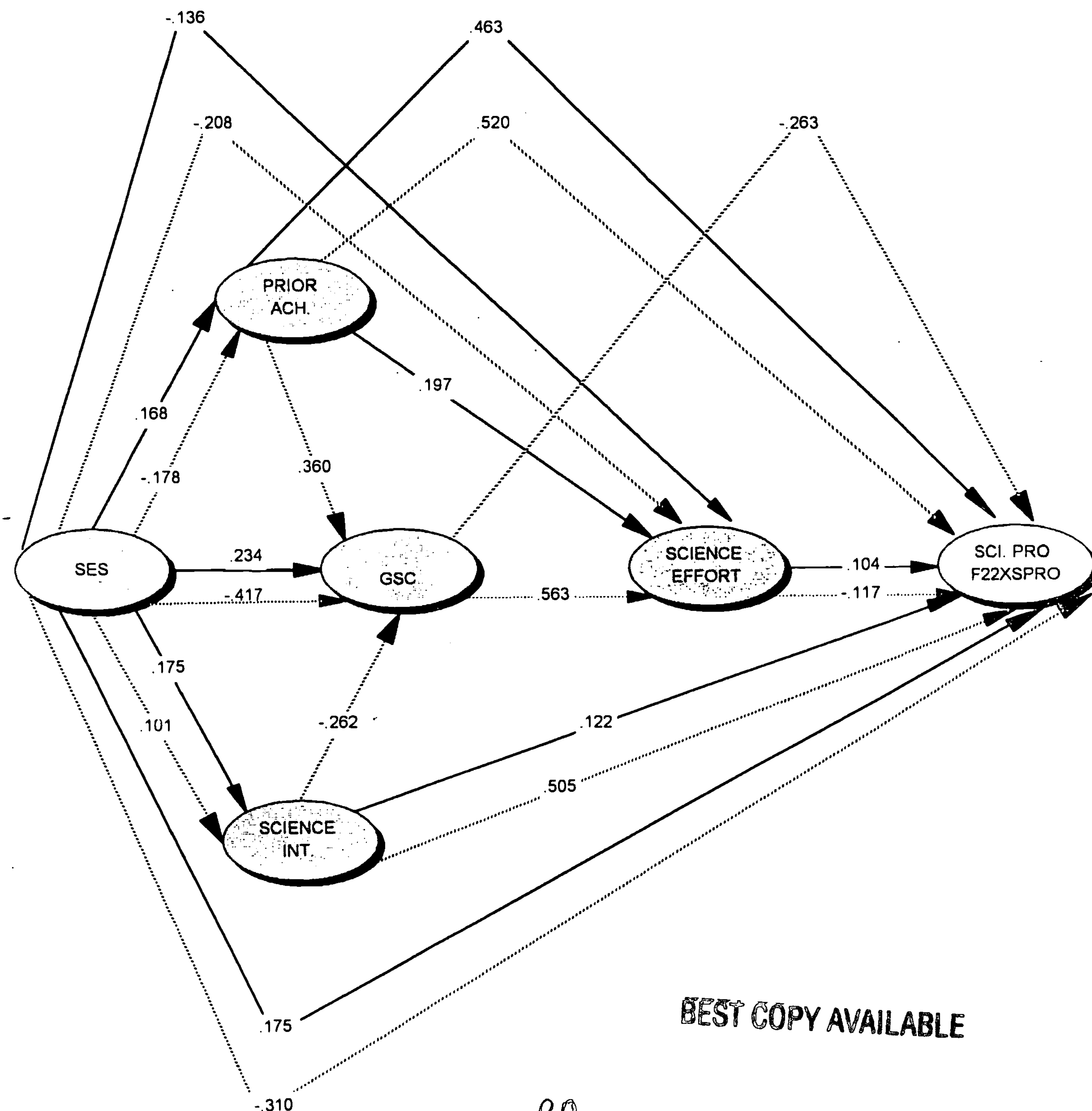

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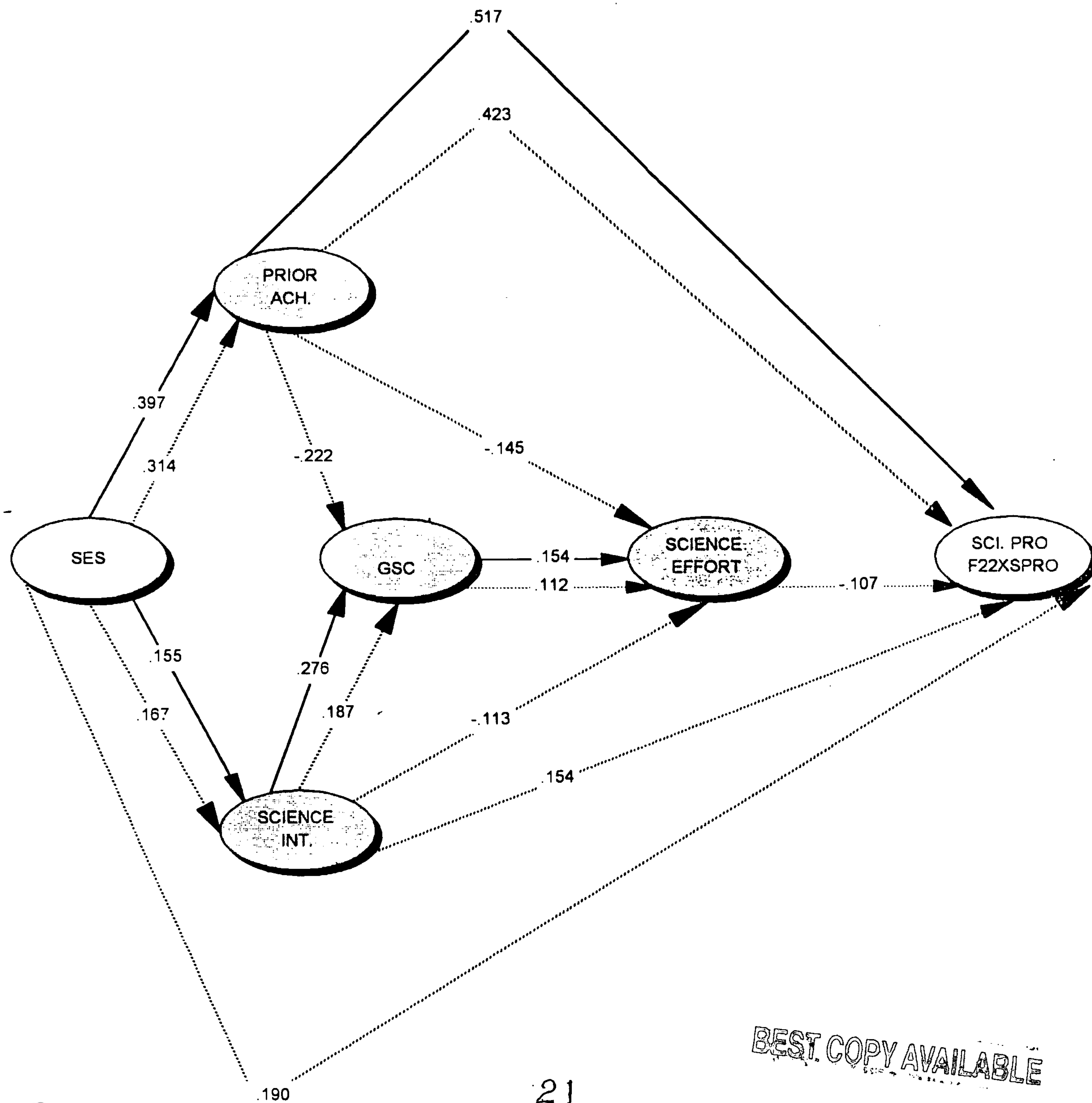
Figure 1.7

OVERALL SCIENCE PROFICIENCY
FEMALES

INTACT: ———— NONINTACT: -----------



was the best predictor of achievement. This finding is consistent with previous research (Campbell & Koutsoulis, 1995; Miranda, 1998; O'Connor, 1997; Verna, 1996).

Directly influencing prior achievement for the males in both intact and nonintact households for both criteria was SES. This is consistent with prior empirical research (O'Connor, 1997). Similar results were evinced for the females for the terminal variable science achievement and for females of intact households for the criterion mathematics.

Additional salient findings are explained per terminal variable with an emphasis on demographic similarities and disparities.

Mathematics Achievement

For both genders in both intact and nonintact households, mathematics achievement was directly influenced by positive prior achievement and negative mathematics performance.

<u>Males</u>

An additional key finding for males from both intact and nonintact households, was that high SES directly influenced the criterion. For nonintact households, additional direct influences were low mathematics effort and GSC.

<u>Females</u>

Additional direct influences included high SES for intact households and low GSC and math effort for nonintact households.

Science Achievement

For both genders in both intact and nonintact households, high science achievement was directly influenced by high prior achievement.

<u>Males</u>

High science interest directly influenced high science achievement for both intact and nonintact households. Additional direct influences included high science effort for intact males and low science effort and GSC for nonintact males.

<u>Females</u>

Additional direct influences included high science interest and SES for nonintact households.

IMPLICATIONS

The results of this study show the best predictor for achievement for males and females from both intact and nonintact households was prior achievement. This robust influence of prior achievement for both males and females as an egregious predictor variable for achievement is consistent with a body of research (Campbell & Koutsoulis, 1995; Miranda, 1998; O'Connor, 1997, Verna,1996). Males and females also closely paralleled each other on terminal models. Again, this finding is in agreement with prior research (NELS: 88; O'Connor, 1997). Similarly, considering the projected increase of "atypical" family structures within the United States, a very positive finding was that family structure did not significantly impact upon achievement.

Another important finding for both genders within both family structures was the direct negative influence of math performance. This enigmatic finding of low performance in relation to high achievement could be due to the limitation of the preset questionnaires and/or the accuracy of students rating themselves. However, there is evidence in the literature that suggests low achievement level students expect to pursue higher level courses and graduate college (Signer and Bauer, 1997).

Another important finding was the strong positive influence SES had on intact and nonintact males. This finding is consistent with previous research (Campbell & Koutsoulis, 1995; Campbell & Wu, 1994; Coleman, 1966; O'Connor, 1997) which denoted that socioeconomic levels are associated with educational levels. Similarly SES also had a direct positive influence for intact females on the criterion mathematics, and for nonintact females on the criterion science. Research shows that students from higher SES were found to complete more mathematics (NELS: 88) and consequently have higher achievement in mathematics (Hoffer, 1995).

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Sharon Anne O'Connor, Ed.D.
EDUCATION DEPARTMENT
Molloy College
Education in the Dominican Tradition
1000 Hempstead Avenue
P.O. Box 5002
Rockville Centre, NY 11571-5002
(516) 678-5000 Ext. 6614
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