

Does Parent Educational Status Matter on the Students' Achievement in Science?

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Abstract—The purpose of this study was to determine if parent educational status influences the achievement in high school science. This study utilized the student's grade point average (GPA) for science during high school years to measure achievement. The data for this study came from the National Assessment of Educational Progress (NAEP) High School Transcript Study (HSTS) 2005. The study described the graduating high school students in the U.S. by their parent educational status and their academic achievement in science. The study compared the mathematics achievement between parent educational statuses. The comparison revealed that there were statistically significant differences in science GPA scores between parent educational statuses; however, the effect size was small.

Keywords—component; achievement; parent educational status; socioeconomic; science

I. INTRODUCTION

Significant studies have suggested that socioeconomic status is one of the best predictors of student achievement (Coleman, et al., 1966; Lee, Bryk, & Smith, 1993). Parent educational status is considered one of the most stable aspects of Socio Economic Status (SES) because it is typically established at an early age and tends to remain the same over time (Sirin, 2005). It has been well documented that family plays a meaningful role in a child's academic performance and development (Cornell & Grossberg, 1987; Thompson, Alexander, & Entwisle, 1988; Tucker, Harris, Brady, & Herman, 1996). Mothers' levels of education and family incomes influence adolescent educational outcome expectancy beliefs (Rhea & Otto, 2001). A study by Campbell, Hombo, and Mazzeo (1999) using NAEP data

indicated that students who reported higher parental education levels tended to have higher average scores.

Parent educational status as an indicator of SES reflects the potential for social and economic resources such as household incomes that are available to the student. Income and education are highly correlated in the United States (Hauser & Warren, 1997). When income is examined as a separate variable the research shows a consistent positive relationship between family income and student achievement. Hill and O'Neil (1994) found that increasing family income by \$10,000 per year is associated with an increase in student achievement of 2.4 percentile points. Grissmer, Kirby, Berends, and Williamson (1994) had similar findings on the relationships between income and mathematics as well as income and reading achievement.

Although many action studies have been conducted in parent education status and academic achievement few of them were based on an analysis of a national data base, and thus, the factors identified in those studies have limited generalizability. The purpose of this study is to examine the relationships between parent educational status and student achievement through analyses of the National Assessment of Educational Progress (NAEP) data base.

II. PURPOSE AND OBJECTIVES OF THE STUDY

The purposes of this study were to describe and investigate the influence of parent educational status on the students' achievement in science. The rationale for the study was to determine if parent educational status contributes to the academic achievement of high school students in science. The results of the study attempted to provide evidence for the value of parent education status as a predictor to students' achievement in science.

Specific objectives formulated to guide the researchers include: 1) To describe graduating high school students in the U.S by their parent educational status. 2) To describe academic achievement of graduating high school students as measured by their science GPA scores. 3) To compare achievement, as measured by science GPA scores, of graduating high school students by their parent educational status.

III. PARENT EDUCATIONAL STATUS AND ACHIEVEMENT

Dave and Dave (1971) found that higher percentages of rank holder belong to homes with higher parental education and higher percentage of failed students belong those who have lower parental education. Rumberger (1995) found that students' "family background is widely recognized as the most significant important contributor to success in schools" (p 587). Rumberger's research supported the findings of earlier researchers who argued that the home has a major influence on student school success (Swick & Duff, 1978) and that it is the quality of relationships within students' home environments that has an important effect on school performance (Neisser, 1986; Selden, 1990; Caldas, 1993). Many factors in the family background have some associations with students' success throughout school and in young adults' eventual educational and occupational attainment. Such variables include family structure (socio-economic status and intact/single-parent families), parental education level, parental involvement and parenting style (Jacob and Harvey, 2005).

Previous studies have showed that students who come from low-income and single-parent homes have significantly less school success than students from high socio-economic (Martini, 1995; Walker *et al.*, 1998) and intact families (Amato & Keith, 1991; Astone & McLanahan, 1991; Downey, 1994; Entwisle & Alexander, 1995; Heiss, 1996). Some potential explanations were - parents in such settings reported lower educational expectations, less monitoring of children's school work and less overall supervision of social activities compared to students from high socio-economic and intact families (Jacob and Harvey, 2005).

More educated parents are assumed to create environments that facilitate learning (Williams, 1980; Teachman, 1987) and involve themselves in their children's school experiences and school environments (Steinberg *et al.*, 1992; Useem, 1992). However, there are students who come from low-income and single parent homes who are high achievers and many students from high socio-economic and intact families who are low achievers. Students may also come from homes where the parents are highly educated and involved in their children's education, yet achieve poorly at school (Jacob and Harvey, 2005).

IV. ACHIEVEMENT AND HIGH SCHOOL GPA

Measuring achievement is a significant part of the education process and informs educators of student ability and progress toward educational goals. It is also the primary gauge used by educators to guide the advancement of students through the education process (National Research Council, 1999). A substantial component of any education

program is assessment, aimed at measuring student performance. A common measure the U.S high school students' academic achievement is the grade point average (GPA). High school subject GPA provides the status of student performance and provides documentation for course competency, mastery and gains. Their purpose is to indicate how effectively educational programs are meeting their goals for student learning. McEwen (2004) simplified that the results of assessments should indicate how effectively educational programs are achieving their goals for student learning. As such, they should inform the educator and should lead to improvements in the teaching/learning environment.

High school subject GPA is also important as predictors of performance at other levels of education (Kuncel, Credé, & Thomas, 2005). Two studies conducted during the 1960's were early evidence of the importance of high school grades as predictors of academic success. Irvine (1966), who conducted a five-year study of University of Georgia students, concluded that high school grade point average was the best single predictor of persistence. Ivey (1966) highlighted that high school rank was the most effective predictor of success in college. Although there has been considerable variability among studies with regard to the predictive value of variables that relate to college success, there is enough consistency to warrant that high school scholarship has been found to be the best *single* predictor of college success (Thomas & Stanley, 1969). Studies on high school GPA by Ramist (1984) and Willingham and Breland (1982) concluded that GPA is one of the best predictors of college grades. Based on these findings, this study used subjects' GPAs to determine the achievement of business education high school students.

V. METHOD

A. Population and Sample

The target population for this study is all public and private high school students in the U.S. The frame for this study is defined as all students enrolled in public and private high schools in the U.S. All public and private high schools in the United States with one or more graduates in 2005 were eligible for HSTS 2005. The accessible population is defined as all graduating high school students enrolled in public and private high schools in the U.S in 2005 and had valid scores in the database of NAEP. The subjects for this study were the samples of the defined accessible population. Students with disability were eliminated from this study to have appropriate comparison groups in the event that one group of handicapped students enrolled in them that may skew results.

The National Assessment of Educational Progress (NAEP) High School Transcript Study (HSTS) 2005 consisted transcripts from about 640 public schools and 80 private schools. These transcripts constituted a nationally representative sample of 26,000 high school graduates, representing approximately 2.7 million 2005 high school graduates..

B. Instrumentation

The instrument used for this research was a disc containing data sets from NAEP HSTS 2005. An Electronic Code Book (ECB); restricted-use data on high school courses; student and school demographics; and technical information for using, analyzing and interpreting the data, are included on the CD-ROM. The variables of the investigation were copied directly from the data sets into SPSS. The variables transferred from this archival database were: age, gender, and GPA scores in science.

C. Data Analyses

Descriptive statistics were used to describe the data for objectives 1 and 2. Independent t-tests were used to conduct the analyses for objective 3. The *alpha* level was set *a priori* at .05. The effect sizes for the t-tests were interpreted according to Cohen’s (1988) guidelines

VI. FINDINGS

A. Objective 1: Parent educational status distribution

Objective 1 was to describe the students’ parent educational status. The educational status of respondents’ parents was examined. Respondents were asked to identify the educational status of their parents by choosing one of three categories for both the mothers’ educational status and the fathers’ educational status: “did not complete high school,” “completed high school or/and some college but no degree,” and “earned a bachelor’s degree.” Table 1 illustrates the data with regards to their parental highest educational status.

The largest group of respondent (*n* = 7,739, 50.1 %) has either parent who graduated from college. The second largest group has either parent graduated from high school and with some college education (*n* = 6,657, 43.1%). The third largest group has neither parent graduated from high school (*n* = 1,050, 6.8%). There were 8,492 respondents whose parent educational status was unknown. The results should be read with caution as there were 8,492 respondents whose parent educational statuses were unknown..

TABLE I. DESCRIPTION OF PARENT EDUCATIONAL STATUS FOR HIGH SCHOOL SENIORS FOR NAEP HIGH SCHOOL TRANSCRIPT STUDY 2005 IN THE U.S

Parent Educational Status	Number	%
Did not graduate high school	1,050	6.8
Graduated high school, and some college education	6,657	43.1
Graduated College	7,739	50.1

Note. *n* = 15, 446; Unknown = 8,492.

Source: U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics, NAEP High School Transcript Study 2005

TABLE II. DESCRIPTION OF STUDENT ACHIEVEMENT LEVELS ON SCIENCE FOR GRADUATING HIGH SCHOOLS IN 2005

Achievement Level (GPA)	Min	Max	Mean	Number	%
Science GPA Score	0.250	4.000	2.722		
B or Better (3.000 – 4.000)				10,044	42.0

Between C and B (2.000 – 2.999)	10,259	42.9
Below C (0.000 – 1.999)	3,611	15.1

Note. *n* = 23,914.

B. Objective 2: Students’ achievement in science

Objective 2 was to describe the academic achievement of graduating school students as measured by their science GPA scores. There were 23,914 valid science GPA scores in the data set. Table 2 illustrates the data regarding the achievement of all students on science as measured by their GPA. The highest possible GPA on science was 4.000. The lowest possible scaled score was 0.250. The mean GPA score of all students on science was 2.722. Students with GPA less than 2.00 accounted for (*n* = 3,611, 15.1%) of respondents. There were (*n* = 10,259, 42.9%) students who had GPA between 2.000 to 2.999 and (*n* = 10,044, 42.0%) students who had GPA 3.000 or greater. There were 24 missing values.

C. Objective 3: Comparison of science GPA scores between parent educational status

The third objective was to compare science achievement as measured by science GPA scores by students’ parent educational status. The researchers acknowledge that the numbers of students in groups based on parent educational status are not similar proportionately and that this is a limitation of this analysis.

Comparisons for differences in the mean science GPA scores and the variable parent educational statuses were made following collapse and recoding of the levels of parent educational status into “Either Parent College Graduate” and “Neither Parent College Graduate” categories. This maneuver was performed in an effort to reduce the danger of achieving spurious results after descriptive statistics revealed that the other parent educational status variable category “Did not graduate high school” had much lesser respondents as compared with the other two categories. Table 3 illustrates the parent educational statuses were collapsed into two categories. There were (*n* = 7,738, 50.1%) students who had either parent college graduate and (*n* = 7,708 49.9%) students who had neither parent college graduate.

TABLE III. PARENT EDUCATIONAL STATUS COLLAPSED INTO TWO CATEGORIES FOR HIGH SCHOOL SENIORS FOR NAEP HIGH SCHOOL TRANSCRIPT STUDY 2005 IN THE U.S.

Parent Educational Status	Number	%
Either parent college graduate	7,738	50.1
Neither parent college graduate	7,708	49.9

Note. *n* = 15,446.

TABLE IV. COMPARISON OF MEAN GPA SCORES BETWEEN GENDER ON SCIENCE FOR HIGH SCHOOL SENIORS FOR NAEP HIGH SCHOOL TRANSCRIPT STUDY 2005 IN THE U.S.

Subjects	Either parent college graduate		Neither parent college graduate		<i>t</i>	<i>p</i> > <i>t</i>	Cohen's <i>d</i>
	Mean	SD	Mean	SD			

Science	2.740	0.74	2.561	0.74	15.06	<.001	0.24
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Note. Either Parent College Graduate: $n = 7,738$; Neither Parent College Graduate: $n = 7,708$ Source: U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics, NAEP High School Transcript Study 2005.

Table 4 illustrates that an independent t -test analysis revealed “Either Parent College Graduate” students had higher science GPA scores than the score of “Neither Parent College Graduate.” “Either Parent College Graduate” students had a statistically significantly t -test ($t = 16.93$) for higher mean GPA score ($m = 2.893$) than “Neither Parent College Graduate” students ($m = 2.603$). The statistical differences existed between the GPAs of “Either Parent College Graduate” students and “Neither Parent College Graduate” students revealed an effect size Cohen’s d ($d = 0.39$) which corresponds to small effect size.

VII. CONCLUSIONS

The majority of graduating high school students has either parent graduate from college. This is based on the finding that 50.1% of the students had either parent graduate from college. Most of graduating students attended public schools. This is based on the finding that 89.6% of the students went to public schools.

Most graduating high school students had better than C grade in science. This conclusion is based on the finding that 20,303 (84.9%) students had GPA 2.000 and above. Conversely, 3,611 (15.1%) had lower than C grade or GPA less than 2.000.

“Either Parent College Graduate” students had higher GPA scores on science than the scores of “Neither Parent College Graduate” students. This conclusion is based on the finding that the mean difference with statistical significance ($t = 16.93$, $p < 0.001$) was found between the two groups and Cohen’s d ($d = 0.39$) revealed a small effect size. This result is consistent with Campbell, Hombo, and Mazzeo (1999) study which indicated that students who reported higher parental education levels tended to have higher average scores.

Parents play an important role in their children’s learning. Aside from being actively involved in their children’s education, parents also provide a home environment that can affect learning. Parents serve as a model for learning, determine the educational resources available in the home and hold particular attitudes and values towards education. Although it is difficult to examine the home environment of each student, the educational attainments which leads to occupation of parents serve as an indicator of the values and resources with which parents create this environment (Education Matters, 2005).

VIII. IMPLICATIONS AND RECOMMENDATIONS

Parent educational status has been identified as an important factor affecting student achievement (Miller, 1980 and Dryfoos, 1990), but other parent related variables need to be addressed. As a result, a number of research questions rose for further studies. For example, do parents pass on innate ability to their children? To what extent does role-

modeling and creating a conducive home environment to study play a role? Are children in these households more likely to receive assistance from parents in their quest to achieve higher achievement in education?

Parents need to be involved with their children education for achieving higher achievements. Both the government and schools need to focus on parent awareness programs in education that could lead to better student achievement (Darling, 2008).

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