THE ROLE OF SOCIAL CLASS MODELS IN THE RELATIONSHIP BETWEEN SOCIOECONOMIC STATUS AND ACADEMIC ACHIEVEMENT

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Dedication

This dissertation is dedicated to my special one in eternal embrace of God.

Abstract

Educational models of achievement almost always include SES measures but these measures are typically selected in an atheoretical way. Using social class theories to conceptualize SES in a study and to help select SES measures should enhance the credibility of inferences. The social class theory literature was reviewed and used to identify SES measures consistent with particular theories. The reviewed social class theories were Weberian, Marxian and Occupationalist theories and SES measures consistent with these theories were income, education, and occupation, respectively. A meta-analysis was used to provide an empirical test of the effect of selecting SES measures in a theoretically grounded way on the relationship between SES and achievement. The results indicated that there were small differences favoring the theoretically grounded measures. The importance of educational researchers turning to the social class literature for guidance in conceptualizing and measuring SES is discussed.

Table of Contents

List of Tables

List of Tables (continued)

List of Figures

Chapter I

Introduction

Educational studies of achievement often include one or more measures of SES to control the effect of this factor. However, most educational studies relating SES to academic achievement have used measures of SES with little, if any, theoretical justification. Lack of a theoretical foundation has made it difficult to know exactly what features or aspects of SES are being measured and precisely what the achievement-SES relationship reflects.

There is no widely agreed upon definition of SES but many definitions have appeared in the literature. Lavin (1965) defined SES as "…an index of the position of the student's family in the status hierarchy." This term is broad and not specific about what source(s) produce status hierarchy. Powers (1982) defined SES as "the social and economic life chances individuals' experience." This definition conveyed that the social and economic sources of power bring common life chances which in turn place people in a hierarchy. This SES definition also suggested that SES might be composed of multiple constructs (e.g., social and economic) and that measures of SES should represent these constructs. Hauser and Warren (1997) defined SES as "... a shorthand expression for variables that enable the placement of persons, families, households and aggregates such as statistical local areas, communities and cities in some hierarchical order, reflecting their ability to produce and consume the scarce and valued resources of society". The National Center for Education Statistics (NCES, March 17, 2009) defined SES as a combined measure of an individual's or family's economic and social position

relative to others, based on income, education, and occupation. (http://nces.ed.gov/programs/coe/glossary/s.asp)).

Despite the lack of agreement of a single definition of SES the perception (correct or incorrect) of the impact of SES on achievement has ensured that SES continues to be widely used in educational studies of achievement. Both White (1982) and Sirin (2005) in their meta-analyses of the SES-achievement relationship pointed out that studies using SES measures lacked explanation regarding the definition of SES, producing an important inconsistency that affects the interpretation of results. White (1982) mentioned that some variables are frequently used as measures of SES such as income, education, and occupation of parent(s), whereas others are used less frequently, for example, dwelling values, school resources, items at home, ethnicity, free/reduced lunch, teacher and pupil ratio, and teachers' salary. However, the rationale behind selecting either a more or less common SES measure was not provided in the studies in White's meta-analysis. This raises important questions about what SES measures are measuring and whether the information provided by these measures is consistent with a researcher's purpose.

Using SES in an atheoretical way also raises questions about the impact of this practice on the correlation between SES and achievement. An important feature of studies involving SES and achievement is that the size of this relationship varies considerably across individual studies. White (1982) and Sirin (2005) conducted two meta-analyses that examined the overall relationship between SES and achievement. These two meta-analyses attempted to explain the variation in the SES-achievement relationship using study characteristics such as type of SES measure and type of

achievement (e.g., mathematics, literacy) as moderators. Although the overall average correlation between SES and achievement from these two meta-analyses seemed to indicate a low-moderate relationship (White: .315, Sirin: .29), the impact of type of SES measure and type of achievement in the relationship differed.

Correlations between SES and achievement in White (1982) ranged from -.75 to .975, and Sirin (2005) reported that all of his study's correlations published between 1990 and 2000 were positive (.005 to .77). The consensus within the education community that higher SES relates to higher academic achievement makes negative correlations questionable, although the majority of White's correlations were negative. More importantly, it was not clear why the ranges of the correlations varied so dramatically in the two meta-analyses. Such a wide range of correlations could be due to a number of factors including measurement error, restricted range, scale of measurement, or a relationship that varies dramatically across different populations (e.g., students, parents, and ethnic groups).

Another feature that might have added variation in the correlations between SES and achievement in the White and Sirin meta-analyses was in the type of achievement. Many educational studies use the term "achievement" in a more general way to indicate any kind of test children/students take including IQ, classroom tests, standardized tests, performance assessment, graduation exams, and college-entrance exams. Depending on the purpose and use of any particular test, the interpretation of the term "achievement" can be different. Researchers need to specify which type of achievement test is used.

For example, many researchers use IQ and standardized achievement tests interchangeably under the general umbrella of achievement. IQ tests are used to

measure intelligence and often focus on the ability to analyze and synthesize, whereas standardized achievement tests mainly assess what students have learned in a school curriculum (Cole, 1990). Other types of achievement indicators found in the studies used in White's meta-analysis such as high school drop out, entering college, years of school, or passing a high-school graduation exam raise questions about whether these should be treated as equivalent to more traditional achievement indicators such as a standardized test. Also, students' performances in verbal areas may be different than in math and may need to be treated separately.

It is important to examine the variation in the SES–achievement relationship that may be attributable to the atheoretical selection of SES measures in educational studies of achievement. Defining SES in a conceptually rigorous way and selecting measures consistent with this definition is critical to generating valid inferences about the impact of SES on achievement.

Importance of the study

SES measures should be selected in a theoretically-grounded way to enhance inferences. This study provide an outline of how three social class theories can be used to identify theoretically-grounded measures and uses meta-analysis to empirically test the impact of these theoretically-grounded measures.

Social class has often been used to refer to social boundaries that could not be crossed due to conditions from birth, (e.g., caste). As societies became more advanced, however, people were able to achieve power beyond their inborn class during their life by acquiring the resources to move upward. Class mobility became more fluid and SES became more meaningful since one's standing could be measured based on social and

economic power at a given stage of a person's life. However, it has not been clear why particular social and economic powers became important in dividing a society or how these two sources should be combined into one measure of status.

For example, some studies have attempted to create a prestige hierarchy using measures like neighborhood, and school district characteristics, or even ethnicity. But it was not clear whether or how, for example, neighborhood characteristics or ethnicity represented social and economic power. Also, measures like possessions at home or eligibility for a free/reduced price lunch appeared to represent economic wealth, but they were more a product of economic power not the source of economic power. Put another way, they may have been the result of differences in wealth but were not direct sources of social or economic power. What is missing in many of these studies of achievement is a conceptualization and measurement of SES that is theoretically-grounded.

Three major social class theories are presented in this study 1) Marxian, 2) Weberian, and 3) Occupationalist theories. Modern socials class theory started from Marx and was focused on economic resources whereas Weberian theory argued that social class formation can be based on more than economic resources. Occupationalist theory incorporated the complexity of distribution of power of which sources are more diversified. Thus each theory relied on somewhat different explanations as the basis of social class formation. It is also important to realize that SES measures that are related to social class formation varied in each theory due in large part to the time period in which the theory was developed. However, in all cases SES measures were selected to represent the source of power in forming social class.

For example, in Marxian theory, economic power is the source of forming social classes and can be observed in income and the fact that different levels of income bring different life chances in society that place people into different social classes. Some measures can be considered to be inconsistent with Marxian theory when they are the result of differences in power, for example, a dwelling area can be an indicator of wealth and it the result of different life chances but it does not cause differences in economic power among people. In Weberian theory, sources of power are recognized in three dimensions (i.e., economic, social, and political). Social power can come from different educational levels that can lead people to different social roles. Political power implies hierarchical power that can be differentiated in a person's job position. Occupationalist theory suggests that modern society has a complex set of sources of power that distribute people's values into different positions in a society. However, people can still be grouped by their occupations which imply that their life styles and chances are similar.

SES measures selected from each theory represent sources of power that can explain social hierarchy and can be considered theoretically grounded. SES measures that are not consistent with a social class theory can not explain power or social hierarchy and will be considered atheoretical. The impact of using theoretically grounded SES measures will be empirically examined using meta-analysis.

A collection of studies examining the relationship between SES and achievement (effect sizes) will be coded to indicate whether each study used theoretically grounded SES measures. Each study will be also coded to reflect type of achievement and characteristics of studies (e.g., percentage of females, percentage of

African Americans, publication type, years of study etc). The meta-analysis will help to summarize the impact on average effect sizes using theoretically grounded SES measures and those atheoretically chosen SES measures. Differences between using theoretically grounded SES measures and atheoretical SES measures will provide an estimate of the impact of using theoretically-grounded measures of SES.

Purpose of the study

The purpose of this study is to examine the importance of conceptualizing SES based on social class theory and selecting measures consistent with this conceptualization. Reviewing major social class theories and how they have influenced the development of SES will provide a theoretical foundation for studying the impact and role of SES on academic achievement. Since the concept of SES is built on an interpretation of social class theory, of particular interest is the research orientation of sociological theory in the selection of particular indicators of SES.

Lastly, it is important to point out that the terms social class, SES, social status, social hierarchy, and social stratification have generally been used interchangeably by researchers (Breen & Rottman, 1995). However, “social class” is not viewed by all sociologists as congruent with SES but for research purposes this investigation will treat the two as interchangeable, providing a coherent theoretical basis for this investigation.

Definition of terms

- *Achievement*: the occupancy of status by virtue of the individual’s accomplishments.

- *Class:* a type of stratum in which the positions are acquired at birth by succession from the parents but may be altered later by achievement or lack of it.

  A class consists of locations for market participation that are broadly similar.

- *Mobility:* how and why people or families change position in the class structure (social mobility: the phenomenon of people or families moving from one class to another).

- *Position:* a place in a given social structure.

- *Power:* the determination of others' behavior in accordance with one's own ends.

- *Social class:* the hierarchical distinctions between individuals or groups in societies or cultures.

- *Socioeconomic status (SES):* a combined measure of an individual's or family's economic and social position relative to others, based on income, education, and occupation. When analyzing a family's SES, the mother's and father's education and occupation are examined, as well as combined income, versus with an individual, when their own attributes are assessed. Position within a class or stratum is referred to as a station or status.

Chapter II

Literature Review

The theory of social classification began with Marx in the 19th century, and since then various ways of describing social classification or stratification have appeared. The social classification theories after Marx generally viewed society as a hierarchy, which means people perceive others according to hierarchical positions in society. The theories of social stratification reflected dimensions of power in society meaning sources of the determination of others' behavior in accordance with one's own end, which in turn determines the hierarchy. The sources of power in what people value have changed over time, but in general major sources of societal power divide people into groups who share various commonalities. Social theories form homogeneous groups of people as a function of power determinants or by power determinants and consequences of power (e.g., rewards of power, life styles).

Identifying which homogeneous group individuals belong to, has been an interest of governments for census or policy purposes, and of social scientists for research purposes. Measures of social classification/stratification have been developed and used in this process. However, several concerns over measuring sources of power have been raised. First, the validity of many of the measures is in question. The measurement of social class/strata needs to represent the dimension of power, and it is frequently unclear that this is the case. Second, the measures need to be reasonably easy to obtain. If what a researcher is trying to measure is very complicated to collect or costly, it will be unlikely to be used. Third, the measures need to reliably reflect social power over time

because in order for SES measures to be valid indicators of social class they have to be reliable.

Indicators measured in social class theory play an important role in explaining factors which affect the relationship between SES and academic achievement, which is a focus of this review. When one or more variables moderate or mediate the relationship between SES and academic achievement, decisions on inclusion of those factors in a data analysis might impact the correlation between SES and academic achievement. Several models investigating the factors that may influence the relationship between SES and academic achievement, including choice of social class theory and associated measures, are presented in this paper.

Lastly, theoretical conceptions of academic achievement are reviewed. The theoretical model of achievement used in a study may have important implications for SES and its measures. The conception of academic achievement is largely divided into two theories: 1) achievement as discrete skills and 2) achievement as higher order skills and advanced knowledge. The former conception is practiced in educational settings testing classroom instructions. The latter conception is more difficult to measure directly but is important in understanding student learning.

A brief review of social class theory is presented as an introduction to how thinking about social class theory has evolved, with emphasis placed upon the theories that have provided a rationale for the measurement of SES in educational research. In sum, three major social class/status theories are introduced: 1) Marxian theory, 2) Weberian theory, and 3) Occupationalist theory. Also, two general categories of measures of social class/status are described: prestige and occupation. Theories

regarding the relationship between SES and academic achievement are investigated with different but related factors, followed by a brief summary of theories on academic achievement. The goal is to provide a framework in which social class theories are used to examine commonly used measures of SES in educational studies in a way that promotes the use of theoretically-grounded-SES measures and studies their impact on the SES-achievement relationship.

Social Stratification Theories

There are many theories describing society, but one common starting point is that people view others not as equals but as having a differentiated status. Levels of a hierarchy are distinguished by power differences, which are related to the distribution of a hierarchical structure. There are many different theories of allocation that distribute goods across various positions or occupations in the division of labor. Marxian theorists divide societies by means of production. Weberian theories acknowledge the multiple dimensions of power in class, status and party, and Functionalists place people in a hierarchy according to the importance of the function of their occupation. Lastly, Occupationalists identify the status of people that are in similar occupations sharing homogeneous characteristics.

Marxist: Ownership of the Means of Production

Marxists dichotomize society into capitalists and workers based on ownership and means of production. Different types of societies in history can be explained by how means of production was controlled. The mechanism of how society can be divided into the two classes in relation with production is expressed by exploitation. Exploitation by the capitalists of the workers causes class consciousness among the workers. Social

revolution is the way to change social structure but it does not allow social mobility between the two classes. With the rigid structure of social class, a middle class is not permitted.

Marx was a pioneer in recognizing social class as a basis for economic and social reform. He drew his ideas from Hegel who had applied the model of dialectical idealism to explain the progress of history. Marx saw social progress from a similar perspective that became known as dialectical materialism. His view was that society is divided into two kinds of people by ownership of means of production: those who own means of production were identified as the bourgeoisie and those who do not own means of production were designated as the proletariat.

Marx viewed each society in history as divided by mode of production, that is, how people earn their livelihood. For example, in societies like ancient Greece and Rome, the mode of production was through slavery. Society in the Middle Ages had feudal means of production. In the ancient world when the mode of production was slavery, the means of production was land and the two classes were masters and slaves. In feudal society, the means of production was also land and class was divided into lords and serfs.

Marxian social class

In modern capitalist societies such as in Marx's time and in our own, Marx thought ownership of means of production (such as property of land, machinery, investment capital or factories), causes division of society, i.e. class. Marx's class divides industrial society into two main classes: proletariat, and bourgeois. In order to live workers sell their labor to capitalists who own the means of production and this is how production

happens. Capitalists as owners of means of production are able to exploit workers (Giddens, 1973). Marx argued that this could happen when the products workers buy exceed their wages. The difference between the price of products and workers' wage is called 'surplus value', which becomes capitalists' profit.

In the society of slavery, masters owned slaves therefore exploitation was possible. In feudal society exploitation existed in that serfs provided free labor to lords and received a share of their production.

Social mobility in Marxian class theory

According to Marx, what bourgeoisies have in common is the fact that each mode of production is eventually superseded by proletariats because of contradictions inherent within it. The same is true of capitalism which will eventually be replaced by socialist society. This will come about when the proletariat recognize themselves to be a class and overthrow the bourgeoisie, in other words, when class consciousness develops and the working class becomes the class. Capitalism is subject to periodic crises in which production outstrips demand, resulting in the laying off of workers and a further decline in demand. As the number of unemployed increase, wages will be driven down, and each of these periodic economic crises will last until wages have been reduced to such an extent that it is once more possible for capitalists to make profits from production. In such crises, Marx argues, both capitalists and workers suffer, but the latter suffer much more, and through this they become aware of the difference between their interests and the capitalists'. Marx pointed out other features that are conducive to the development of class consciousness, including urbanization (which brings workers into

geographical proximity) and increased reduction of skill differences in using between members of the working class, resulting in the homogenization of labor.

Critiques of Marxian social theory

Marx also mentioned a tendency for 'intermediate classes' to disappear as large capitalist enterprises drive out smaller ones, thus leading to the disappearance of groups such as the petty bourgeoisies (made up of small trades people, shoemakers, artisans, self-employed workers, peasants). At the same time, the gap in relative material conditions between workers and capitalists widens because of the continued expropriation of surplus value by the latter (Breen and Rottman, 1995). However, in reality, the middle class is actually increasing as capitalism progresses. The middle class, whose members administer capitalist enterprises as managers, administrators or lower-level clerical workers, are indispensable to the functioning of production although not directly engaged in production themselves. This contradicts Marx's prediction that the middle class will submerge into the proletariat and society will become more polarized.

Weberian: Power or Authority over the Labor of Others

Weber claimed there are three dimensions to power: class, status and party. Other resources besides property/capital are skills and education. The Market system plays a role in assigning societal values to people who can be stratified. Weberians see social hierarchy as allowing mobility through education.

In contrast to dividing society into just two classes, Weber viewed society in more complex ways. Weber understood that the class structure of advanced capitalist societies is actually not polarized. To Weber, class could not be reduced to simply

production and ownership because even within a class there are many conflicting interests. Weber describes the concept that “class creates classes” meaning that people in a separate class correspond to sentiments of belonging in a class of communal identity which constitutes differential ‘status’ (Wright, 1980).

Class (Weber)

Like Marx, Weber starts with economic class. But Weber divided the two economic classes further according to ‘the kind of property….and the kind of services that can be offered in the market’ (Weber, 1968). Among those with property he distinguishes between the ‘dominant entrepreneurial and propertied groups’ and the petty bourgeoisie, while among those lacking property, the market situation of those with formal credentials (the middle class) is distinguished from that of manual workers (Breen & Rottman, 1995).

Status (Weber)

According to Weber, status is the social estimation of honor or esteem through visible lifestyles according to the principles of their consumption of goods. A status group is a group of people who share a common style of life and have a certain level of prestige in society. They share certain preferences (for example, in clothes, furniture, or manner of speaking) which convey meaning and distinguish them from other status groups (Bourdieu, 1984). Status groups exist by virtue of the subjective evaluations (positive or negative) of others, and their members are therefore conscious of the prestige or status that they have as a group.

Party (Weber)

The third dimension Weber used to discuss stratification of society is party. Weber identifies a party as group of individuals who work together because they have common aims or interests. This definition includes political parties but also encompasses any group whose purpose it is to exercise power in society or which concerned with the competition for power' (Hamilton & Hirszowicz, 1987). The power of the party usually comes through the state and its legitimacy. Party is bureaucratic power and is possible within communities which are societalized, that is, which have some rational order and a staff of persons available who are ready to enforce this order.

Weberian social class

Dynamics of these three dimensions of power may overlap in the sense that a social class may also be a status group, or a status group may constitute a party. However, none of these dimensions is, in general, wholly reducible to another. Status groups and parties occupy positions of power which do not rest on an economic basis *per se*. However, these three dimensions are separate powers but one dimension can affect another dimension. Weber argued that economic classes can combine into "social classes" (Breen & Rottman, 1995). Although economic classes are the products of impersonal market processes, other factors intervene to provide the continuity required to transform economic relationships into discrete social categories.

Resources from the economic, class, and political power (party) dimensions are brought into the market to exchange into rewards in society. People with different rewards will gain differential potentials of life chances they can enjoy in life. This places people on different life-chances. Based on similar life-chances, people will have similar consumption patterns which are related to homogeneous life styles in terms of

economical and cultural values. The second dimension of Weber's social class, status, arises when people will acknowledge prestige by judging where other people belong.

The class structure of a particular society depends on the distinctive combination of what Giddens (1973) terms mediate and proximate structuration factors. Mediate factors are those that 'intervene between the existence of certain market capacities and the formation of classes as identifiable social groupings'. Proximate structuration captures the 'localised' factors that condition or shape class formation. Three sources of proximate structuration are highlighted. Two operate within the productive enterprise: the division of labor and authority relationships. The third source of proximate structuration is forged in consumption patterns, as in the emergence of class-specific residential areas (Giddens, 1973).

The line between social classes is drawn when individuals' capacities are similar in terms of their interests, resources, preferences, allegiances, and other characteristics to have sufficient in common to make the variation within the class less than the variation between that class and other classes (Breen & Rottman, 1995).

Role of market system in class formation (Weber)

A class is formed through the market system that assigns values of different resources people bring and places people according to their values of power dimensions. Resources people bring into a capital market can not only be property but also credentials, assets or goods, services or skills (Breen & Rottman, 1995). Weber said "a class situation is one in which there is a shared typical probability of procuring goods, gaining a position in life, and finding inner satisfaction" (Weber, 1968). This probability depends on resources people bring into the market system rather than

reference to their place in the relations of production. The worth of these resources for example, commodity, credit, and labor that people bring unequally into a class situation is identified only through the market system. Where people possess a common set of goods, services, or skills for market exchange, a broadly similar standard living and life experiences will be found. There can be many classes and class conflicts that reflect differing market positions. Boundaries between classes can be drawn by the structure of class relationship 1) ownership of property, 2) possession of educational or technical qualifications, and 3) possession of manual labor. Weber described four classes: the upper class represents privileged owners of property and educated people, the middle class represents people who possess education or technical qualification, and the property-less and lower classes are people who perform manual work.

Life chances (Weber)

Weber's class distinction came from the idea that people bring different resources into the capitalist labor market and through it, life chances are allocated. Objective characteristic such as class influence life chances. Once people are in a class, they have similar life chances. It is more like a community built upon criteria of grouping. This affiliation within groups results in monopolistic privileges. A cluster of class situations are linked together by virtue of the fact that they involve common mobility chances either through career or family. Someone can move from a manual working job to a more technical oriented job when they acquire skills and techniques while working in manual working environments, or can move from the property-less class to the property owning class by inheriting property. Mobility chances introduce the diversity of class under relationships. However, the fewer the mobility chances, the more this facilitates

the formation of identifiable classes and the reproduction of common life experiences across generations. Mobility within the group is confined by occupation which generates similar ranges of material outcomes (Giddens, 1973).

Mobility in Weberian social theory

According to Weber, issues of mobility are especially likely when there is conflict between continuous power dimension such as economic resources and discrete power dimensions such as status. Change of distinct status plays an important role in mobility along with changes in economic resources. Typically status that is handed down in a family is likely to be passed on to the next generation. However, through capitalist market systems, mobility can occur because people bring different resources into a market that can be achieved by individuals, such as education.

The mechanism of how people move to other classes and why they move has been studied by many mobility analysts (e.g., Breen & Rottman, 1995; Goldthorpe, 1980) who have argued that mobility can be explained as the result of two processes:1) structural mobility and 2) exchange mobility. The idea of structural mobility is the following: in a given society, the amount of inter-generational class mobility will depend upon the degree of change in the class or occupational structure of that society. So, a society which was developing rapidly should show substantial mobility, in part because many occupations would be declining in importance. For example, men whose father held one occupation would have great difficulty in pursuing the same occupation, and would likely be forced to move out of that class or occupation by virtue of the fact that the occupational positions were no longer available. For example, farming

occupations are diminishing and more technical and informational occupations are increasing.

It is usually argued that the process of structural mobility operates independently of other processes of social mobility, and in particular that it operates independently of processes of exchange mobility, which was concerned with how different class origins influenced mobility and the inequalities in mobility chances that derive from different class origins. The reason why different origins confer different chances of mobility is that they provide people with different resources for mobility. So, people born into more advantaged classes generally acquire higher levels of formal qualifications and in addition, may have other resources (such as kinship links or friendship networks) which they can use to help them acquire a more desirable class position.

Goldthorpe's mobility model

Goldthorpe (1980) developed a Weberian-oriented mobility model in which he argued that patterns of social fluidity (in other words, patterns of inequality of access to particular class destinations as between people of different class origins) were shaped by three factors: 1) relative desirability of different classes as destinations, 2) barriers to entry to these classes, and 3) resources attached to different class origins which allow these barriers to be overcome and the more desirable destinations to be entered. People seek to gain entry to more highly desired destination classes, but to do this they must overcome a variety of barriers to entry (such as the requirement to possess certain educational or other credentials; or the acquaintance of particular individuals), using the resources that they have acquired as a result of their origin-class position.

Occupationalists: Skill and job-based resources

Occupational social theory was introduced by Durkheim (1984) who argued that societal differentiation in the modern era makes it difficult to put people in a few social classes. Because the homogeneity in a social class is broken down into multiple and complex groups, the only way of recognizing their identity is by occupation.

Multidimensions in modern society

According to Durkheim, political society as a whole, or the state, clearly cannot draw on the system of rules of society and it is now lacking. Economic life, because it is becoming increasingly specialized, lies outside political authority. Activity within a profession can only be effectively regulated through a group close enough to that profession to be thoroughly cognizant of how it functions, capable of knowing all its needs and following every fluctuation in it. The group that meets these conditions is that constituted by all those working in the same industry, assembled together and organized into a single body. This is what is termed a corporation, or professional group (Durkheim, 1984). Collective action is diminishing in traditional social classes divided into a few groups, whereas there are intraclass conflicts within a class (Grusky & Sorensen, 1998). Still, collective action can be recognized both horizontally and vertically within an occupational level. Socio-technical changes weakened aggregate solidarities and generated a new stratification order (one more localized) based on life-style, taste, and culture rather than categories of social class. This pattern hampers stereotypical behavior expectations and becomes less binding. Jobs that require multiple activities are breaking down conventional skill-based distinctions. Organized sectors of the labor force such as professionals are expanding rapidly. Vertically organized labor

forces are differentiating and are becoming more "occupationalized." Less organizational but more occupational identity occurs (Grusky &Sorensen, 1998).

Class formation in Occupational class theory

According to Durkheim, individuals who are in the same trade are in contact with one another by the very fact that their activities are similar. Competition with one another engenders mutual relationships. Professional grouping is a moral force capable of curbing individual egoism, and nurturing among workers a more envigorated feeling of their common solidity. As soon as a certain number of individuals find they hold in common ideas, interests, sentiments and occupations which the rest of the population does not share in, it is inevitable that, under the influence of these similarities, they should be attracted to one another. They will seek one another out, enter into relationships and associate together. Thus, a restricted group is gradually formed within a society as a whole, with its own special features. Once such a group is formed, a moral life evolves within it which naturally bears the distinguishing mark of the special conditions in which it has developed. As a consequence, a group will share common circumstances of life and homogeneity of intellect and morals.

Summary

Although Marx is credited for initiating social class theory, Marx's determinant of power-ownership of means of production-did not match the consequences of class division in the sense that each class had heterogeneous life styles and levels of power within it. Also Marx's theory did not describe layers of life styles (e.g., middle class).

Later social class theorists (Weberian and Occupationalist) considered the critiques of Marxism and refined his social theories. Social class was described as social

stratification in a gradational hierarchy, with more than one dimension of power as described by Weber. These theories are more adapted to the complexity of power structures in modern society, and attempted to match determinants of power and the consequences of life styles within each strata of society so that each social stratum becomes more homogeneous. Reviewing these three social theories helps to clarify the power dimensions that form social classes and how changes in one of these power dimensions mobility occurs. These dimensions of power are the origin of selecting social class measures, which will be discussed in the next section.

Social Class Measures: Property, Authority and Skills

Associated with the different social class theories are efforts to measure theoretical concepts. It is not easy to fully capture theoretically abstract social dimensions such as class, status and party in a few indicators. Social class measures have been utilized either as individual measures containing individual dimensions of power or as one measure with several dimensions. Measures of social class need to represent social structure and serve as reliable and valid indicators as well as be practical to obtain. Different measures, both subjective (i.e., prestige) and objective (i.e., occupation), have been used as social class measures historically. Also, depending on the theory a researcher chooses, the ways to classify a measure can be different. Marx originated the theory of objective measurement of social class through the ownership of means of production, and Weber opened the door for measuring status in subjective forms through prestige.

Subjective measures of social classes: Deference and Prestige

In the U.S., economic factors are important in determining the class position of any family or person. They influence the behavior of a class and contribute to the present form of our status system (Warner et al., 1960). But economic factors are not sufficient to predict the class of a particular family or individual or to explain completely the phenomena of social class. In order to do so, money must be translated into socially approved behavior and possessions, and these in turn must be translated into intimate participation with acceptance by members of a higher class (Warner et all, 1960).

Degree of acceptance by other members of society is explained by Shils (1968) who suggested the term ‘deference’. Shils used the term “deference-entitling properties” to infer certain characteristics or properties of [a person’s] role or action. Among the many types of entitlements of attributes, deference from the occupational role is the most important one. Deference -a degree of appreciation or derogation- can be grouped into a common category especially by occupation. Individuals place themselves and others onto an imagined deference distribution. The placement is made on the basis of fragmentary information concerning deference-entitling properties like occupational attainment and life style. Shils referred to this class consciousness as “a matter of sensing one’s membership and being regarded by others as a member.”

Although Shils did not attempt to measure deference, Weber tried to measure prestige that is linked to deference in one’s social position. Prestige draws boundaries between social classes and maintains one’s identity within a class. The idea of measuring social class as prestige is attributable to Weber because Marx’s economic phenomenon creates classes that did not necessarily correspond to sentiments of communal identity which

constitute differential ‘status’ (Giddens, 1973). Weber introduced the concept of prestige or honor that is differentiated in a society. People in the same class share similar sentiments about who they are and those in the other group do not share the same identity. The line (prestige) differentiating different groups are the criteria determining different status. The stratum concept involves grouping people into homogeneous groups using several discrete dimensions of inequality in power. Therefore, this is discrete grouping. Prestige groups practice exclusion or closure such as marriage that has clear distinction between classes. High prestige causes deference, and low prestige causes contempt (Breenan & Rottman, 1995).

Weber’s prestige has often been measured by surveying people and asking them to rate other people in terms of their prestige. An obvious problem of judging prestige is that people employ different criteria (for example, wealth, education or morality) in rating prestige, and thus, it would not be valid in representing social status. Prestige ratings can be unreliable because, depending on those surveyed, the rating can be different. Self-aware class notions will be more likely to rely on opinion than the product of solid evidence of power dimensions such as class, or party (Breenan & Rottman, 1995). In addition, it is difficult to rank an entire group of people in a society using the hierarchy of prestige because surveys asking about prestige have been conducted in a few neighborhoods and the range of prestige in a particular neighborhood does not typically represent an entire nation.

Objective: Occupational Hierarchies

Due to issues related to subjective measures of social class, such as the difficulty of listing all people in one hierarchy, problems of relying on opinion (measuring prestige),

and suspect validity with respect to representing social status, scholars have tried to find alternative ways of measuring social status with objective criteria. However, prestige can not be completely removed from measuring social status because prestige points out that social stratification groups need to involve group identity (Breen & Rottman, 1995). Keep in mind that there has to be some kind of identity-based measure of social status, and at the same time considering multiple dimensions of power factors, using occupation as a measure of social status seemed plausible. Other merits of using occupation as an objective measure of a social hierarchy include its reliability and validity and the fact that occupation can be measured in a variety of ways reflecting different dimensions of social factors (e.g., educational and economic factors, prestige factor, life-chances and style factors, relational resource factor, authority factor, etc). Different categorizations of occupation have been used and criticized over the years.

Composite indices of SES

Blau and Duncan (1967) constructed an index of occupational status based on two measures: 1) educational attainment, and 2) income. Together these variables explained 91% of the variation in prestige ratings and served as a reliable indicator of a given occupation's general standing (based on 446 occupations). Blau and Duncan's model effectively rejects the interpretation of social status as a set of discrete, non-overlapping groupings. They justify their approach by citing the high degree of occupational overlap in the distributions of income, educational attainment, consumer expenditures, measured intelligence, political orientations and residential locations.

Trieman (1976) laid the foundations for a single occupational prestige hierarchy that is applicable across countries and time that he referred to as the *Standard Scale.* In

the International Standard Classification of Occupations (ISCO), the Standard Scale included 509 occupational titles that are comparable across countries. Trieman noted that the average correlation of the new Standard Scale with the reported prestige hierarchies in 55 countries was .91 and that this scale is the best available predictor of the prestige of occupations in any contemporary society. His argument was based on two points. First, prestige depends on the amount of skill, authority, and/or economic control associated with a given occupation. And second, the universal way in which certain occupations are associated with rewards is what explains the invariance of prestige scores across different societies. His explanation was that similar functional needs across societies create similar occupational roles. To the extent that individuals in one occupation differ from those in another (with respect to skill, authority, and wealth), each role leads to stratification.

Using Duncan's Socioeconomic Index (SEI) that measured a composite of education and income, Hauser and Warren (1997) tested whether those two indicators should be weighted equally in representing SES using structural equation modeling on data from the 1994 General Social Survey (GSS). The result was that the weight associated with occupational income was not statistically different from zero. This suggests that the process of occupational stratification is best described by relationships among occupation-based measures of educational attainment, not by the combination of occupation based measures of educational attainment and wage rates. This finding points to occupational differentiation by education as a central feature of the stratification process.

Critiques of prestige rating

Goldthorpe and Hope (1972) criticized the way occupational prestige was constructed in the Blau and Duncan's scale because prestige scales do not measure prestige as it is conceived within the broader sociological tradition. To them, prestige positions do not derive directly from the attributes of a role or collectivity 'objectively' considered, but rather from the way in which certain of these attributes are perceived and evaluated in some culturally determined fashion. Although occupational prestige is related to the objectively measured resources and rewards that Trieman and others focus on, the relationship is at most indirect. That is, skill, wealth, and authority are only meaningful to the extent that such attributes symbolize social superiority or inferiority. Goldthorpe and Hope (1972) argued that prestige ratings like the scale developed by Trieman are not adequately attuned to the symbolic qualities of a given occupation. If it is true that respondents typically evaluate occupations on the basis of what they know (or think they know) about a number of objective characteristics, then the resulting scales will inevitably fail to capture certain symbolic criteria of generalized superiority and inferiority with all their attributes and behavioral implications. The recommendation of Goldthorpe and Hope was to use prestige data as a proxy for SES.

Hauser and Warren (1997) suggested several benefits of using occupation as a SES index: 1) occupation defines how and under what conditions individuals spend much of their time (social role); 2) occupations act as a single measure for economically productive skills, and thus serve as a reliable predictor of earnings; 3) almost everyone can be characterized according to occupation; 4) good occupational data can be readily applied to a wide variety of scales and measures; 5) respondents tend to report

occupational data with a higher degree of reliability and validity than measures of wealth, a characteristic that is beneficial to any number of research endeavors.

Social measures in each theory by occupation

One other advantage of using occupation is that it can be used as a measure of social stratification by all three theories reviewed earlier but classified in different ways. According to Weberian theory, individuals with common status (culture), class (economic status) and party (legal authority), in a group share common life-styles. Occupations that possess common sets of cultural experiences, similar income levels, and come with similar ranges of authority to control people for one's own benefit can be classified into a social status. Weber recognized three different sources of power determinants in society, but common life styles of similar levels of those powers make a homogenous social group. Therefore, a group of occupations such as professional or managerial or manual labor will share common life styles with similar power in class (economic resource), status (social esteem: desirability of job and education level) and party (political and hierarchical power). These three components of Weberian stratification can overlap unlike Marxist's components.

Occupational theory according to Durkheim and others use occupation as a measure of stratification because societies are diversified and it is not easy to classify people according to a few criteria. But people in the same occupation share common interests and we can see patterns among those groups. It is more similar to Weberian theory in which social strata match common life styles, although occupationalists do not consider power determinants that give a hierarchical concept of social positions. But there is a hierarchy in life styles such as consumption pattern and the way of spending

leisure time. Occupationalists' concept of social class is that it is difficult to divide a society into a few groups because each occupation can be identified as a social stratum. There are so many kinds of jobs in society that, if each job represents a class, it might lose meaning to call it social stratification or status.

For Marx, a class is defined in terms of its position in the relation of production: a class is thus not defined in terms of income, for example, since this is a consequence of class position, not a determinant of it. The same is true of occupation, narrowly defined: a self-employed plumber and an employee plumber share the same occupation and may earn the same amount of money but belong to different classes. However, position in the means of production is very important because from it, a range of consequences follow such as political and economical power as well as class consciousness.

However, Marx recognized a number of obstacles to the development of class consciousness, the most important of which is the existence of ideology by which the capitalist class provides a justification for the status quo. This arises because economic power and political power follow the same lines. Thus, in Marx's famous phrase, 'the class which is the ruling material force in society is at the same time its ruling intellectual force' (Marx & Engles, 1965).

Summary

Two major measures of social class are prestige and occupation (occupation is based on income and education). Prestige opened the door for measuring social strata and social stations people are placed in by others according to Weberian theory. Subjectivity of people's opinion in placing others and the difficulty in placing all people in a hierarchical social station led social theorists to look for a more objective social

measure, like occupation. Occupation was a helpful means to identify and reflect bases of power sources, which can be multi-dimensional, and provided a way to divide a whole society by one scale of occupation. Moreover, occupation can be used as a social measure in different social theories because occupation can be decomposed by several dimensions of social resources and power.

The stability and validity of occupation also attracted social researchers to this measure as well as its benefits of practical accessibility. It is important to assess whether SES measures are reflecting power dimensions or major resources in placing people into classes. Other things being equal, a study using a social measure that includes as many of these dimensions as possible will minimize bias. This in turn will allow a rigorous conceptualization of SES and should enhance our understanding of its effects on academic achievement.

Educational Achievement

Educational achievement theory is essentially divided into two schools of thought: 1) achievement as basic skills and facts, and 2) achievement as higher-order skills and advanced knowledge (Cole, 1990).

The conception of educational achievement as basic skills and facts was influenced by the 1960's behavioral psychology movement. Behavioral psychology measured specific behavior observed under given reinforcement. Educational achievement was considered as measuring desired outcomes after specific instruction in school. In the 1970s, this achievement theory went along with the public's concern that students were not learning how to read, write and do basic arithmetic computation. The argument was that educators needed to teach specific, separate, basic skills and facts

and achievement should reflect what was taught in classroom. Many educational measurement specialists promoted criterion-referenced testing or objective-based testing (Popham, 1978). The demands for accountability that became prominent during this period were shaped by this notion and by state-mandated achievement tests, some notions of functional literacy, and lists of knowledge that all educated people should have (Grosvenor, 1989).

The concept of discrete achievement considers, for example, measuring reading skills summing individual skills such as recognizing letters, associating letters and sounds, pronouncing words in sequence, and paraphrasing meaning. More complex reading skills include the ability to: use skills to construct meaning from text, guide the reading process with self-correcting strategies, and use reading as enabling skill for other learning (e.g., Anderson, Hiebert, Scott, & Wilkinson, 1985). In writing, it involves reproducing letters, words, phrases with correct spelling and accepted grammatical form as discrete individual skills. More complex writing skills concern communicating effectively through writing to different audiences. Basic math skills are addition, multiplication, division and subtraction.

The second conception of achievement involves higher-order skills and advanced knowledge focuses on achievement involved with critical thinking or problem solving and advanced knowledge of subjects such as understanding or expertise. This perspective originated from philosophy and cognitive psychology in the late 1970's and the 1980's. Ennis (1962, 1985) suggested that critical thinking involves a high level, logical analysis of a situation or problem, resulting in a decision or conclusion based on principles of logic. However, critical thinking is not easy to break into isolated and

instructable parts; not easy to assess economically; not easy to explain and describe; and cannot be observed directly.

According to Broudy (1988), we have overemphasized the replicative and applicative uses of schooling. The replicative use refers to the ability to repeat knowledge learned in the form learned, and applicative use means the combination of principle and use of principle, often in practical situations. The use of the two abilities includes some of the conceptions of achievement as basic skills and facts. There is a process-content distinction that can be made within the higher-order conception. Ennis focuses on a general process-type of skill, and Broudy, while retaining some of this process orientation, moves to advanced knowledge and understanding. Broudy also mentions that we underestimate the associative uses of schooling and the interpretive uses, which involve increasing the web of associations students have and translating ideas as well as giving meaning. This kind of achievement, he believes, has a lasting and potent impact on students.

This higher order conception of achievement is also studied in the cognitive science approach. Glaser (1985) presents expert knowledge as; 1) a coherence of what is known, 2) knowledge of domain-specific patterns or principles, 3) use of patterns and principles in problem solving, 4) recognition of situations and conditions for using knowledge, 5) highly efficient performance, and 6) use of self-regulating skills (meta-cognitive strategies, such as forward reasoning). These characteristics, presumably describing a desired goal of education as well as a conception of educational achievement, differ markedly from the characteristics associated with achievement as basic skills and facts that can be listed and taught in the short term (Cole, 1990).

Achievement measures used in educational research are a mixture of the two concepts of discrete and higher function. For example, standardized tests students take in school have elements of testing what they learned in school as well as higher levels of thinking e.g., the ability to solve problems, ability for abstract thinking, or analyzing and constructing skills. IQ tests used in educational assessment are closer to a basic and abstract ability that students do not learn in school. GPA is more directly related to measuring discrete pieces of what students learn in class. Some educational studies study discrete achievement and some study achievement based on higher-order thinking. The differences between these two conceptualizations of achievement suggest that they should be examined separately when studying the relationship with SES.

Relationship between SES and educational achievement

Educators have long observed that children from higher social classes tend to have higher academic scores in school. Educational scholars have sought to measure the extent of this relationship and have generally found a positive correlation between parents' social class and children's academic progress in school. Many studies on this subject reported a bivariate correlation around .30, but, some studies had correlations as low as .01 to .08. These studies varied in many ways including how they defined and measured social class, and it was not clear what theory provided the basis for the way that SES was conceptualized or measured. The wide range of correlations reported is discouraging. Are they due to methodological factors such as measurement error or range restriction, to variability of this relationship across populations, or something else? Whatever the explanation is the atheoretical conceptualization of SES and

selection of appropriate measures is exacerbated by (and may be partly responsible for the atheoretical conceptualization of SES and selection of appropriate SES measures.

Educational researchers have adopted different approaches for measuring the relationship between SES and academic achievement. Because there are many different factors impacting this relationship in the form of moderator or mediator variables, the correlation between SES and achievement could change depending on which variables are studied. One approach that purports to clarify the relationship between SES and academic achievement takes into consideration the dynamics that underlie behavior: motivation and resources is (Values and Life Styles (http://www.sri-bi.com/VALS/moreinfo.shtml)). Some determinants of academic achievement come from the combination of motivation and resources, which are not direct measures of SES but might be related, for example, that higher SES children would have more access to resources that could be used (e.g., computers) for academic needs. Yet, motivation is still required to utilize the resources to facilitate academic achievement. The motivation factor also can be influenced by membership in SES whereby interest stimulates learning and academic success.

Other research that has examined the relationship between SES and academic achievement found that low SES negatively affects academic achievement because low SES hinders access to vital resources and creates additional stress at home (Barry, 2005; Eamon, 2005; Majoribanks, 1996; Jeynes, 2002). High parental aspirations have been associated with increasing students' interest in education. The effect of parental involvement in their children's school vis-à-vis on academic achievement is less clear (Domina, 2005). Maternal characteristics are another key factor that can affect academic

achievement. Mothers who are more educated and have higher self-esteem have children who tend to receive higher test scores. Also, mothers who delay childbearing have been shown to provide more "cognitively stimulating" and supportive environments at home which has a positive effect on school performance (Eamon, 2005).

A conceptual model describing the relationship between the variables of parental socio-economic status (SES) and the achievement process is credited to Blau and Duncan (1967). Blau and Duncan's "basic model" demonstrated the stratification process using the father's education and occupation to examine how these elements affect children's educational attainment and ultimate employment. This study explored the perpetuation of family social class to the next generation in terms of how higher SES children obtain their education. In this study, paternal education and occupation had considerable impact on children's education level with correlations of .310 and .279, respectively. Although they showed a relationship exists, Blau and Duncan did not indicate why and how parental SES impacts children's school performance.

Another study by Sewell et al. (1969) relating parental SES to educational performance included social psychological factors as mediators and reported a weak correlation between parents' SES and children's educational performance in high school (.01). Children's mental ability (such as IQ) and significant others' encouragement for educational learning seemed to play important roles, and their correlation with educational performance were .63 and .47, respectively.

Extending Blau and Duncan's stratification model to children's cognitive development, Spaeth (1976) used environmental variables corresponding to parental

social class which related increments of children's competency to cognitive growth. His theory proposed that parental SES as an indicator of the complexity of a child's cognitive environment was mediated by environmental setting variables:

Competencies: are developed through sequential experience. General skills associated with the first stage of life cycle include fluency in the use of and understanding of language and the ability to do simple computations and they extend to the capacity to deal with various forms of abstractions (Spaeth, 1976). These competencies can be measured by standardized intelligence tests. At early ages children would gain more competencies and value education as parents provide more competency stimuli at home.

Environmental variable related to parental SES (mediators): competencies mentioned above can be directly influenced by cognitive socialization from parents in home environmental variables, for example, intensive educational treatment by parents and conscious parental efforts to enhance children's learning; mother's language usage, correction of inadequate usage, providing a variety of stimuli in and out of home, providing learning materials and encourage their use by the child plus encouragement of advanced schooling for a child. These variables can be measured by either child-rearing practices from the mother or both parents, or parents' behavior vis-à-vis a specific child.

Parental SES: resources required for facilitating the above listed environmental socialization can be supported by parents' income and time. Parents who can afford various learning materials and education oriented environmental settings will more likely to provide learning stimuli for children (for example, books, activities, clubs, educational trips etc). Also parents' education is related to whether parents would emphasize teaching and providing learning facilities to children. Spaeth also mentioned

that mother's education has an effect to the degree the mother (or parents: whoever is at home the most to take care of children's learning).

These parental SES variables can be indicators of home environmental variables although they are not direct factors in children's competency in learning and educational achievement in early years of school. Sewell et al. (1969) also reported that in the social psychological model there is a weak relationship between parents' SES and children's academic performance (.01) because there are mediators between SES and academic performance variables: 1) influence of significant others including parents' encouragement of college, which is provided by parents' emphasis on education and learning (correlation .47) and 2) mental ability, which is similar to children's competency and cognitive skills in learning (correlation .63). Spaeth's finding of correlations in the cognitive model was .3 between SES and IQ (which overlaps with academic achievement in early school), .5 between SES and home environmental variables, and .65 between home environmental variables and IQ.

From the above findings, social class variables appear to influence academic achievement through various channels of mediating/moderating factors. Perhaps each component of the social class concept works as a resource for mediator variables. Whether the effect of social class variables on academic achievement is minimal or substantial, social class variables have an important place in explaining the mechanism of students' achievement in school.

The Meta-Analyses of White (1982) and Sirin (2005)

Recognizing the importance of the SES-achievement relationship, and the need to better understand the SES construct and the different measures that have been used, White (1982) conducted a meta-analysis to identify how SES was measured and to characterize their effect on the SES-achievement relationship (measured by the correlation between SES and achievement in a study). White (1982)'s meta-analysis made an important contribution to our understanding of the magnitude of the SES-achievement relationship and the impact of SES variables to that relationship. White's work has been widely cited in the educational literature White reported an average SES-achievement correlation of r = .315 for all and r = .245 for student unit and that different types of SES measures differentially effect the SES-achievement relationship, although he recognized the confusion of using different variables as SES measures and the difficulty of defining what SES actually is. For example, White reported that parental occupation and measures of occupational status were associated with smaller SES-achievement effect sizes than that of home atmosphere. However, certain limitations associated with both theoretical and methodological issues may have significantly biased the conclusions of White's meta-analysis. Regarding the confusion about SES measures, Sirin (2005) agreed with White (1982) in that there are commonly used SES terms as income, occupation and education and there are other kinds of SES such as home or neighborhood factors. However, Sirin (2005) pointed out that SES describes combination of valued commodities such as wealth, power, and social status, which can be traced from Weber's three power concepts of economic, political and social status. White (1982) reported, among these traditional SES measures, income has the largest correlation (.315) with achievement whereas Sirin (2005) showed education was the

largest (.30). The smallest correlation was education (.185) by White (1982) and occupation (.28) by Sirin (2005).

In terms of achievement, both White and Sirin did not differentiate IQ from standardized achievement and school performances. Specifically, White included IQ as part of students' achievement and Sirin did not report separate effect sizes for IQ. Nevertheless, White (1982) showed that average effect size is higher with IQ (.403) than other kinds of achievement. Between verbal and math areas of achievement, White (1982) produced higher average effect sizes in verbal (.307) than math (.246) whereas Sirin (2005) did not provide them. In terms of the unweighted average effect size using all effect sizes, White (1982)'s was .315 and Sirin (2005)'s was .32.

Variation among correlations between SES and achievement led White to conduct a meta-analysis to find the average correlation. White noticed that there was no unified definition of SES as a construct or its measures in the studies he sampled. He commented that this possibly could have caused the observed variation among the correlations. White's meta-analysis also examined the effects of different types of SES measures (e.g., mother's education, student eligibility for a free or reduced price lunch) on the relationship between SES and achievement. However he did so in a purely empirical way. That is, White did not differentiate among SES measures on the basis of theories describing what SES represents. This led White to select SES measures for his meta-analysis in a non-theoretical way. Theoretical selection would entail consideration of SES measures in terms of the social class theories described earlier.

White pointed out that it is possible that different types of SES measures will have different, and perhaps substantial, effects on achievement. However, the ability of

his meta-analysis to examine this effect was limited. For example, White coded SES in a particularly simple way. A more refined coding might have changed the findings. Consider that White did not distinguish between mother's and father's education which can have different effects on some educational outcomes (Entwhisle & Astone, 1994; Strauss & Thomas, 1995). White also did not provide a rationale for the 0-3 ordered scaling of the SES measures or how sensitive the findings were to the chosen scaling. Lastly, White did not distinguish between single-item SES measures like eligibility for a free/reduced price lunch or composite measures like Duncan's socioeconomic index (SEI) that is occupational list based on differences in education, but there is now evidence (e.g., Bollen, et al, 1999; Friedlin & Salvucci, 1995; Hauser & Warren, 1997) suggesting that there may be important differences in their effects.

Another issue is that White's choice of effect size when SES consisted of three of more ordered groups may have misrepresented some study results. Many of the studies in White's meta-analysis treated SES as a continuous variable and used the Pearson r correlation coefficient to capture the linear SES-achievement relationship; the remaining studies defined SES through three or more groups (e.g., low, medium, high) or in a contingency table in which the dependent variable achievement was qualitatively ordered (9.6% of the effect sizes). White used Fisher's η = [SSBetween Groups/SSTotal]$^{1/2}$ for the multiple groups case and an average tetrachoric correlation for contingency tables as effect sizes. White acknowledged that using η overestimated the SES-achievement relationship because this parameter is sensitive to both linear and nonlinear relationships. However, White failed to acknowledge another, more serious problem with η: Combining ηs from studies which defined SES groups differently

introduced several potentially important confounding variables. This in turn may have led to serious mis-estimation of the strength of the relationship between SES and achievement. However, this study produced 9.6% of other kinds of effect size among all effect sizes.

This study addresses the theoretical and methodological issues that may have biased White's findings. Specifically, a meta-analysis will be undertaken on the studies used by White (available as an extant dataset) that will (1) be guided by the use of social class theory to select measures of SES that are theoretically grounded and (2) avoid the methodological problems linked to White's meta-analysis. The results will add to the literature by promoting the use of social theories to guide the selection of SES measures in models of educational achievement, and by characterizing the empirical effect of this guidance through re-analysis of the studies analyzed by White (1982). Analysis results might be different too. Specifically, there may be a difference between theory driven SES measures' correlations and White's, which would suggest which SES measures are more appropriate to use.

Conclusion

Social class theory attempts to depict current power sources and to describe the process of people acquiring them or losing them through social mobility. Three social class theories were reviewed. Although there have been many studies since the early writings of Marx and Weber, the foundation for describing social stratification originated from these two sociologists, and studies after them generally involved additions or some modification of their theories. Marxian theory posited two classes in one dimension based on the ownership of means of production. Weber went further than

Marx, incorporating multiple dimensions of social power. His hierarchical view of society better fits modern society with its complex multiple dimensions of resources and power. However, modern society is more complex than Weber's time, so social class might need even more refined power dimensions.

Weber's social class is a combination of multiple power factors that collectively are not necessarily coherent. Realization of social hierarchy by listing all people in one line by strata of common life styles has been attempted through measures of social strata as a proxy of the theoretical concept. However, what common life-styles mean is ambiguous and the diversity of industrialized societies and differentiation of multiple power factors makes it difficult to picture one line of hierarchy of social status. Multi-class society according to Weber allowed mobility, and education was one of the key factors.

Occupationalists tried to reflect diversified society due to industrialization on social class, which reflects changes that have occurred in modern social structures. However, heterogeneity of society makes it difficult to group people in common experiences of life. Occupationalists claimed people in the same occupation share commonality which in turn can be a grouping method of society. Similar to Weber's life chances/styles a social class shares, occupationalists' similar occupations share common life styles and tastes. However, using common life styles does not fully explain the process of social class formation and which elements cause someone to be in a certain class. In addition this view does not convey the hierarchy of values in society and since there are many occupations in a society it is questionable whether it can be called a

social class—in some sense there are as many occupations as the number of people that exist.

Social stratification theory reflects the history of social change. As society becomes more advanced and control of power is distributed to more people in the society, social stratification theories became more multidimensional.

An industrially advanced country such as the United States does not necessarily acquire social positions based on a set of power sources such as party in Weber's time. Today, political power is considered more as leverage from a person's position in a job hierarchy, whereas political power influence was an important part of obtaining leverage in Weber's time. However, current means of obtaining power can come from relational social connections, cultural knowledge or updating current informational knowledge.

Opinions about measuring social class have not always been the same. Some researchers used prestige and others used occupation. Although prestige could capture the hierarchical concept of social status, its reliability and validity were questioned. On the other hand, occupation was considered as a realistic measure of social class and a reliable one as well. Another advantage of using occupation as social class is that it can reflect changes in society.

Social class as described in the theories studied in this paper could be measured by occupation in various ways. Occupation can reflect potential social connections and power from relations. It is important to identify major sources of power in occupation or potential power sources occupation can bring, implying that occupation will be a good measure of social stratification. Also, as a society changes and different power sources

appear, there will be new occupations that appear representing that power. Based on Weberian power dimensions, occupation might be a good candidate for a social class measure unless each power dimension is collected and used as a composite. Occupation implies an economic dimension (class by Weber) from salary earnings, status as prestige, and job desirability from educational level, and political power coming from level of enforcement of order in hierarchy in a job position.

Reviewing these social class theories and associated measures provided descriptions of how power dimensions in society are processed to define classes and how social class has been measured in practice. Weberian theory opened up the differential power dimensions in capitalist society through market systems so that this theory can be applied to explain the social dynamics in modern society, although current society might actually need to reflect more complex dimensions. According to Weberian theory, the measure of social class needs to convey major power dimensions such as economic resources, political resources, social and cultural resources, and status.

The impact of social class on educational achievement, according to Weber's theory, needs to be explained through power sources such as economic resources, political resources, and social resources. These affect educational performance through other moderating/mediating variables such as mental ability, significant others' educational encouragement, home environment, resources for study, motivation, parental educational support etc. The correlation between social class and educational performance might fluctuate depending on whether mediator variables are included in the model. Also, a measure of social class might show different correlation values

depending on how well each social measure is representing power dimensions of social class.

A review of educational achievement demonstrated that modern assessment often combines discrete objectives and higher-order thinking. Assessment of achievement can vary depending upon what it measures and what the use of the test is. Tests that assess more discrete learning are standardized tests or teacher-made tests. The usage of this kind of test can be either nation-wide or within a classroom. Tests measuring ability of higher-order thinking such as IQ are different from standardized or teacher-made tests since they assume a different concept of achievement.

Theoretical reviews of SES, achievement and the relationship between SES and achievement will be used in the next two chapters to guide analyses of data. Data-analytic models designed by theories will be compared with their atheoretical counterparts. This will provide evidence of the effect of selecting SES measures based on a conceptual framework versus selected in an atheoretical fashion.

Chapter III

Methods

This chapter describes the methodology used for the study. Meta-analysis using the studies in White's (1982) was employed to re-examine the relationship of SES and academic achievement. To examine the relationship changes with different SES measures, SES measures were selected using three Social Class theories and analyzed using Hierarchical Linear Models (HLM).

Nature of the Problem

Statistical modeling of educational achievement has been an important part of educational research with far-reaching implications. This modeling has been done at the national and international levels (e.g., TIMSS, 2003; PISA, 2006), state levels (e.g., MEAP, 2002), and in local settings (e.g., NCEA, 2002). A characteristic shared by the majority of these studies is that measures of educational achievement have been strongly grounded in theories of achievement that have been widely adopted (e.g., TIMSS, 2003).

Another characteristic shared by many statistical models of educational achievement is the inclusion of one or more measures of SES to control the effects of this factor. Researchers likely do this to bolster the credibility of the findings. As argued earlier, it has been somewhat common for educational studies modeling academic achievement to include measures of SES with little, if any, theoretical justification. That is, SES measures used in these statistical models appear to be selected in non-theoretical ways, with little information provided about the author's conceptualization of what SES should reflect, and limited or no use of theories of SES (or social class) to guide the

selection of SES measures. The lack of a theoretical foundation makes it difficult to know exactly what features or aspects of SES are being measured, and precisely what the achievement-SES relationship reflects.

Research Questions

The meta-analysis will be used to answer five research questions. The first three questions are guided by three social class theories (Weberian, Marxian, and Occupationalist, respectively) and respond to the theoretical issues discussed earlier. Questions four and five respond to the achievement methodological issues discussed earlier.

Weberian theory Weberian theory (Weber, 1968) characterizes social class as using three dimensions of power: (1) class (2) status, and (3) party. These different sources of power cause hierarchical status in society that brings different levels of life chances.

The class refers to economic sources of power. Economic power can be acquired by inheritance, or income, which can then be exchanged with ownership of possessions or goods through market. Economic sources can afford more educational opportunities such as extra curricula activities, books, computers, etc.

Status implies social status level that differentiates the degrees of social desirability. One's standing in society can be more or less prestigious. For example, professional or managerial status types are more prestigious than technical or manual labor status types. These status levels can be determined by one's level of education. Higher levels of education provides potential for achieving status of higher status jobs but lower levels of education often limits one to lower level status jobs.

Party indicates political power or so called bureaucratic power which reflects a hierarchy of power. Degree of hierarchy grants power to control others for one's own purposes. This kind of power varies depending upon one's position in terms of levels of authority and how many people are above or under the individual. Bureaucratic or political power can be found in occupational levels. The three SES measures that are consistent with Weberian theory in White's meta-analysis are income (class), education (status), and occupation (party).

Research question 1: To what extent do SES measures selected based on Weberian theory noted above explain variation in effect sizes (correlation) capturing the relationship between SES and academic achievement?

Marxian theory Marx's notion of social class (Marx, 1844) is divided by ownership of property, although this difference in wage of ownership was caused from the surplus of capitalists' exploitation (Wright, 1997). This economic resource is not very similar to Weber's economic class dimension due to its nature of exploitation. However, collected SES measures in this study were limited because this is secondary data from White (1982)'s studies. Although it was not possible to code SES measure indicating exploitation surplus from the selection of SES, the closest indicator of difference in wage was income. Most consistent SES measure with Marxian theory in this study is income.

Research question 2: To what extent do SES measure selected based on Marxian theory explain variation in effect sizes capturing the relationship between SES and academic achievement?

Occupationalist theory Occupationalist theory (Durkheim, 1984) defines social class by occupation. Characteristics of occupations are unique in the sense that life styles and backgrounds are shared among people of similar occupations. Occupationalists acknowledged a few resources of power cannot cover all the differences in people in modern time as diversity has increased.

Occupations in White's meta-analysis were measured as 1) an index of occupation such as the Sims index (Cuff, 1934) which measures prestige levels of an occupation, 2) the Hollingshead scale (occupation and education) (Hollingshead, 1975) which matches occupation levels according to equivalent levels of education, 3) the Warner index (Warner et al, 1949), or 4) a single measure of occupation.

Research question 3: To what extent do SES measures selected based on Occupationalist theory explain variation in effect sizes capturing the relationship between SES and academic achievement?

Research question 4: Which measure of SES appear to be the strongest predictor of variation in effect sizes?

Other SES Measures

There are a number of widely used measures of SES in models of educational achievement that are not directly related to theory of social class, and, consequently, are difficult to categorize in terms of what precisely they are measuring. In general, these measures appear to have been chosen in a non-theoretical fashion. For example, a student's eligibility for a free/reduced lunch is a common measure of SES, especially in state and national datasets. Free/reduced price lunch is usually intended to represent the degree of poverty or economic status, but this measure also reflects other factors. Some

of these include: a student's willingness to bring home (and return) the forms needed to receive a free/reduced price lunch, the willingness of parents or guardians to provide the information requested on these forms (some of which is intrusive), a school or school district's participation in the free/reduced price lunch program (about 10% nationwide do not participate), and the fact that the criteria for being eligible have little to do with a student's economic status (Hauser, 1994). So the use of student eligibility for a free/reduced price lunch is not guided by social class theory and can make inferences involving this measure suspect.

Other SES measures in White's meta-analysis are either not designed to explore a social class theory. These measures include ethnicity, neighborhood (dwelling values, poor/wealthy housing areas, school area housing values), crowdedness of home (including number of siblings, ratio of people in rooms, number of adults, number of rooms), home possessions (including owning telephone, TV, car, computer etc), activities (extracurricular activities, social activities, TV viewing habits), mobility, type of school (parochial. public, private, suburb schools), ordinal position in family, family attitude (parents' argument, mother's sex attitude, living with two parents or not), employment status, and IQ.

Research question 5: Is there any difference between SES measures selected using theory (SES theory) and those selected in an atheoretical fashion (SES atheoretical) in terms of the average effect sizes in the correlation between SES and achievement?

Educational achievement White's meta-analysis treated educational achievement as a unitary concept, with IQ scores, school grades, competency tests, and diagnostic test scores lumped together. However, these achievement measures can be different in

important ways (e.g., purpose, content areas, and scope of administration). As an example, IQ measures cognitive ability (higher-order skills) whereas other kinds of achievement tests measure learned outcomes (basic skills).

K-12 achievement tests are classified into three groups based on their primary intended uses according to Millman and Greene (1989): (a) Draw summative conclusions about the level and pace of student achievement, (b) draw formative or diagnostic conclusions about student achievement in an academic content area or other school related areas, and (c) make decisions about selection, placement, and continuation in special programs and services. Assessments that draw summative conclusions about student achievement include content area achievement surveys, end-of-course exams, and high school exit exams. Assessments that draw formative or diagnostic conclusions about student learning include academic area achievement and diagnostic assessments and school readiness assessments. Assessments that involve making decisions about selection, or placement can be gifted and talented screening instruments and procedures.

The effect of SES on achievement in literacy may also differ from its effect on mathematics achievement or any other (content area test) as well as with IQ test (selection or placement purpose) and GPA (formative assessment).

Research question 6: Does the effect of SES on achievement change for different kinds of achievement, and, if so, how?

Analysis Plan

A meta-analytic approach was used to answer these questions. The first phase attempts to replicate White's (1982) findings. Next, that work will be extended to

reflect more refined coding of various SES measures that are guided by social class theories. Descriptive analyses will be used to study patterns in the effect sizes and tests of moderator variables (i.e., variables that affect the relationship between two variables) using White's coding system versus those that provide evidence about the contribution of more detailed and theory-guided coding, and in the process provide evidence about replicability. Hierarchical linear modeling (HLM) (Raudenbush & Bryk, 2002) will be used to construct explanatory models that, among other things, allow the contribution of study-level predictors to explaining variation in effect sizes to be estimated, and will be the primary statistical tool in answering the research questions.

Methodology

Population of studies White (1982) did not clearly identify the population of studies of interest, but it appears that the focus was on studies modeling achievement including norm and criterion-referenced statewide and nationwide tests or studies with IQ that sampled studies used one or more measures of SES for kindergarten through college-age students from 1900 through approximately 1975. Based on this definition of the population of studies, the corresponding sample of studies and their effect sizes can be treated as having been sampled from a population distribution with a common effect size (fixed) or from a distribution in which no common effect size is assumed (random). For random effects it is assumed that there is a distribution of effect sizes in the population of studies (Hedges & Vevea, 1998). This paper focuses on random effect models with variation among effect sizes that is potentially explainable by study characteristics.

A. *Sampling mechanism and number of studies (K)*

White (1982) did not provide information about the sampling mechanism, but it is assumed that White's studies represent a non-random sample. White reported using K = 101 studies in his analysis. Over a period of approximately one year Harwell, Maeda, and Lee (2006) attempted to obtain all 101 studies used by White, but only 90 of the 101 studies were retrieved despite extensive efforts. The 11 studies were not obtained due to inaccessibility and were not necessarily excluded based on any selection bias. Thus the proposed analysis is not an exact replication of White's (1982) meta-analysis.

B. Coded variables and a rationale for their inclusion and scaling

White (1982) coded 15 variables for each study in his meta-analysis:

1. Unit of analysis
2. Type of achievement
3. Grade level
4. SES reporting error
5. Achievement range restriction
6. SES range restriction
7. Percent ethnic minority
8. Year of study
9. Number of items
10. Number of students
11. Type of publication
12. Sample
13. Type of SES measure
14. Number of SES group

15. Internal validity of study

In this paper additional variables were coded for SES and achievement guided by social class theory and types of achievement:

1. Use of Index of SES (Duncan's, Warner's, Hollingshead, and Sims' SES index)
2. Free/reduced lunch program
3. Family income
4. Family size
5. Mother's occupation
6. Father's occupation
7. Mother's education
8. Father's education
9. Parents' occupation
10. Parents' education
11. Resources at home
12. Composite SES
13. Other SES
14. IQ (math, literacy, general, and other)
15. Standardized achievement (verbal, math, science, general, and other)
16. GPA
17. Performance

Three kinds of effect sizes were coded. Following White (1982), the Pearson correlation coefficient between achievement and SES served as the primary effect size. For studies in which SES was categorized into three or more unordered groups, White

used Fisher's η as the effect size. If the outcome variable was qualitatively ordered, White used the average tetrachoric correlation (across all possible 2 x 2 tables) as the effect size. One set of effect sizes resulted from transforming the Pearson correlations to Fisher r-to-z values. The Fisher Z values have several advantages in meta-analytic work over the Pearson correlation values (Shadish & Haddock, 1994). However, it appears that White also transformed the η and tetrachoric values using the Fisher r-to-z expression, which is inappropriate. Assuming SES and achievement are correlated means that the sampling distribution of Pearson correlations is skewed. But η and tetrachoric correlations are based on qualitative values, so transforming them is inappropriate.

White's coding of effect sizes scheme was expanded in two ways. First, for SES variables involving more than two groups a Pearson correlations effect size was coded for every pair of groups. This introduces dependency among effect sizes within studies but avoids the previously noted difficulties linked to η. An indicator variable was created to distinguish whether multiple effects sizes reported for a study were dependent. Separate analyses were performed for the independent and dependent effect sizes. White also appears to have included dependent effect sizes (e.g., multiple effect sizes produced by the same subjects in a study) in inferential analyses requiring that effect sizes be mutually independent. Consequently, the results of inferential statistics that are based on an independence assumption would be biased. In turn, the analyses results may not be credible and it is difficult to make a generalization.

Second, achievement measures were distinguished through content areas (mathematics, literacy, composite, other) and achievement types (IQ, standardized

achievement outcomes, GPA). Finally, information was coded about the instrument the outcome was based on, for example, name and developer of the instrument and its reliability.

C. Psychometrics properties of coded variables and procedures to ensure consistent and valid coding

Three coders were used to document the White's studies. Initial reviews of White's

coded variables led to a general consensus among coders on how these should be consistently and validly coded. Development of a preliminary set of additional variables to be coded followed. Next two coders coded the same 15 studies resolving disagreements through discussions of all three coders. These experiences led to modification of some of the additional coded variables. The two coders then re-coded the same 15 studies on all variables and found relatively few disagreements, which were again discussed until a consensus was reached. Study coding then continued in a round robin fashion, with each study coded by at least two coders. Regular meetings among the coders also helped to ensure inter-coder consistency and valid coding for the duration of the data collection.

Data Analysis

Descriptive analyses will be used to summarize patterns of variability among the effect sizes and, if appropriate, average effect sizes. When effect sizes show variation analyses involving moderator variables such as SES measures from social class theories and measures of achievement using Hunter and Schmidt's correction for sampling error (Hunter & Schmidt, 2004) will be used. Most scientists believe that the

goal of cumulative research is to produce better answers than can be obtained from isolated studies (Rubin, 1990). From this point of view, the purpose of meta-analysis is to estimate the relationships that would have been observed if the studies had been conducted perfectly (Rubin, 1990), that is, to estimate construct-level relationships. Given this purpose, a meta-analysis that does not correct for as many artifacts as possible is an unfinished meta-analysis.

Rubin (1990) commented that variation among the correlations (effect sizes) s_r^2 is a confounding of two sources: variation in population correlations (if there is any) and variation in sample correlations produced by sampling error. Thus, an estimate of the variance in the population correlations can be obtained only by correcting the observed variance s_r^2 for sampling error. Sampling error across studies behaves like measurement error across persons. The formulas used to correct s_r^2 are comparable to standard formulas in classical measurement theory (reliability theory). According to Hunter and Schmidt (2004),

Average weighted correlation:

$$\bar{r} = \sum n_j r_j / \sum n_j ,$$

where n_j is sample size per effect size, r_j is the effect size.

Variance of correlations:

$$\sigma_r^{\,2} = \sum n_j (\bar{r} - r_j)^2 / \sum n_j$$

Average sample size:

$$\bar{N} = T / K ,$$

where T is total sample size, and K is number of studies

Sampling error variance:

$$\sigma_e^2 = (1-\bar{r}^2)^2/(\bar{N}-1)$$

Estimate of the variance of population correlations:

$$\sigma_\rho^2 = \sigma_r^2 - \sigma_e^2$$

A two-level HLM will be employed for the inferential analyses (Raudenbush & Bryk, 2002) to explore the variation among the effect sizes and to construct explanatory models. These models are not centered. The first level (Level 1) in these models is unconditional (within-studies) and the second level (Level 2) (between-studies) will contain predictors to explain the variation among the study effect sizes. The fitted models will have the general form:

Level 1 $Y_{ij} = \beta_{0j} + r_{ij}$

Level 2 $\beta_{0j} = \gamma_{00} + \sum_{q=1}^{Q} \gamma_{0q} \chi_{qj} + u_{0j}$

Combined level $Y_{ij} = \gamma_{00} + \sum_{q=1}^{Q} \gamma_{0q} \chi_{qj} + u_{0j} + r_{ij}$, r_{ij} ~Normal (0, σ^2) u_{0j}

~Normal (0, τ)

Where, β_{0j} is a population effect size for the jth study, Y_{ij} is the i(th) sample effect size in study j, γ_{00} is the intercept, γ_{0t} is the slope capturing the effect of the q(th) (q = 1,2,... Q) level 2 predictor χ_{qj} of effect sizes, u_{0j} is the unique effect of each study, and r_{ij} is the within-study error term.

Summary

This study addresses the theoretical and methodological issues that may have biased White (1982)'s findings and in the process provides an important empirical test of using social class theory to guide the use of SES measures in educational models of achievement. Specifically, a meta-analysis on a sample of studies used by White will (1) be guided by the use of social class theory to select measures of SES that are theoretically grounded and (2) avoid the methodological problems linked to White's meta-analysis. The results will contribute to the associated literature by promoting the use of three social theories to guide the selection of SES measures in models of educational achievement, and by characterizing the empirical effect of this guidance through the re-analysis of a sample of studies analyzed by White (1982).

Chapter IV

Results

This chapter provides a comprehensive overview of the analysis findings. The purpose of the analyses is to compare the results of White's meta-analysis to those using the proposed methods outlined in chapter III. A key component of the proposed methods was using different SES measures based on social class theories. The analysis results include: 1) descriptions of the coded variables and of the effect sizes of the relationships between the achievement and SES measures, 2) overall effect sizes by SES and achievement measures, and 3) Hierarchical Linear Modeling (HLM) output.

Description of meta-analysis variables

The current analysis was based on 90 studies that were accessible of the original 101 studies from 1918 to 1975 in White (1982)'s meta-analysis. Thus the current study is not a replication of White's meta-analysis. Utilizing the proposed coding system, 2,866 effect sizes were obtained whereas White had 636 effect sizes. The difference in numbers of effect sizes is attributable to how effect sizes in Coleman et al. (1967) were handled. White apparently averaged many of Coleman et al.'s effect sizes whereas the current meta-analysis coded these terms in their original form.

Of the effect sizes coded, a total of 769 that were used for analysis in this study were independent. Many studies produced more than one effect size that is using different samples. For example, Coleman et al. (1967) produced 936 effect sizes and depending on which effect size of achievement is selected, the number of independent effect size can differ. At least 30 different samples were used in Coleman et al.'s study. Due to this selection issue, 30 independent effect sizes were not included in the final

independent effect sizes (769) for the analysis. The sample sizes across studies varied from a minimum of six to a maximum of 2,205,319 with a median sample size of 998. Regarding publication types, technical reports produced the most effect sizes (1,540) and then journal articles (497). Grade levels in the data set ranged from kindergarten to college freshmen and students were the unit of analysis for 2,351 effect sizes.

Educational achievement types were coded as IQ (verbal, math, composite of verbal and math, and other), standardized achievement (verbal, math, science, and other), GPA, and performance portfolio. IQ tests included the WISC, Thorndike, Raven, Otis-Lennon, and Peabody. Standardized achievement measures included the Miller Analogies Test (MAT) (An introduction to the Miller Analogies Test (http://www.milleranalogies.com)), Stanford achievement test (Stanford Achievement Test series, tenth edition (http://pearsonassess.com)), Iowa Tests of Basic Skills (ITBS)(the Iowa Tests of Basic Skills (http://www.education.uiowa.edu/itp/itbs)), Scholastic Aptitude Test (SAT) (SAT reasoning test (http://professionals.collegeboard.com)), American College Test (ACT) (Understand Your Scores (http://www.actstudent.org)), California Achievement Test (CAT) (California Achievement test fifth edition CAT/5 (http://www.ctb.com)), Comprehensive Tests of Basic Skills (CTBS) (TerraNova CTBS (http://www.ctb.com)), and other kinds of test. Standardized achievement tests in science and performance produced a small number of effect sizes (24 and 6 respectively) and were not used in the analysis.

Coded SES measures included income, parental education (mother, father or both), occupation (mother, father or both), home atmosphere, school resources,

dwelling value, free/reduced lunch, subjective judgment and other. Parental occupation was also measured by occupational index (e.g., Sims, Duncan, Hollingshead indices). Effect sizes capturing the relationship between SES and achievement are mostly Pearson correlation coefficients but there are some Cohen's d values and tetrachoric correlations although the percentage in the total effect sizes was less than 10%. Tables 1 through 7 summarize the effect sizes of variables in the sample of studies.

Table 1

Frequency of Effect Sizes

Variable	Categories	N	%
Effect Size	Total	2866	10.0
	Independent	769	26.8
	Dependent	2097	73.2
	Coleman Study	936	32.7

Note. Total number of studies = 90.

Table 2

Frequency of Effect Sizes for Study Characteristic Variables

Variable	Categories	N	%
Publication Type	Journal Article	497	17.3
	Book	463	16.2
	Unpublished Paper/ERIC Document	34	1.2
	Dissertation/Master's Thesis	332	11.6
	Technical Report	1540	53.7
Grade Level	Kindergarten	30	1
	1st Grade	135	4.7
	2nd Grade	75	2.6
	3rd Grade	223	7.8
	4th Grade	79	2.8
	5th Grade	126	4.4
	6th Grade	551	19.2
	7th Grade	18	.6
	8th Grade	170	5.9
	9th Grade	325	11.3
	10th Grade	64	2.2
	11th Grade	5	.2
	12th Grade	673	23.5
	College Freshman	49	1.7
	Mixed (E.G., 5th And 7th Grade)	279	9.7
Nature of Sample	Local	843	29.4

	Regional	754	26.3
	National	1223	42.7
Unit of Analysis	Student/Individual	2351	82
	Classrooms	16	.6
	Schools	101	3.5
	School District	368	12.8

Table 3

Frequency of Effect Sizes for Achievement Type Variables

Variable	Categories	N	%
Standardized achievement	Verbal	1163	4.6
	Mathematics	606	21.1
	Science	24	.8
	Composite (Verbal & Math)	237	8.3
	Other	152	5.3
IQ	Overall	625	21.8
	Verbal	1135	39.6
	Mathematics	683	23.8
GPA Outcome		182	6.4
Performance Assessment		6	.0

Table 4

Frequency of Effect Sizes for SES Variables

Variable	Categories	N	%
SES	Income	253	8.8
	Parental Education	378	13.2
	Occupation Of Head Of Household	487	17.0
	Home Atmosphere	724	25.3
	Dwelling Value	227	7.9
	School Resources	504	17.6
	Subjective Judgment	213	7.4
	Eligibility for Free Lunch as SES Indicator	2	.1
	Other	876	3.6
SES Occupation Index	Duncan's Index Used As SES Indicator	77	2.7
	Warner's Index Used As SES Indicator	91	3.2
	Hollingshead Index Used As SES Indicator	19	.7
	Sims' Report Card Used As SES Indicator	178	6.2

Note. Some studies used more than one SES indicators as a composite SES or as separate SES indices.

Table 5

Frequency of Type of Achievement for Effect Size Variables

Variable	Categories	N	%
Verbal Achievement	Eta	27	.9
	r	973	33.9
	d	169	5.9
	r Tetrachoric	1	.0
Math Achievement	Eta	4	.1
	r	599	2.9
	r Tetrachoric	1	.0
Science Achievement	Eta	1	.0
	r	22	.8
Composite: Verbal And Math Achievement	Eta	1	.0
	r	230	8.0
Other Achievement	Eta	28	1.0
	r	310	1.8
IQ	Eta	34	1.2
	r	446	15.6
	d	9	.3

Note. r = Pearson Correlation Coefficient, d = Cohen's d.

Table 6

Frequency of Effect Sizes for Achievement Test Variables

Variable	Categories	N	%
IQ	WISC	15	.5
	Thorndike	24	.8
	Raven	21	.7
	Otis-Lennon	37	1.3
	Peabody	6	.2
	Other	348	12.1
Standardized Achievement	MAT	13	.5
	Stanford Achievement Test	59	2.1
	ITBS	147	5.1
	SAT	8	.3
	ACT	15	.5
	CAT	33	1.2
	CTBS	12	.4
	Other	1275	44.5

Table 7

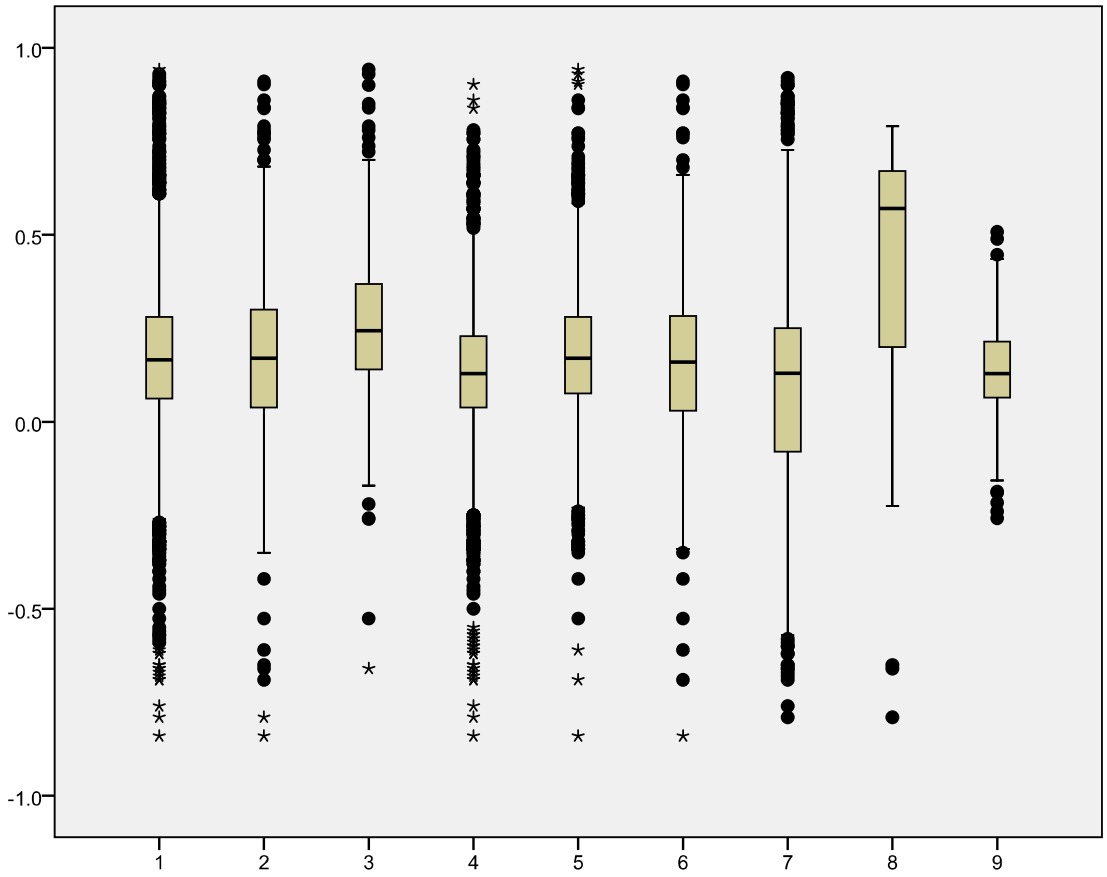
Summary Statistics for Unweighted (Pearson Correlations) Effect Sizes with Different Units and SES Variables

	All	Independent	SES theoretical	SES atheoretical	Student Unit	Student Independent	Aggregated Unit	Aggregated Independent	Coleman Study
N	2866	769	844	1921	2351	714	485	25	936
Minimum	-.84	-.84	-.66	-.84	-.84	-.84	-.79	-.79	-.26
Mean	.17	.169	.25	.12	.17	.156	.11	.33	.13
Median	.16	.170	.24	.12	.17	.160	.13	.57	.12
Maximum	.94	.91	.94	.90	.94	.91	.92	.79	.51
SD	.21	.23	.18	.19	.17	.21	.32	.48	.10
Skewness	-.06	-.09	.07	-.47	.16	.04	.14	-1.27	.10
Kurtosis	2.50	1.35	1.51	3.05	2.08	1.39	.46	.46	.26

Note. SES theory indicates SES measures selected by Weberian, Marxian, and Ocucpationalist theories. SES atheoretical indicates SES measures that are not based on the above three social class theories.

Figure 1

Boxplots of Effect Sizes (Pearson Correlations) with Different Units and SES Variables



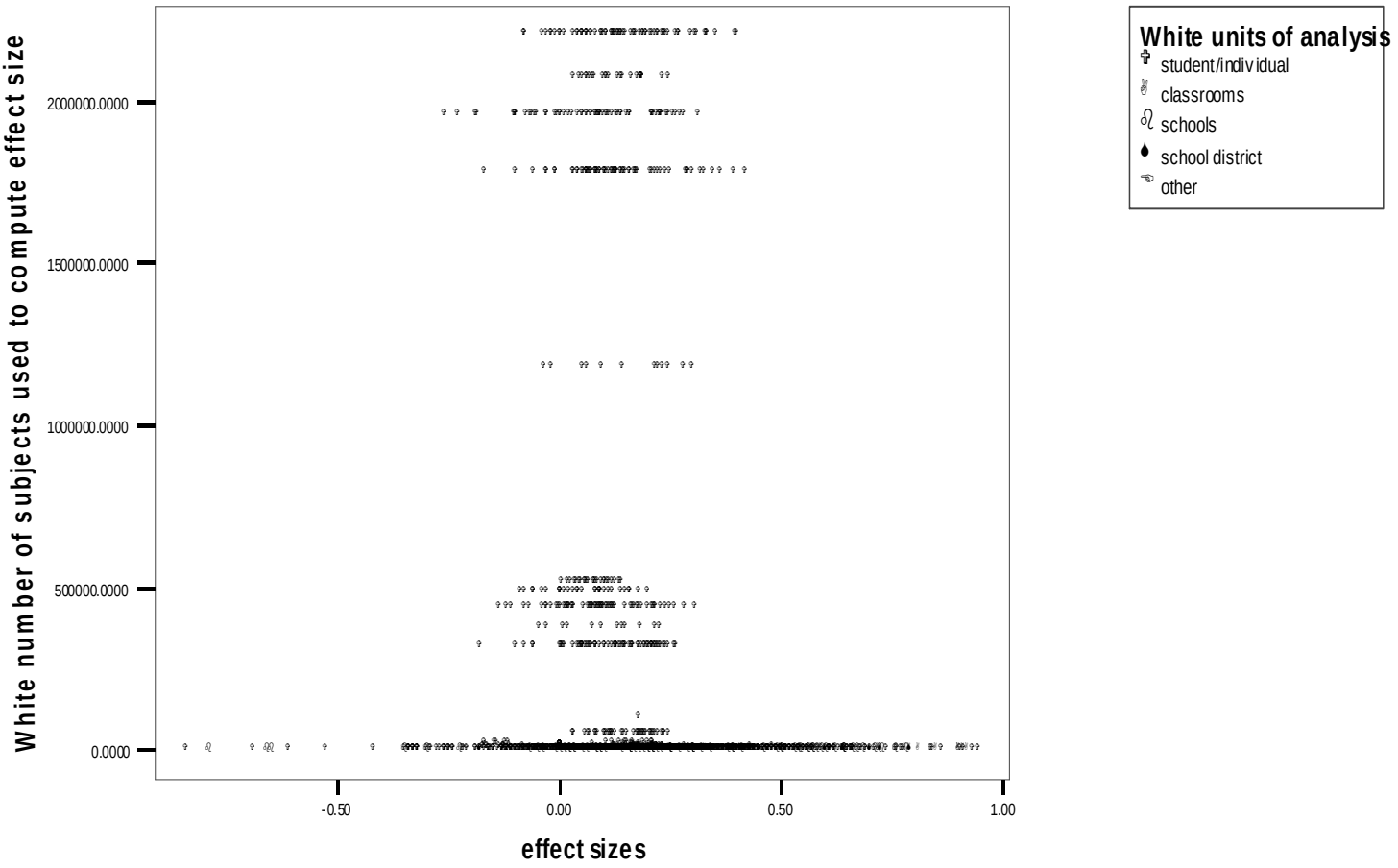
Note. 1 = all effect sizes, 2 = independent effect sizes, 3 = effect sizes using theoretical SES, 4 = effect sizes using atheoretical SES, 5 = effect sizes using student unit, 6 = effect sizes using independent student unit, 7 = effect sizes using aggregated unit, 8 = effect sizes using independent aggregated unit, and 9 = effect sizes from Coleman study.

Table 7 illustrates descriptive statistics for effect sizes with different units and SES variables. The variables in Table 7 range from the low negative end to the high positive end, except that of the Coleman et al. study. From skewness and kurtosis values, the variables seem to be fairly normal. Figure 1 shows their distributions and ranges in boxplots. Most variables in the boxplot show long ranges of outliers with relatively

shorter middle 50%. The middle 50% of the independent aggregated unit variable is more variable than the other variables. The Coleman et al. study shows less variation.

Figure 2

Funnel Plot of Sample Sizes by SES/Achievement Effect Sizes (N=2,866)



The funnel plot in Figure 2 shows standard errors and bias due to sample sizes. As sample size increases the range of effect sizes becomes narrower and closer to the

average effect size. In Figure 2, there is a lot of variation in effect sizes when the sample sizes are relatively small and effect sizes became more stable as sample size increases.

The overall unweighted mean effect size in White's study was .315 (N=620) with a median effect size of .251. The results of the pseudo-replication show that the unweighted average effect size is .17 (N=2,866). The mean effect size in this study for aggregated units (.34) is higher than that of student units, as expected (Robin, 1950; White (1984). In Figure 2, the effect size values from the aggregated units are located below the sample size of 100,000 and from the lower end to the higher end of effect size values.

Moderator analysis using Hunter and Schmidt's correction for sampling error

Table 8

Average Effect Sizes by Study Characteristics after Correcting Sampling Error

	N	K	$\bar{r}$	Var r	$\overline{N}$	Var E	Var ρ	Lower 95% CI	Higher 95% CI
Overall Independent	191326587	755	.0664	.0105	253413	0	.0105	.0664	.0664
SES theoretical	7943498	298	.2704	.0076	26656	0	.0076	.2703	.2705
SES atheoretical	183383086	457	.0576	.0087	401276	0	.0087	.0576	.0576
SES:Income	17916	253	.2537	.1009	71	.0125	.0884	.2490	.2584
SES:Parent's Education	7378281	134	.2844	.0034	55062	0	.0034	.2844	.2844
SES:Parent's Occupation	308427	128	.1771	.0042	2410	.0004	.0038	.1769	.1773
SES:Occupation Index	639218	194	.0853	.0209	3295	.0003	.0207	.0849	.0857
SES:Mom's Occupation	5791	9	.126	.0008	643	.0015	0	.1253	.1267
SES:Dad's Occupation	725798	141	.1055	.0199	5148	.0002	.0197	.1052	.1058
SES:Mom's Education	12581	30	.1123	.0094	419	.0023	.0071	.1106	.1140
SES:Dad's Education	600286	90	.0891	.0216	6670	.0001	.0215	.0887	.0895
IQ Overall	270782	256	.1504	.0373	1058	.0009	.0364	.1497	.1511
IQ:Verbal	5912	30	.2446	.0938	197	.0045	.0893	.2368	.2524
IQ:Math/Other	13149	80	.1565	.0496	164	.0058	.0438	.1527	.1603
Achievement Overall	190556426	351	.0662	.0104	542896	0	.0104	.0662	.0662
Achievement: Verbal	190536495	262	.0662	.0104	727239	0	.0104	.0662	.0662
Achievement: Math	9198	41	.1442	.0297	224	.0043	.0254	.1407	.1477
GPA	249546	72	.07	.0164	3466	.0003	.0161	.0695	.0705
Performance	684	6	.0293	.0129	114	.0088	.0041	.0208	.0378
Other Achievement	247304	52	.0981	.0262	4756	.0002	.026	.0975	.0987
Coleman Study	351214008	936	.148	.0121	375229	0	.0121	.1480	.1480

Note. N is the number of total sample size. K is the number of correlations. $\bar{r}$ is the weighted mean correlations. Var r is variance of the weighted mean correlation. $\overline{N}$ is the average sample size. Var e is variance of sampling error. Var ρ is variance of population mean correlation after removing sampling error from variance of r.

Applying Hunter and Schmidt's sampling error correction method to examine moderator effects, Table 8 presents average effect sizes by SES and achievement type factors. This method used only independent effect sizes that reported sample sizes. The overall independent effect size is .0664 which is much lower than the unweighted average effect size (.17). Theory-based SES measures (income, education, and occupation) shows a higher mean of .27 whereas atheoretical SES measures show a mean of .06 suggesting that the choice of SES measure can make a difference in correlations of SES and achievement. Among the theory-based SES measures, the average effect size was highest for parents' education (.28), followed by income (.25) and parents' occupation (.18). The occupation index shows a relatively lower average effect size (.09) than parents' occupation, and mother's occupation or father's occupation show lower effect sizes than parents' occupation. A similar pattern emerged for parent's education.

Overall the average correlation for IQ (.15) is higher than that for overall standardized achievement (.07). Verbal and math subject areas produced average effect sizes of .24, .16 for IQ and .07, .14 for standardized achievement. GPA, performance and other achievement mean effect sizes are relatively lower than IQ and standardized achievement (.07, .03, and .10, respectively).

HLM approach using theory-based SES measures

HLM was used to explore variation among effect sizes and to construct explanatory models. Level 1 in these models has effect sizes as the outcome variable and level 2 has SES measures as explanatory variables that are selected according to each social class theory to explain variation among effect sizes.

HLM results

Two level hierarchical linear models (HLM2) were fitted to the effect sizes using the HLM software® (Bryk, Raudenbush, and Congdon, 2004). Specifically, maximum likelihood (ML) was used to estimate between study variance and covariance components and regression coefficients.

Pearson correlations are not transformed using Fisher's R to Z method in this study. According to Hunter and Schmidt (2004), calculations with and without Fisher's Z transformation did not show difference in results. Similarly, a separate analysis using Fisher's R to Z transformation (not included in this paper) showed a small upward average effect size. However, this could be resulted from transforming eta and tetrachoric effect sizes in addition to r, because their range is positive and can inflate the result. But the percentage of eta and tetrachoric effect sizes in the total effect sizes was less than 10 % of the total effect sizes, which could not distort the result if otherwise. Rather, Fisher's Z generates an upward bias when there is variation in the population correlations across studies (Hunter et al., 1996; Schmidt & Hunter, 2003) resulting in overestimated mean correlations. And it gives larger weights to larger correlations, resulting in more positive bias (Hunter & Schmidt, 2004). And effect sizes in this study showed most effect sizes small, it would have not given too much upward inflation even if they were transformed to z.

Hunter and Schmidt (2004) reported sample size weighting gives more accuracy when there is little or no variation in population effect. If the data set had just a few larger sample size studies the average will be heavily weighted by those few studies, but in this meta-analysis, 76.4% (1,904 effect sizes out of 2,345 student effect sizes) of sample sizes are less than 100,00. The rest of the sample sizes ranged from 100,000 to 2,205,319.

HLM is presented based on four analyses using: 1) total student unit effect sizes (Tables 9-12), 2) independent effect sizes using student unit (Tables 13-16), 3) sample size weighted total student effect sizes (Tables 17-20), and 4) sample size weighted independent effect sizes using student unit (Tables 21-24). Each analysis was done for unconditional and conditional models using SES measures and each set of Tables (e.g., 9012) provides results relevant to answering the research questions. Two level models were fitted, initially using unconditional models to examine whether there is significant variation among effect sizes. Then a model with SES variables was fitted in the 2^{nd} level to see how much variation is explained by SES variables and study features. A type I error rate of .05 was used for all statistical tests.

HLM results indicate that the unweighted grand mean for unconditional models for all effect sizes (Table 9) versus only independent effect sizes (Table 13) in unconditional models are very similar (.28 and .26, respectively). The weighted grand mean for all effect sizes (Table 17) versus independent effect sizes (Table 21) in unconditional models are much smaller (.09 and .06). The smaller means are consistent with the overall mean effect size in Table 8. The grand effect size means in all models are statistically significant. In the unconditional model with all effect sizes, variation

left to be explained in the 2nd level was 56.09%. Fitting income as a level 2 predictor produced a grand mean of .27 and reduced level 2 variation by .018% (Table 10). Including income, education, and occupation increased the grand mean to .31 and explained variation in the level 2 by 1.4% (Table 11). Occupation variable in the model showed that the grand mean was .29 and variation was reduced by .1% (Table 12). SES measures consistent with Weber theory showed the highest grand effect size mean when income, education and occupation are included in the model and the most variation explained although it was still small, 1.4%. The relationships of SES variables to effect sizes were not significant.

Unconditional independent effect size model (Table 13) produced a grand mean of .26 with 45% of the variation left to be explained in the level 2 model. The grand effect size means in conditional models using SES variables showed a similar pattern as above (Table 14, 15, and 16): income (.26), income, education, and occupation (.31), and occupation (.28). Level 2 regression coefficients for SES predictors were not significant. Conditional models with income reduced level 2 variation by .1%. Income, education, and occupation model reduced 4% of the variation in the level 2, and occupation reduced the variation by .003%.

Sample weighted models using all effect sizes (Table 17) showed a smaller grand effect size mean (.09) and this unconditional model had 27% of unexplained variation. In the level 2 conditional model with income, education and occupation (Table 19) showed the largest grand mean among the other SES measures was .14. Also in this model, education seems to have a slightly negative impact on mean effect size in the study level (slope = -.059, sig). Thus, with other predictors held constant, increases in

parental education were associated with a weakening of the SES/achievement correlation. Income and occupation variables showed positive effect on mean effect sizes in the study level. Each weighted model reduced slight amount of level 2 variation (.21%, .16%, .1%).

Weighted model using independent student effect sizes (Table 21) showed lower grand mean (.06) and a very small amount of level 2 variation for unconditional model (.04%, insignificant level 2 error variation). Regardless of level 2 predictors, this variation remained almost same level (insignificant level 2 error variations). The conditional model (Table 23) showed education variable as having a significant and negative impact on mean study level effect sizes and education appeared to be significant ($\hat{\beta}$ = -.11, meaning the grand mean is lower by .11 when education is included, although this is not treated as absolute due to correlation with income and education in the model).

Table 9

HLM results for unweighted unconditional model—all effect sizes (total student unit)

Final estimation of fixed effects

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
INTRCPT1, B0 INTRCPT2, G00	.277053	.020041	13.825	79	.000

Final estimation of variance components

Random Effect	Standard Deviation	Variance Component	df	Chi-square	P-value
INTRCPT1, U0	.16242	.02638	79	2275.61294	.000
level-1, R	.14371	.02065			

Table 10

HLM results for unweighted conditional model—all effect sizes (total student unit):

Income

Final estimation of fixed effects

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
INTRCPT1, B0					
INTRCPT2, G00	.274039	.023691	11.567	78	.000
INCOME_M, G01	.010571	.044392	.238	78	.813

Final estimation of variance components

Random Effect	Standard Deviation	Variance Component	df	Chi-square	P-value
INTRCPT1, U0	.16237	.02636	78	2227.84950	.000
level-1, R	.14371	.02065			

Table 11

HLM results for unweighted conditional model—all effect sizes (total student unit):

Income, education and occupation

Final estimation of fixed effects

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
INTRCPT1, B0					
INTRCPT2, G00	.311661	.036872	8.453	76	.000
INCOME_M, G01	.018478	.043525	.425	76	.672
EDU_MAX, G02	-.068145	.039733	-1.715	76	.090
OCCU_MAX, G03	-.013849	.040760	-.340	76	.735

Final estimation of variance components

Random Effect	Standard Deviation	Variance Component	df	Chi-square	P-value
INTRCPT1, U0	.15782	.02491	76	1736.16313	.000
level-1, R	.14373	.02066			

Table 12

HLM results for unweighted conditional model—all effect sizes (total student unit):

Occupation

Final estimation of fixed effects

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
INTRCPT1, B0					
INTRCPT2, G00	.291429	.032814	8.881	78	.000
OCCU_MAX, G01	-.022935	.041464	-.553	78	.581

Final estimation of variance components

Random Effect	Standard Deviation	Variance Component	df	Chi-square	P-value
INTRCPT1, U0	.16260	.02644	78	2496.29821	.000
level-1, R	.14369	.02065			

Table 13

HLM results for unweighted unconditional model—independent effect sizes (student unit)

Final estimation of fixed effects

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
INTRCPT1, B0 INTRCPT2, G00	.261369	.027570	9.480	51	.000

Final estimation of variance components

Random Effect	Standard Deviation	Variance Component	df	Chi-square	P-value
INTRCPT1, U0	.16697	.02788	51	60.11723	.000
level-1, R	.18327	.03359			

Table 14

HLM results for unweighted conditional model—independent effect sizes (student unit):

Income

Final estimation of fixed effects

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
INTRCPT1, B0					
INTRCPT2, G00	.255584	.031901	8.012	50	.000
INCOME, G01	.022676	.063239	.359	50	.721

Final estimation of variance components

Random Effect	Standard Deviation	Variance Component	df	Chi-square	P-value
INTRCPT1, U0	.16677	.02781	50	58.17617	.000
level-1, R	.18327	.03359			

Table 15

HLM results for unweighted conditional model—independent effect sizes (student unit): Income, education and occupation

Final estimation of fixed effects

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
INTRCPT1, B0					
INTRCPT2, G00	.308567	.048631	6.345	48	.000
INCOME, G01	.034985	.060251	.581	48	.564
EDU, G02	-.104718	.053135	-1.971	48	.054
OCC, G03	-.016584	.054048	-.307	48	.760

Final estimation of variance components

Random Effect	Standard Deviation	Variance Component	df	Chi-square	P-value
INTRCPT1, U0	.15422	.02378	48	379.83822	.000
level-1, R	.18349	.03367			

Table 16

HLM results for unweighted conditional model—independent effect sizes (student unit): Occupation

Final estimation of fixed effects

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
INTRCPT1, B0					
INTRCPT2, G00	.282833	.044147	6.407	50	.000
OCC, G01	-.035174	.056512	-.622	50	.536

Final estimation of variance components

Random Effect	Standard Deviation	Variance Component	df	Chi-square	P-value
INTRCPT1, U0	.16691	.02786	50	626.51924	.000
level-1, R	.18322	.03357			

Table 17

HLM results for weighted unconditional model—all effect sizes (student unit)

Final estimation of fixed effects (with robust standard errors)

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
INTRCPT1, B0 INTRCPT2, G00	.085971	.023258	3.696	78	.001

Final estimation of variance components

Random Effect	Standard Deviation	Variance Component	df	Chi-square	P-value
INTRCPT1, U0	.06591	.00434	78	543.27836	.000
level-1, R	.10723	.01150			

Table 18

HLM results for weighted conditional model—all effect sizes (student unit): Income

Final estimation of fixed effects (with robust standard errors)

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
INTRCPT1, B0					
INTRCPT2, G00	.085509	.023195	3.687	77	.001
INCOME_M, G01	.118213	.038407	3.078	77	.003

Final estimation of variance components

Random Effect	Standard Deviation	Variance Component	df	Chi-square	P-value
INTRCPT1, U0	.06553	.00429	77	546.88700	.000
level-1, R	.10721	.01149			

Table 19

HLM results for weighted conditional model—all effect sizes (student unit): Income, education, and occupation

Final estimation of fixed effects (with robust standard errors)

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
INTRCPT1, B0					
INTRCPT2, G00	.144785	.029165	4.964	75	.000
INCOME_M, G01	.072790	.045870	1.587	75	.116
EDU_MAX, G02	-.059633	.024819	-2.403	75	.019
OCCU_MAX, G03	.014989	.023803	.630	75	.531

Final estimation of variance components

Random Effect	Standard Deviation	Variance Component	df	Chi-square	P-value
INTRCPT1, U0	.06558	.00430	75	551.68159	.000
level-1, R	.10721	.01149			

Table 20

HLM results for weighted conditional model—all effect sizes (student unit): Occupation

Final estimation of fixed effects (with robust standard errors)

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
INTRCPT1, B0					
INTRCPT2, G00	.085280	.023297	3.661	77	.001
OCCU_MAX, G01	.059753	.035436	1.686	77	.095

Final estimation of variance components

Random Effect	Standard Deviation	Variance Component	df	Chi-square	P-value
INTRCPT1, U0	.06575	.00432	77	55.64433	.000
level-1, R	.10722	.01150			

Table 21

HLM results for weighted unconditional model—independent effect sizes (student unit)

Final estimation of fixed effects (with robust standard errors)

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
INTRCPT1, B0 INTRCPT2, G00	.062926	.000221	284.870	51	.000

Final estimation of variance components

Random Effect	Standard Deviation	Variance Component	df	Chi-square	P-value
INTRCPT1, U0	.00204	.00000	51	1.96860	>.500
level-1, R	.10074	.01015			

Table 22

HLM results for weighted conditional model—independent effect sizes (student unit):

Income

Final estimation of fixed effects (with robust standard errors)

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
INTRCPT1, B0					
INTRCPT2, G00	.062910	.000206	304.663	50	.000
INCOME, G01	.070896	.051990	1.364	50	.179

Final estimation of variance components

Random Effect	Standard Deviation	Variance Component	df	Chi-square	P-value
INTRCPT1, U0	.00203	.00000	50	1.88941	>.500
level-1, R	.10073	.01015			

Table 23

HLM results for weighted conditional model—independent effect sizes (student unit): Income, education and occupation

Final estimation of fixed effects (with robust standard errors)

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
INTRCPT1, B0					
INTRCPT2, G00	.172794	.021944	7.874	48	.000
INCOME, G01	.026438	.045359	.583	48	.562
EDU, G02	-.110055	.021939	-5.016	48	.000
OCC, G03	.025282	.003758	6.728	48	.000

Final estimation of variance components

Random Effect	Standard Deviation	Variance Component	df	Chi-square	P-value
INTRCPT1, U0	.00202	.00000	48	.84815	>.500
level-1, R	.10066	.01013			

Table 24

HLM results for weighted conditional model—independent effect sizes (student unit): Occupation

Final estimation of fixed effects (with robust standard errors)

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
INTRCPT1, B0					
INTRCPT2, G00	.062752	.000029	214.596	50	.000
OCC, G01	.045136	.018250	2.473	50	.017

Final estimation of variance components

Random Effect	Standard Deviation	Variance Component	df	Chi-square	P-value
INTRCPT1, U0	.00203	.00000	50	1.42245	>.500
level-1, R	.10070	.01014			

Using the Meta-Analyses to address the Research Questions

Research question 1: To what extent do SES measures selected based on Weberian theory explain variation in effect sizes (correlation) capturing the relationship between SES and academic achievement?

Research question 2: To what extent does SES measure selected based on Marxian theory explain variation in effect sizes capturing the relationship between SES and academic achievement?

Research question 3: To what extent does SES measure selected based on Occupationalists theory explain variation in effect sizes capturing the relationship between SES and academic achievement?

Research questions 1-3 were answered using variance components in the HLM outputs. HLM models were fitted using SES measures consistent with each social class theory: Marxian theory: income, Weberian theory: income, education and occupation, and occupationalist theory: occupation.

Variance explained by each SES measure(s) consistent with a social class theory was computed by dividing the variance component of the second level by the total variance component of both levels contained from the final estimation of variance components table in each HLM run.

The amount of variance reduction in level 2 due to SES predictor(s) was computed using the difference between the unconditional and conditional variance in level 2 over the unconditional variance of level 2:

$$R_2^{\,2} = \frac{\tau_{unconditional} - \tau_{conditional}}{\tau_{unconditional}}$$

For the Marxian model (income) using independent effect sizes, the variance reductions were: 1) unweighted model (.002), and 2) weighted model (0). For the Weberian model (income, education, and occupation) using the independent effect sizes, the variance reductions were: 1) unweighted model (.056), and 2) weighted model (0). For the Occupationalist model (occupation) using the independent effect sizes, the variance reductions were: 1) unweighted model (0), and 2) weighted model (0).

Research question 4: Which measure of SES (income, education, and occupation) does appear to be the strongest predictor of variation in effect sizes?

From the model fitted with these three SES predictors, regression slopes in the second level are indicators of the relationship to the effect sizes. The level 2 slopes in the model with unweighted independent effect sizes were: 1) income (.034: p=.564), 2) education (-.104: p=.054), and 3) occupation (-.016: p=.760). The level 2 slopes in the model with weighted independent effect sizes were: 1) income (.026: p=.562), 2) education (-.110: p=.000), and 3) occupation (.025: p=.000). In both the weighted and the unweighted independent models, education seems to be the strongest predictor.

Research question 5: Is there difference between SES measures consistent with social class theory (theoretically grounded SES measures) and measures not consistent with theory (atheoretically grounded SES measures) in terms of average correlation between SES and achievement?

The average correlation between theoretical SES (including income, education, and occupation) and achievement was .270 after removing the sampling error and being weighted by the sample size. The average correlation between atheoretical SES (any other SES but major SES measures) and achievement after removing the sampling error and being weighted by the sample size was .057. This finding shows that there is a difference in the correlation of SES and achievement depending on which SES measure is used. It supports the idea that SES measures guided by theories explain more variation in the relationship between SES and achievement.

Research question 6: Does the effect of SES on achievement change for different kinds of achievement, and, if so, how?

The average correlation between SES and general IQ was .150 and the average correlation using general standardized achievement and SES was .662. In terms of content area, the verbal area in IQ showed the highest correlation (.244) and the math IQ the second highest (.156). In standardized achievement tests correlations, math (.144) were involving higher than the verbal area (.066).

Summary

Three major social class theories (Weberian, Marxian, and Occupationalist) provided structures of social class and dimensions of power that guided selection of SES measures in this study.

Independent student effect sizes were used for the study analyses. The weighted overall mean effect size (Pearson correlation) after sampling error was removed was .07. SES measures that were selected based on their grounding with respect to the three social class theories above (income, education, and occupation) showed a weighted mean effect size of .27, whereas other SES measures found in the meta-analysis data had a lower mean effect size of .06. Among the major SES measures, parents' education was the highest in magnitude (.28), followed by income (.25) and then parents' occupation (.18). The weighted average effect size using occupational index was .09.

Achievement type was most frequently associated with IQ and standardized achievement measures. However, GPA and performance tests were also considered as other kinds of achievement measures. IQ and standardized achievement tests were divided into subject areas of verbal, math, and other. Overall IQ and standardized achievement weighted effect size means were .15 and .07, respectively. Verbal content area for IQ and standardized achievement had means of .24 and .07, respectively. The

means of math subject for both IQ and achievement were .16 and .15 and GPA and performance tests showed weighted effect size means of .07 and .03, respectively.

HLM analyses were conducted using unweighted and weighted approaches. The unweighted grand mean for independent student effect sizes was .26. The unweighted Marxian model had a grand mean of .26, Weberian .31, and Occupationalist .28. Unconditional variation in level 2 was 45% and each conditional model reduced variation by .1%, 4.0%, and .003%, respectively. Inclusion of education and occupation in the Weberian model appeared to lower the grand mean effect size since the level 2 regression coefficients were slightly negative (although it is important to note that none of three regression coefficients were statistically significant).

The weighted unconditional model showed a grand mean .06, which coincides with Hunter and Schmidt's overall grand mean after sampling errors are removed. The amount of level 2 variation was small and not significant (.04%). Grand effect size means for the conditional models of each theory were .06, .17, and .06 (Marxian, Weberian, and Occupationalist respectively). In the Weberian model, income and occupation showed a positive moderating impact on the relationship between SES and achievement.

Chapter V

Discussion

This chapter offers some conclusion based on the findings from the analysis results provided in chapter IV. Suggestions for future research on SES and academic achievement are also presented.

Conclusion

Meta-analytic findings showed that theory-based SES measures (income, occupation and education) consistent with one of the three social class theories generally agreed with traditional SES measures used in the literature that are not consistent with any particular social class theory (White, 1982). When the major (theoretically grounded) SES measures were used as predictors of achievement, they did not explain much variation, although employing multiple predictors (the Weberian model) increased the variation explained. This suggests that the often-held belief about a strong correlation between any kind of SES measure and achievement is not necessarily true.

Although theory-based SES measures showed weak to moderate correlation with achievement, the choice of SES measure, based on theory or not made a modest difference in the magnitude of the average effect size between SES and achievement. Also, the choice of type of achievement measure was associated with variation in the size of the correlations. Perhaps the correlation between SES and achievement may not be measuring one single concept. Instead, the definitions of SES and achievement may create different concepts of which each correlation can be unique. If this is the case,

researchers should make it very clear what they are referring to when they use the terms SES and achievement.

The average effect size using atheoretical SES measures produced smaller correlations with achievement than that of theory-based SES. This suggests that different kinds of SES measures are differentially related to students' academic achievement. Also, variation in effect sizes can be at least partly attributed to different types of achievement with IQ verbal associated with the largest effect sizes.

Higher correlations of theory-based SES measures with IQ (especially verbal) agrees with Speath (1969)'s model between SES and achievement. Among theory-based SES measures, parents' education showed the highest correlation. According to Speath, parents with higher education are more likely to put emphasis on their children's education by providing more educational stimuli and support on learning. Then, parental support on learning in early stages will likely bolster their children's intelligence. Parents' focus on education can be enhanced when parents have more income and time. Intellectual supports at home appear to be more related to increased intelligence of students' verbal skills than math skills. Perhaps this is due to parents' verbal choices and vocabularies in along with educational and academic activities that influence children's verbal skills.

Comparing White (1982) and Sirin (2005)'s findings, the results of this study were consistent with those of White (1982) in that average effect sizes between SES and achievement were weak to moderate. Theory-based SES measures in this study were the same as those typically defined in educational research according to White (1982). White's largest effect size was for income (.315) when a single SES measure was used

but a combination of income, education and occupation (.318) was larger. For achievement, IQ (.403) was associated with the highest average effect size among other types of achievement. Between verbal and math, the verbal average effect size (.307) was larger than that of math (.246).

Sirin (2005)'s results were somewhat different than those of this study: 1) among income, education and occupation, education revealed the largest average effect size (.30), 2) between verbal and math, math yielded larger average effect size (.35). Sirin did not report average effect sizes among different kinds of achievement.

Recommendations

The weak to moderate average correlations between SES measures and achievement measures used in this study, as well as some differences compared to other meta-analysis study results (e.g, White (1982), Sirin (2005)) raises the possibility of other significant sources of variation not accounted for in this study. One possible factor is the influence of children's home background that, while perhaps viewed as functioning fairly independently from the influences of school, may be more correlated with achievement than assumed. Educational studies may need to further examine home background in a broader scope that connects both home and school factors. Studies examining causal mechanisms among home and school factors could be helpful.

Second, future research could examine how much of the variation in meta-analysis results can be attributed to methods employed in the meta-analysis. Although the meta-analytic approach is a powerful way of summarizing studies over a particular topic, the substantive decisions made during the coding and the analyses might lead to differences in the results. For example, some SES measures might be coded as categories such as

low, middle and high and numbered as 1, 2, and 3 whereas other SES measures such as occupational index are continuous in nature, perhaps ranging from 1-10. Yet another SES coding might be dichotomous such as yes/no (e.g., inclusion of occupation or not). In similar ways, the scales of achievement measures can be different (e.g., standardized test (100-500), GPA (1-4)). It is questionable whether these different scales can be as equally capturing SES or achievement and how much instability it will cause in the results of the meta-analysis. It is not certain whether the concept of SES as continuous can be still valid with respected to particular uses and/or interpretations when it is measured with categorical or dichotomous coding. And of course, categories that unnecessarily restrict range can depreciate the magnitude of correlation coefficients.

Perhaps most significantly, researchers using terms like SES and achievement need to provide clear definitions and note their theoretical considerations to make readers aware of the frame of reference for their research. It is important for a study to provide a strong theoretical foundation of SES so that the result of the SES measure(s) based on the selected theoretical rationale can be interpreted clearly. Without a clear notion of what SES is may be difficult to explain convincingly why a measure of SES should be interpreted in a particular fashion. A theoretical SES model ideally would be selected to correspond with the purpose of the research, and it may be that different studies will employ different theoretical rationales for SES. No matter which social class theory is used to conceptualize SES and select appropriate SES measures should be selected. This will, in turn, enhance the credibility of study results.

Researchers need to choose SES measures that are valid and reliable as indicators of the conceptualization of SES. There can be many choices of SES measures for a given conceptualization.

Researchers conducting literature reviews should be cautious when citing a value for 'the correlation' between SES and achievement and/or ability measures. A single value to cover all situations does not seem justified based on the study findings. Conditional factors should be considered. For example, a researcher conducting research primarily on IQ or academic ability may need to refer to one value while a researcher interested in achievement may wish to cite another. The same is true for researchers reviewing literature in specific subject areas such as math. Diligence in the research process will result in a more meaningful and enlightening result with stronger theoretical, methodological, and inferential implications. Finally, building the research on a sound theoretical base provides support for the complete research process.

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APPENDICES

Appendix A: White's Coding Scheme

Variables	Code #	Coding categories	Information
Study ID number			
Author			
Year of Publication		Last two digits of year	
Type of Publication	1	Journal article	
	2	Book	
	3	Unpublished conference paper/ERIC	
	4	Dissertation/ Master's thesis	
	5	Technical reports (government/project)	
	6	Other	

Variables	Code#	Coding categories	Information
Grade level	#	Numerical values	0 - Kindergarten 1 ~ 12 – grade level 13 – College freshman 14 – College sophomore 15 – College junior 16 – College Senior 17 – Mixed (e.g., $5^{th}/7^{th}$ grade)
Ethnic Composition in percent		% White	%'s across categories must add to 100%
		% Black	
		% Hispanic	
		% Asian	
		% Other than White, Black, Hispanic & Asian	
Nature of Sample	1	Local	Where did subjects come from?
	2	Regional	
	3	National	

Variables	Code#	Coding categories	Information
Unit of analysis	1	Student/ individual	
	2	Classroom	
	3	School	

	4	Mixture	
	5	School district	
	6	Confounded	
	7	Other	
# of students used to compute correlation effect size	###	Number used to compute ES	

Variables		Code #	Coding Categories	Information
Type of Achievement measure	Verbal	1	Yes	
		0	No	
	Math	1	Yes	
		0	No	
	Science	1	Yes	
		0	No	
	Composite (Verbal + Math)	1	Yes	
		0	No	
	IQ	1	Yes	
		0	No	
	Other	1	Yes	
		0	No	
Achievement range restriction		1	No restriction	
		2	Slight to moderate restriction	
		3	Moderate to strong restriction	
		4	Substantial restriction	

Variables	Code #	Coding Categories	Information
SES reporting error	1	**Most accurate** (Ex. Information was obtained from **parents**)	
	2	Somewhat accurate (Ex. Information was reported by **students**)	
	3	Somewhat inaccurate (Ex. Information was estimated by **teachers**)	
	4	**Substantially inaccurate** (Ex. Information was estimated by **the central office**)	
SES range restriction	1	No restriction	

		2	Slight to moderate restriction	
		3	Moderate to strong restriction	
		4	Substantial restriction	Ex. Inner-city and low income students
Number of items in the SES instrument		#		
Types of SES Measure	Income of family	0	Not represented in the instrument	
		1		
		2		
		3	Major representation in the instrument	
	Education of parents	0	Not represented in the instrument	
		1		
		2		
		3	Major representation in the instrument	
	Occupation of head of house	0	Not represented in the instrument	
		1		
		2		
		3	Major representation in the instrument	
	Home atmosphere	0	Not represented in the instrument	Ex. • Parents' attitude toward education • Parents' aspiration for their children • Cultural and intellectual activities of the family
		1		
		2		
		3	Major representation in the instrument	
	Dwelling value	0	Not represented in the instrument	
		1		
		2		
		3	Major representation in the instrument	
	School resources	0	Not represented in the instrument	Ex. • Age of buildings • Salary of teachers • Size of district • Experience of teachers
		1		
		2		
		3	Major representation in the instrument	

	Subjective judgment	0	Not represented in the instrument	Ex. Pure judgment with no objective criterion
		1		
		2		
		3	Major representation in the instrument	
	Other	0	Not represented in the instrument	Ex. • # of siblings • ethnicity (1-%nonWhite) • mobility of family (1-%mobile) • (1-free lunch%)
		1		
		2		
		3	Major representation in the instrument	
# of SES groups		#		* continuous variable – code as "99"

Variables		Code#	Coding categories	Information
Verbal	Type of effect	0	Eta -squared (η)	+ r means high achievement goes with high SES (e.g., no free lunch); - r means low achievement goes with high SES (e.g., no free lunch)
		1 2	r- Pearson's correlation r_{tet}-tetraphoric correlation	
	Effect size	##.##		
Mathematics	Type of effect	0	Eta -squared (η)	
		1 2	r- Pearson's correlation r_{tet}-tetraphoric correlation	
	Effect size	##.##		
Science	Type of effect	0	Eta -squared (η)	
		1 2	r- Pearson's correlation r_{tet}-tetraphoric correlation	
	Effect size	##.##		
Composite (Verbal + Math)	Type of effect	0	Eta -squared (η)	
		1 2	r- Pearson's correlation r_{tet}-tetraphoric correlation	

	Effect size	##.##		
Other	Type of effect	0	Eta -squared (η)	
		1 2	r- Pearson's correlation r_{tet}-tetraphoric correlation	
	Effect size	##.##		
IQ	Type of Effect	0	Eta -squared (η)	
		1 2	r- Pearson's correlation r_{tet}-tetraphoric correlation	
	Effect Size	##.##		

Variables	Code #	Coding Categories	Information
Internal validity	1	High internal validity	Combination of study quality and validity of study effect
	2	Medium internal validity	
	3	Low internal validity	

Appendix B Part of Harwell, Maeda, and Lee Coding Scheme

Variables	Code#	Coding categories	Information
Type of School	1	Public*	Code as '-9' if paper does not state a specific type of school * Code as 'public' if schools were selected from a district.
	2	Private	
	3	Mixture	
Sampling method	1	Simple random sampling	Method of sampling
	2	Stratified random sampling	
	3	Cluster sampling	
	4	Convenience sampling*	*code as convenient sampling if paper does not state a specific sampling procedure. ** includes matching technique
	5	Entire population used	
	6	Mixture**	

Variables	Code#	Coding categories	Information
Study method (s) of collecting SES data	1	Archival / Records search	
	2	Survey Questionnaire completed at home/school	
	3	Interview	
	4	Mixture	
	5	Other	
# of categories for SES used	1	2 categories	
	2	3 categories	
	3	More than 3 categories/ Continuous	
Duncan's socioeconomic index	1	Yes	
	0	No	
Warner's occupational rating	1	Yes	
	0	No	
Hollingshead Job scale	1	Yes	
	0	No	
Sims' Socio-economic Score Card	1	Yes	
	0	No	
Free/reduced	1	Yes	

lunch program	0	No	
Family income	#	Average income	
Family size	#	Average family size	
Mother's occupation	1	Yes	
	0	No	
Father's occupation	1	Yes	
	0	No	
Mother's educational level	1	Yes	
	0	No	
Father's educational level	1	Yes	
	0	No	
Parent's occupational Level	1	Yes	
	0	No	
Parent's educational level	1	Yes	
	0	No	
Resources in Home	1	Yes	e.g. Reading materials
	0	No	
Composite	1	Yes	2 or more SES indicators aggregated
	0	No	
Other	1	Yes	
	0	No	

Variables		Code#	Coding categories	Information
Mathematics / Nonverbal IQ				+ r means high achievement goes with high SES (e.g., no free lunch); - r means low achievement goes with high SES (e.g., no free lunch)
	Effect size	##.##		
Literacy / Verbal IQ				
	Effect size	##.##		
General / Total IQ				
	Effect size	##.##		
GPA (H)				
	Effect size	##.##		
Other				
	Effect size	##.##		

Variables	Code#	Coding categories	Information
Overall methodological quality of study (based on information reported)	A, A^-, B^+, B, B^-, C^+, C, C^-, D^+, D, D^-, F	C = average (e.g. cite a study) A=1, A^-=2, B^+=3, B=4, B^-=5, C^+=6, C=7, C^-=8, D=$^+$9, D=10, D^-=11, F=12	i.e. Research design, Sampling, Instrumentation, Data Analysis, Conclusions from Data Analysis

Quality of research design = Construct validity & External Validity + Internal Validity & Statistical Conclusion Validity